











TABLE OF CONTENTS

2	Welcome
3	Schedule
3 - 4	Judges
5	Categories
6	 Bio & Biomedical
71	 Business Research
81	 Translational & Clinical
110	 Computation & Bio Modeling
120	 Computation & Modeling (Non-Bio)
143	 Creative Arts & Design
164	 Humanities & Social Sciences
203	 Education & Outreach
217	 Physical Science & Engineering



WELCOME

Welcome to the 2015 Drexel University Research Day!



The hard work of creating new knowledge and creative works transpires 24 hours a day, 7 days a week and 365 days a year here at Drexel. Stop by campus late on any Saturday night or early on New Years Day and you are bound to find dedicated students, staff and faculty engaged in the hard work of creation and discovery. Today is the day we celebrate these efforts by engaging with our students and colleagues across campuses to learn about their research efforts, interests, aspirations and challenges. One of our hopes is that new interactions will occur today that will foster groundbreaking research, scholarship and creativity.



Enjoy the day!



Aleister Saunders, Ph.D.

Interim Senior Vice Provost for Research

SCHEDULE

9:00 AM **Doors Open for Hanging Posters and Other Exhibits**

11:00 AM **Poster Presentations and Other Exhibits**
to 2:30 PM Presenters are required to be at their location from:
11:00 AM - 12:30 PM or
12:00 - 1:30 PM or
1:00 - 2:30 PM

2:30 PM **Closing Reception**
Registration Area

JUDGES

Jennifer Adams
Stacey Ake
Michael Akins
Ulrike Altenmueller-Lewis
Peter Amato
Murugan Anandarajan
Babak Anasori
Alexey Aprelev
Theo Artz
Yasmine Awais
Chris Badurek
Benjamin Barnett
Konstantinos Baxevanakis
John Berton
Debjani Bhattacharyya
Philip Bloomfield
Francisco Borrero
Valerie Bracchi-Ricard
Joke Bradt
Wesley Broadnax
Jean Brody
Sharon Brubaker
M. Eric Carr
Oben Ceryan
Hao Cheng
Sonam Chheda
Richard Chiou
Jack Cliggett
David Cohen

Therese Comella
John Cooke
Anthony Coratolo
Fran Cornelius
Carmen Cronin
Luis Cruz
Dave Culver
Lauren D'Innocenzo
Kapil Dandekar
Rajnish Dave
Jonathan Deutsch
Rose Ann DiMaria-Ghalili
Michelle Dolinski
Anda Dubinski
Daniel Duran
David Ebaugh
Justin Emami
Jacqueline Emrich
Lawrence Epstein
Yalcin Ertekin
Bernard Eskin
Dalit Eyal
Lisa Farley
Bakhtier Farouk
Theresa Fay-Hillier
Jane Fedorczyk
Elise Ferer
Frank Ferrone
James Feustel

Troy Finamore
Margaret Finley
Mary Flynn
Aroutis Foster
Vladimir Genis
Nancy Gerber
Ellen Giarelli
Amy Giddings
Cem Girit
Dave Goldberg
Elizabeth Gonzalez
Deborah Gordon
Peter Grillo
Shawkat Hammoudeh
Travis Harman
Kelsey Hatzell
Uri Hershberg
Linda Hock-Long
Tobie Hoffman
Irina Husanu
Monica Ilies
Tania Issac Hyman
Greg Jewell
Frank Ji
Ying Jin
April Johnson
Kathie Jordan
Suresh Joshi
Monika Jost

JUDGES

Karen Kabnick
Goran Karapetrov
Santosh Katiyar
Dana Kemery
Zafar Khan
Marlin Killen
Daniel King
Claire King
Ann Klassen
Ioannis Koutroulis
Panagiotis Kratimenos
Vera Lee
Hwan Yong Lee
Beth Leonberg
Peter Lewin
Hualou Liang
Xia Lin
Daniela Livingston
Christina Love
Vicki Mahan
Taron Makaryan
S.Nini Malayaman
Walt Mankowski
Dan Marenda
Anne Martella
Michael Mauk
Mary Mawritz
Donald McEachron
Bob McGrath
Alexey Melishchuk
Vandana Miller
Clare Milner
Kimberly Mitchell
Lawrence Moore
Julie Mostov
Mary Mulcahey
Glen Muschio
Russell Neilson
Danuta Nitecki
Romy Nocera
Catherine Nowak
Ana Nunez
Sean O'Donnell
Mira Olson
Banu Onaral
Patrick Osei-Owusu
Karol Osipowicz

Flavia Padovani
Robert Palisano
Haemin Dennis Park
Marcia Pelberg
Rakhmiel Peltz
Karen Pelzer
Ron Perline
Margene Petersen
Ekaterina Pomerantseva
Rick Rest
Rachel Reynolds
Mehdi Rhazali
Danielle Rice
Lorraine Richards Bornn
Adam Rickert
Noreen Robertson
Candace Robertson-James
Michelle Rogers
Maryam Ronagh
Heather Rose
Warren Rosen
Kim Rutherford
Susan Rutkowsky
Ahmet Sacan
Christopher Sales
Dario Salvucci
Aleksandra Sarcevic
Aleister Saunders
Ellen Schelly Hill
Bette Seamonds
John Seay
Jonathan Seitz
Bhaswati Sen
Natalie Shaak
Mamta Shah
Samir Shah
Michal Sharoni
Scott Sigman
Julia Sluzenski
Nathaniel Snyder
Alan Soble
Paulina Sockolow
Il-Yeol Song
Suruchi Sood
Prashant Srivastava
Aron Starosta
Jeanne Steuber

Judith Storniolo
Julia Stoyanovich
Todd Stochlic
Deeptha Sukumar
Rajneesh Suri
Albert Tedesco
Masaru Teramoto
Roger Thomas
Eva Thury
Monica Togna
Nader Toossi
Kazuhito Toyooka
Oleh Tretiak
Alex Turfa
Ferit Tuzer
Catherine Ulozas
Carmen Vicente
Stella Volpe
Maria Volynsky
Kirtanaa Voralu
Nicholas Wagner
Roberta Waite
Scott Warnock
Anika Warren
Bernie Weinberg
Mark Willie
Dennis Yang
Walter Yerk
Jian-Min Yuan
Adam Zahn

BIO & BIOMEDICAL

BUSINESS RESEARCH

TRANSLATIONAL & CLINICAL

COMPUTATION & BIO MODELING

COMPUTATION & MODELING (NON-BIO)

CREATIVE ARTS & DESIGN

HUMANITIES & SOCIAL SCIENCES

EDUCATION & OUTREACH

PHYSICAL SCIENCE & ENGINEERING

Tip60 Mediated Regulation of Cognition Linked Gene Targets in Drosophila

BB-01

Anisha Sunkerneni

Advisor(s): Dr. Felice Elefant, Priya Panikker

Undergraduate Student

College of Arts and Sciences

Neurodegenerative diseases, such as Alzheimer's Disease (AD), are associated with gene misregulation related to cognitive function. Epigenetic machinery is essential for proper cognitive function. Epigenetic modifiers, such as histone acetyltransferases (HATs), cause genetic alterations in the human genome. HATs acetylate lysine amino acids located on histone proteins and transfer an acetyl group from acetyl CoA to create ϵ -N-acetyllysine, leading to transcriptional activation of genes. Tip60 is a HAT linked to neurodegenerative conditions, including AD. Tip60 is implicated in AD via its interaction with AD-linked amyloid precursor protein intracellular domain (AICD). Previous research from our lab demonstrated the role of Tip60 in neuronal functions such as locomotion, memory and learning. Additionally, we have shown that excessive Tip60 partially rescues the defects seen in some neuronal functions. However, the mechanism by which Tip60 beneficially regulates these processes remains unclear. This project investigates the changes in expression of cognition linked Tip60 gene targets under neurodegenerative conditions. Here, we use qPCR to test the changes in expression of genes related to cognitive function in order to see how varying levels of Tip60 affect their expression. Findings from this research help in understanding the mechanism by which Tip60 plays a beneficial role under neurodegenerative conditions.

Translocation Renal Cell Cancer: A Rare Disease in Adults

BB-02

BB

Anthony Willis

Co-Author(s): Dr Mark Hysell, Dr Andrei Plagov

Resident/Fellow (MD)

College of Medicine

Radiology

Common Types of renal cell carcinoma (RCC) include clear cell, papillary, chromophobe, collecting duct, and spindle cell carcinoma. These forms are associated with specific genetic alterations including regulator deletions in clear cell and trisomy in papillary. Translocation RCC is common in children, but rare in adults, accounting for 1.6% to 5% of adult RCCs. Translocation of the transcription factor E3 (TFE3) gene on Xp11.2 and fusion between TFE3 and ASPL, PRCC, PSF, NonO, or CLTC results in overexpression of the TFE3. In adults, translocation RCC is found at advanced stages and has an exceptionally aggressive clinical course without an effective therapy apart from surgery. Unfortunately, many of the patients are not surgical candidates secondary to vascular invasion and metastases. Our case report is a 29-yr-old male who presented with malaise, weight loss, and back pain. Computed tomography revealed a large left renal tumor with extensive metastases. Hematoxylin-eosin staining revealed nested and papillary architecture with abundant eosinophilic cytoplasm. A diagnosis of Xp11.2 translocation renal cell carcinoma was based on the HES characteristics and strong nuclear expression of TFE3.

Onset of Bruxism Following Initiation of Olanzapine Treatment: A Case Study

BB-03

BB

Syed Sikandar Shah

Co-Author(s): Raj Kaur, Mitali Patnaik, Rick Jossiason

Resident/Fellow (MD)

College of Medicine

Psychiatry

Mr. L is a 51-year-old African American male who was referred for medication management by his psychotherapist. His primary psychiatric diagnosis is Major Depressive Disorder with Psychotic Features (DSM5: 296.34). He was referred primarily because he was not responding to his medication regimen although he was compliant with them. He still felt depressed, was very seclusive, paranoid, with paucity of speech and thought content, and was fatigued and sleep disturbed. At his initial visit he was taking Abilify 5mg qdaily, Bupropion 300mg XL qdaily, Klonopin 1mg tid, Trazodone 300 mg qHS and Ambien 5 mg qHS. Due to his complex polypharmacy a decision was made to slowly taper off the Abilify, Trazodone and Ambien over a period of one month. Once tapered off the medications, the patient was started on Olanzapine 5 mg qHS and he was maintained on this dose.

The patient was being seen on a monthly basis and at his one-month visit he reported that his mood, sleep and appetite were markedly improved. He also looked less paranoid. At his 6th month visit he stated that he had been "... grinding his teeth for the past 2-3 weeks, 4-5 times a day and multiple times at night." He stated further that he "... was unable to control it voluntarily." At this 6-month visit his neurological exam was within normal limits, specifically he had no muscle rigidity, EPS, or oral-facial movements. His score on the Abnormal Involuntary Movement Scale (AIMS) was zero. After careful consideration he was diagnosed with bruxism, defined as a movement disorder with nonfunctional activity of teeth, including clenching, grinding, gnashing, and bracing of teeth. The patient noted that he had never before experienced these symptoms.

The Role of CCL2 and Innate Immune Response in the Development of Spinal Cord Injury-induced Neuropathic Pain

BB-04

Soha Chhaya

Co-Author(s): Daniel Quiros Molina, John R Bethea, Megan Ryan Detloff

Advisor(s): Megan Ryan Detloff

Graduate Student

College of Medicine

Department of Neurobiology and Anatomy/Graduate Neuroscience Program

Neuropathic pain after spinal cord injury (SCI) is recognized as a neuroimmune disorder. Early after SCI, resident microglia are activated and peripheral macrophages are recruited to the spinal cord by the chemokine CCL2. This causes polarization of microglia/ macrophages into a predominantly pro-inflammatory (M1) rather than an anti-inflammatory (M2) phenotype. A resultant upregulation of inflammatory mediators causes secondary tissue damage, influences neuronal plasticity, alters nociceptive processing, and may contribute to the development of chronic pain. Thus, we tested whether SCI-induced pain corresponds to an increase in the levels of CCL2 as well as a change in the proportion of M1/M2 activated microglia/macrophages in the dorsal horn and dorsal root ganglia over time. Adult, female Sprague Dawley rats received a C5 hemi-laminectomy (n=10) or a moderate, unilateral C5 spinal cord contusion (n=60). Rats were assessed for the development of neuropathic pain using the von Frey monofilament test and the Hargreaves test and were sacrificed at 3, 7, 14, 28 or 42 days post injury. Spinal cord and DRGs were dissected, and immunohistochemistry was performed to determine the microglia/macrophage response using Iba-1 (ubiquitous), ED-1 (M1), CD206 and arginase-I (M2) antibodies. Additionally, we are analyzing CCL2 upregulation post-SCI via ELISA in the dorsal horn, DRG and serum. We hypothesize that the M1 microglia/macrophage response correlates with the development of SCI-induced neuropathic pain. Identification of specific molecules that initiate or maintain the pro-inflammatory state, activation of microglia and resultant chronic pain may provide potential therapeutic targets to contain this aberrant immune response and resultant pain co-morbidity after SCI.

Support contributed by: Commonwealth Universal Research Enhancement (CURE) Program Grants (MRD & JRB).

Chronic Cervicitis: Presenting Features and Response to Therapy

BB-05

BB

Julia Polk

Co-Author(s): Shawn Mattson

Advisor(s): Paul Nyirjesy

Resident/Fellow (MD)

College of Medicine

Ob/Gyn residency

The objectives of this study were: characterize non-gonococcal (GC), non-chlamydial (CT) cervicitis, identify treatments used for non-GCCT cervicitis and their outcomes and determine the microbes concomitantly present with non-GCCT and their possible significance.

This retrospective review included all patient encounters with the diagnostic code for cervicitis from the Drexel University Vaginitis Referral Center between April 1, 2008 and March 1, 2014. 58 cases of non-GCCT cervicitis were found to meet the following diagnostic criteria (two of three): mucopurulent discharge noted by (1) patient and/or (2) practitioner and (3) cervical bleeding upon gentle probing with a cotton swab. Data regarding patient's background characteristics, symptoms, treatment, tests and response were collected and compared.

All 58 patients received one of three initial treatments (azithromycin, doxycycline, or moxifloxacin), and 33% of patients pursued one or more of 11 additional treatments. The cure rate after initial treatment was 62% overall. Approximately half of the 58 patients were tested for various bacterial pathogens of unknown significance commonly found in the genito-urinary tract, as part of their cervicitis work-up. Positive bacterial tests (as detected by nucleic acid amplification, bacterial culture or PCR) were not shown to affect the clinical course or predict cure.

More than half of cervicitis is not caused by GC or CT. The true prevalence and cause of this entity has yet to be determined. At present, there is no literature directing the management of non-GCCT cervicitis. However, as this study helps to illustrate, this is a clinical entity associated with significant morbidity, with 50% of patients complaining of symptoms for greater than one year at time of presentation. Successful resolution of symptoms in 62% of patients with a single course of antibiotics supports the role for treatment and the need for further classification.

Pitch Types and Velocity in Major League Pitchers Prior to Ulnar Collateral Ligament Reconstruction

BB-06

John Prodromo

Co-Author(s): Kevin Denehy, Neil Kumar, Nimit Patel, Loni Philip Tabb, James Tom

Resident/Fellow (MD)

College of Medicine

Orthopaedic Surgery

In the seasons prior to surgery, Major League Baseball (MLB) pitchers that went on to ulnar collateral ligament reconstruction (UCLr) threw a higher percentage of fastballs and lower percentage of changeups with greater mean pitch velocity compared to a control group.

Methods: All MLB pitchers active during the 2002 to 2013 seasons were included in this study. MLB pitchers active in 2013 that had UCLr prior to the completion of the 2013 season were considered. All preoperative seasons between 2002 and 2013 were included. The control group was comprised of all seasons pitched from 2002 to 2013 by remaining MLB players. Pitch types were recorded as percentage of total pitches thrown. Pitch velocities were recorded for each pitch type. Pitch type and pitch velocities during preoperative seasons for UCLr pitchers were compared to all individual seasons for control pitchers using independent-samples t tests.

Results: This study included a total 7,342 seasons pitched by 2,048 players. 7,047 seasons pitched by the control group were compared to 295 preoperative seasons pitched by the UCLr group. Preoperative seasons pitched by UCLr players had a greater mean fastball percentage ($p = 0.002$) and lower mean changeup percentage ($p=0.22$) when compared to seasons pitched by control players. Preoperative seasons pitched by UCLr players had a greater mean fastball velocity ($p < 0.001$), slider velocity ($p < 0.001$), cut fastball velocity ($p < 0.001$), curveball velocity ($p = 0.002$), change-up velocity ($p = 0.006$), and split-finger velocity ($p = 0.012$) when compared to seasons pitched by control players. Although preoperative seasons pitched by UCLr players had a greater mean curveball percentage, this difference was not statistically significant.

Conclusion: In the seasons prior to surgery, MLB pitchers that went on to UCLr throw a higher percentage of fastballs and lower percentage of changeups with greater mean pitch velocity compared to a control group.

Physician Survey of ondansetron (Zofran) use practices

BB-07



Eric Lusinski

Co-Author(s): Richard Brodsky MD

Advisor(s): Richard Brodsky

Resident/Fellow (MD)

College of Medicine

St. Christopher's hospital for children, Emergency Department Fellowship

Ondansetron is currently used for nausea and/or vomiting primarily in a hospital setting. Currently there are no studies that examine the use of ondansetron in an outpatient setting and physician prescribing practices. With a new black box warning of QTc prolongation there are no studies that study how this impacted the use of ondansetron among physicians and its use in the outpatient setting. We theorized that the new black box warning has not affected physician use of ondansetron and that it is widely prescribed for outpatient use.

Physicians who are Pediatric and/or trained that work in the ER or Urgent Care centers were surveyed across the United States. The data was used to see how physicians prescribe ondansetron and what percentage prescribe it for outpatient use. The data was also analyzed to include demographics, to see at what age physicians prescribe ondansetron, what form of ondansetron most physicians prescribe and concern if it will mask a surgical emergency.

A total of 303 physicians completed the survey, 50.9% were pediatric trained, 38.9% Pediatric ER trained. 84% use ondansetron in the ER, 11% in urgent care and 5% in private practice/clinic. Dose of ondansetron most commonly used is 0.15mg/kg/dose (51.7%) vs. age based dosing (24.35%) vs. 0.1mg/kg/dose (23.95%). 54.46% of physicians start utilizing ondansetron at 6 months of age vs. 22.7% at 3 months of age, 14.5% at 1 year, 6.27% at 1 month of age. Most common forms of ondansetron used are ODT (30.8%) vs. IV (29.83%). 50.5% prescribe ondansetron for outpatient use vs. 15.2% do not prescribe for outpatient use and 34.3% prescribe it on a case by case basis. Most physicians prescribe 1-5 doses for home use 55.45% vs. 27.4% prescribe 6-10 doses and 17.15% prescribe >11 doses. 86.47% vs. 13.53% have not changed their practice in the use of ondansetron due to the new black box warning on ondansetron. 73% vs. 27% of physicians are not concerned that using ondansetron will mask a surgical emergency.

Implications of the Sonic Hedgehog Signaling Pathway in Alzheimer's Disease

BB-08

BB

Gabriel Horwitz

Advisor(s): Michal Sharoni, Aleister Saunders

Undergraduate Student

College of Arts and Sciences

Biological Sciences

Alzheimer's disease (AD) is a neurodegenerative disease characterized by memory loss and neuronal death. AD is initiated by a sequential proteolytic cleavage of amyloid precursor protein (APP), leading to a formation of A β fragments as plaques. Strong evidence suggests, A β plays a role in AD pathogenesis. This would indicate any modulation in APP metabolism could lead to a change in A β levels and affect AD initiation. Certain modulators of APP metabolism have been introduced, however there has yet to be a successful therapy developed. Previous data from our lab, utilizing in vitro and in vivo models, demonstrated that inhibition of Shh pathway via Cyclopamine results in altered APP processing and A β generation. It is known that Cyclopamine acts as a Sonic hedgehog (Shh) signaling pathway inhibitor. The major players in the Shh pathway are sonic hedgehog peptide (shh), Smoothed (Smo), patched1 (Ptch1) and Gli1, 2 and 3 transcription factors. In this research I monitored changes in APP metabolism through downregulation of Gli3 and Ptch1 by following changes in APP c-terminal fragment (CTF) accumulation. Our study is the first to indicate a connection between Shh signaling pathway and APP metabolism and could lead to development of novel therapeutic target.

High-resolution 3D Chemical Exchange Saturation Transfer Imaging of Glycosaminoglycan of In Vivo Human Knee Cartilage at 7T MRI

BB-09

Guruprasad Krishnamoorthy

Co-Author(s): Puneet Bagga, Hari Hariharan

Advisor(s): Ravinder Reddy

Graduate Student

School of Biomedical Engineering, Science and Health Systems

Biomedical Engineering

Osteoarthritis (OA) is a degenerative disease affecting molecular composition of cartilage of Knee. Early detection of OA is critical for preventing the progression and reversing the course of the disease when the cost of the treatment is low and treatment success rate is much higher. Early stage of OA is associated with the loss of Glycosaminoglycan which are side chains of Proteoglycan (PG) molecules from the Extracellular Matrix of cartilage. Currently available non-invasive methods to measure PG have limitations in either specificity or sensitivity / spatial resolution. A recently developed method known as Chemical Exchange Saturation Transfer imaging of Glycosaminoglycan (gagCEST) images PG non-invasively. While this method is highly specific to GAG, the current implementation of this method is based on a single slice, time intensive and not conducive for routine evaluation of patients. In this study, a novel 3D / multi-slice gagCEST imaging technique is developed to image PG of human knee cartilages in a practically achievable scan time at 7T MRI. Asymptomatic healthy volunteers and elderly subjects with knee pain have been scanned and intra-subject reproducibility was determined by Intra-class correlation of 0.95.

Pheochromocytoma induced Hyperglycemia leading to misdiagnosis of Type 1 Diabetes Mellitus

BB-10

BB

David Bole

Co-Author(s): Dr. Barbara Simon, Dr. Renee Amori, Dr. Wilbur Bowne

Resident/Fellow (MD)

College of Medicine

Endocrinology

A 31 y/o male with past medical history of Type 1 Diabetes Mellitus presented with symptoms of episodic headache, blurry vision, palpitations, diaphoresis, tremors, and chest pain over a period of 3 weeks. His admitting blood pressure was 220/120 mmHg. A 24 hour urine collection showed Epinephrine of 1754 mcg/24hr (2-24mcg/24hr), Norepinephrine: 1743 mcg/24hr (15-100mcg/24hr), Dopamine: 642 mcg/24hr (52-480mcg/24hr), Metanephrines: 51460 mcg/24hr (45-290mcg/24hr), and Normetanephrines: 17666 mcg/24hr (82-500mcg/24hr). MRI of abdomen/pelvis revealed bilateral adrenal masses (left side 6.5x6.0x5.7cm, right side 8.3x8.4x7.9cm) with characteristics consistent with pheochromocytoma. Other significant findings included hypercalcemia, elevated intact PTH and a nodular thyroid. Fine needle aspiration showed medullary thyroid cancer, and positive RET proto-oncogene confirming diagnoses of MEN 2A syndrome. The patient gave a history of Type 1 Diabetes Mellitus diagnosed 3 years prior to admission. He was taking Novolin (70/30) 45 units with breakfast and dinner. During his hospital course the insulin regimen was changed to Lantus 45 units and Aspart 15 units with meals. GAD-65 autoantibody was negative. In preparation for bilateral adrenalectomy, the patient was started on alpha blockade with phenoxybenzamine and metyrosine 250mg QID which was uptitrated to 750mg QID over a period of 2 weeks. His glucose levels began trending downward requiring significant dose reductions in his insulin after medication initiation. In the pre-operative period, his insulin requirements decreased by 50%. After bilateral adrenalectomy, glucose levels were observed hourly with the lowest reading of 58mg/dL, occurring 3 hours postoperatively. There were no further episodes of hypoglycemia. Despite being maintained on steroid replacement therapy postoperatively, the patient remained euglycemic and did not require any insulin treatment.

Role of Astrocytes in Neural Circuit Maintenance in Adult Brain

BB-11

BB

Harina Raja

Co-Author(s): Kayla Murphy, Marcus Gerald, A. Denise Garcia

Advisor(s): A. Denise Garcia

Graduate Student

College of Medicine

Astrocytes are the most abundant glial cells found in the central nervous system. During development, they are known to be required for the formation and regulation of synapses which are the structural and functional units of cortical circuits. Intact neural circuitry is important for the normal function of the brain. Although astrocytes are known to play an important role in maintaining synaptic activity and function, the molecular mechanisms by which astrocytes regulate synapses are not well understood. To study the role of astrocytes in regulation of synapses, we used transgenic mice in which a subpopulation of astrocytes expressing the transcription factor, Gli1, are selectively targeted for ablation. We subsequently examined changes in synapse number in cortical neurons. Our results show that we can effectively ablate approximately 38 % of astrocytes in the cortex, a number consistent with the number of previously identified astrocytes expressing Gli1. We also show that although there is no difference in overall synapse density, we observe a general trend in increase in synapse numbers in the cortical neurons following Gli1 astrocyte ablation. This suggests that astrocytes have an important role in regulating the synapses in adult brain. This study sheds light on the functional significance of astrocytes in maintaining normal cortical function and the neural circuitry.

Immunotherapy vs. Chemotherapy: Which treatment optimizes prognosis and quality of life for cancer patients?

BB-12

Cheyenne Tedesco

Co-Author(s): KellyAnn Deuchar

Advisor(s): Masaru Teramoto

Undergraduate Student

College of Nursing and Health Professions

Health Sciences

Cancer has been typically treated up until this point with radiation and chemotherapy. As technology has advanced so has the science behind the treatment of cancer. The purpose of this narrative review is to explore the risks and benefits when treating cancer with immunotherapy when compared to the more common treatments of chemotherapy. We have analyzed literature of some of the most recent studies in the fields of immunotherapies and cancer. Several different types of cancer and their corresponding immunotherapy are discussed in this narrative. We examined 15 studies and systematic reviews and analyzed the different immunotherapies used in each research article. One includes information about chemotherapy and the physical and psychological effects of chemotherapy on cancer patients. This was used as a baseline in order to weigh the risks and benefits of the immunotherapies versus traditional cancer treatments. We specifically looked at remission rates and survival rates of one or more years when analyzing the research. The review also discusses the benefits and risks to using combination immunotherapies. This research can only rely on what is currently known about immunotherapy and cancer, the science behind it is still new. Correct dosages, strength and which therapies work the best with which cancers is still something that needs to be determined and will require further research.

Protocol for the Quantification of Radial Tie Fibers in the Knee Meniscus

BB-13

BB

Niobra Samuel-Peterson Keah

Co-Author(s): Feini Qu, Alexander Neuwirth, Miltiadis Zgonis, Robert L. Mauck

Advisor(s): Robert L. Mauck, Miltiadis Zgonis

Graduate Student

College of Medicine

School of Biomedical Sciences and Professional Studies

The menisci are semi-lunar shaped fibrocartilaginous wedges located between the distal femur and the tibial plateau that support the structure and mechanical function of the knee joint. Menisci are primarily composed of circumferentially oriented type I collagen fibers that transfer and distribute mechanical forces on the tibial plateau. Interspersed within the extracellular matrix is a smaller population of 'radial tie fibers' (RTFs), which may interact with the circumferential component to enable efficient mechanical stress and strain transfer. We hypothesized that the density of these radial tie fibers varies by location within the meniscus, and that a greater number of fibers would be found in the posterior horn than the anterior or body horns, given the higher mechanical demands placed on this location. We also hypothesized that thicker radial tie fibers would be found in the outer (peripheral) zones of the meniscus than in the inner zones of the meniscus. To test these hypotheses, we evaluated RTF density and structure as a function of location (body, anterior and posterior horns) and zone (inner and outer) within the meniscus, which are associated with varying degrees of load-bearing. Histological cross-sections (8 μ m thick) of six medial bovine menisci (6 months of age) were stained with Picrosirius Red for collagen and imaged at 10x magnification under polarized light. RTF area fraction and thickness were quantified using ImageJ software. Counter to our hypothesis, results of this analysis showed that the posterior horn of the meniscus contained a lower density of RTFs than the anterior horn and meniscus body. Additionally, the inner zone contained RTFs with thicker diameters than the outer zone regardless of location. Findings from this research represent the first time that radial tie fibers in the knee meniscus have been empirically quantified. Future studies will explore how results from the present study may vary in fetal and adult menisci, and the impact that the RTF density, size, and distribution has on the mechanical operation of the meniscus under normal conditions and when tears interrupt the fibrous architecture.

Diatoms Used to Evaluate Fracking Wastewaters

BB-14

BB

Allison Starr

Advisor(s): Dr. Marina Potapova

Undergraduate Student

College of Arts and Sciences

Biodiversity, Earth, and Environmental Science

Diatoms, microscopic algae, can be used to evaluate the ecological health of a stream. The practice was pioneered in the United States by the late Doctor Ruth Patrick of the Academy of Natural Sciences. My goal was to conduct a similar study on four waterways in western Pennsylvania that have been exposed to fracking wastewater effluent. This is the first time the effect of fracking on river diatoms has been examined. Partner scientists from the Dartmouth College, NH collected the samples above, at, and below the effluent. They also recorded the conductivity, temperature, and pH of the water. I processed the samples and prepared permanent diatom slides. I created a visual dictionary of the diatoms in these waters. I then identified and counted a hundred diatom valves from each slide. Doctor Potopova then reviewed the slides and conducted statistical analysis of the data. My results show that although the effect of the effluent was evident at each of the four sites, it was weaker than the effect of other environmental factors that influence community composition. Diatom community composition changed due to the effluent's toxicity, but communities showed signs of recovery downstream from the wastewater treatment facilities. The experiment is part of a larger project to evaluate the impact of the wastewater effluent on the study sites. The results of this experiment, and the project as a whole, will add to the body of evidence concerning the impact of fracking on the environment.

Oncogenic ras p21 supercomplex as a therapeutic target in pancreatic cancer

BB-15

BB

Mohammad Shaikh

Co-Author(s): Patrice Love, Elizabeth M. Gleeson, Blake D. Babcock, Katlin Davitt, Maly Fenelus, Victor Adler, Matthew R. Pincus

Advisor(s): Dr. Wilbur B. Bowne

Resident/Fellow (MD)

College of Medicine

Surgery

Pancreatic cancer causes over 40,000 deaths in the U.S. each year with a dismal five-year-survival rate between 2-5 percent. A centrally important causative factor of pancreatic cancer is the k-ras oncogene present in over 90 percent of human pancreatic cancers. K-ras encodes the ras-p21 protein. Our laboratory has previously shown that microinjected oncogenic ras-p21 induces oocyte maturation utilizing a signal transduction pathway that differs from endogenous wild-type ras-p21. Secondly, two peptides synthesized from ras effector-binding domains, called PNC-2 and PNC-7 were found to block oncogenic ras-p21-induced oocyte maturation; but had no effect on insulin-induced oocyte maturation. These findings suggest signal transduction pathway differences between oncogenic and activated wild-type ras-p21. Remarkably, we found that these peptides caused phenotypic reversion or necrosis of ras- transformed pancreatic cancer cells, with no demonstrable effect upon growth of their normal cellular counterparts. These observations, in part, may be attributed to the formation of a super-complex that develops between oncogenic ras-p21 and critical levels of activated protein kinases including RAF, MEK, MAPK (ERK) and JNK in selected pancreatic cancer cells resulting in continuous positive feedback mechanism of unregulated mitogenic signaling. Importantly, diminished or absent levels of activated complex were observed within untransformed cells. Furthermore, we have shown that PNC-2 and PNC-7 inhibit activation of JNK and RAF kinase, decreasing viability of MiaPaCa-2 and Panc-02 pancreatic cancer cells. In summary, these preliminary results suggest a pancreatic cancer specific over-expression of protein kinases that form a super-complex with oncogenic ras-p21. Existence of a k-ras super-complex in pancreatic cancer may lead to novel targeted investigative approaches.

Evolutionary Ecology of Brain Structure in Army Ants (Formicidae: Ecitoninae)

BB-16

BB

Paulina Khodak

Co-Author(s): Elisabeth Sulger, Kaitlin Baudier, Susan Bulova, Sean O'Donnell

Advisor(s): Sean O'Donnell

Undergraduate Student

College of Arts and Sciences

Army ants, Formicidae Ecitoninae, have been noted to have variability in both body size and lifestyle behaviors. The purpose of this study is to address some possible relationships between such variations. I will address the following questions: Does variation in body size relate to brain sizes? Do lifestyles such as foraging above or below ground influence brain volume? A total of 9 species from 3 different genera were used for analyses. Species range from foraging above ground, below ground or a mixture of both behaviors. Within each species there is variation in body and head sizes. Brain volumes for each species were measured and plotted against predicted sizes and then compared to against other. Measured brain sizes do not seem to match the predicted sizes and there is significant differences shown in average brain size between species.

Conservation strategies for understanding and combating the primate bushmeat trade on Bioko Island, Equatorial Guinea

BB-17

Drew Cronin

Co-Author(s): Paul Sesink Clee, Cirilo Riaco, Demetrio Bocuma Meñe, Gail Hearn, Mary Katherine Gonder

Post-Doctoral Fellow (PhD)

College of Arts and Sciences

Biology

Bioko Island, Equatorial Guinea is one of the most important places in Africa for primate conservation, but a cultural preference for bushmeat and a lack of effective law enforcement has encouraged commercial bushmeat hunting, threatening the survival of the remaining primate population. Using bushmeat market data collected over 13 years in the market of the capital, Malabo, we recorded over 41,000 primate carcasses, documenting “mardi gras” consumption patterns, seasonal carcass availability, and negative effects resulting from government intervention. Forest surveys were also conducted throughout Bioko’s two protected areas in order to quantify primate populations and hunting pressure. Using these data, we were able to document the significant negative impact bushmeat hunting had on monkey populations, estimate which species are most vulnerable to hunting, and develop ecological niche models to approximate the distribution of each of Bioko’s monkey species. The critically endangered Pennant’s red colobus (*Procolobus pennantii*), for example, exhibited the highest vulnerability to hunting and appears extirpated throughout Bioko, including Pico Basilé National Park, except for an area of less than 250 km² in the southwest of the Gran Caldera Scientific Reserve. These results have allowed for the identification of primate hotspots, and thus, priority areas for conservation on Bioko, leading to more concise conservation recommendations. Current and future efforts now focus on bridging the gap between investigators and legislators in order to develop and effectively implement a management plan for Bioko’s Gran Caldera Scientific Reserve, the key site for primate conservation on the island, and to develop a targeted educational campaign to reduce demand by changing consumer attitudes towards bushmeat. Using this multidisciplinary approach, informed by biological, socioeconomic, and cultural research, there may yet be a positive future for the primates of Bioko.

Exploring patterns of symbiont diversity in natural pea aphid populations

BB-18

BB

Andrew Smith

Co-Author(s): Brooke Deal, Barrett Wagner, Kerry Oliver, Stephanie Weldon

Advisor(s): Jacob Russell

Graduate Student

College of Arts and Sciences

Biology

Symbioses that involve maternally inherited bacteria have proven to be highly prevalent in the natural world and serve as important sources of adaptive novelty. Many of these symbionts are facultative or found at intermediate frequencies within host populations and confer unique phenotypes to the host that favor both the host and bacterium under certain conditions. High levels of symbiont diversity in some host populations in nature are likely maintained by a heterogeneous environment over space and time. Understanding adaptive evolution will require identification of the environmental forces that shape symbiont-, and by extension, phenotypic- variation in the wild. The pea aphid, *Acyrtosiphon pisum*, and its diverse microbiome serve as a model to study the dynamics and diversity of heritable symbiosis. All seven symbionts have been implicated, to some extent, in defense against natural enemies. Recent surveys reveal that the frequencies of these symbiont species differ in relation to host plant, geography and, to some extent, fluctuating natural enemy pressures. Yet multiple strain variants exist for several symbiont species, and the known variation in effects conferred by different strains, suggest a need to track symbiont genotype along with species prevalence. Toward this end we have begun to investigate the genetic variation of *Hamiltonella defensa* and its associated bacteriophage over several scales, spanning multiple years, regions, and host race populations. Our findings reveal variation in strain types across regions and, potentially, seasons. They also show non-random associations between *H. defensa*/bacteriophage strains and other co-infecting species, suggesting the potential for symbiont-symbiont mutualisms or beneficial effects of specific co-infections at the host level.

Development of a Screening Array for Congenital Melanocytic Nevi

BB-19

BB

Alexander Valiga

Co-Author(s): Daniel Widmer, Thomas Biedermann, Phil Cheng, Reinhard Dummer, Mitchell Levesque

Advisor(s): Mitchell Levesque

Undergraduate Student

School of Biomedical Engineering, Science and Health Systems

Congenital melanocytic nevi (CMN) are benign melanocytic tumors that exist at birth. Through a series of genetic and phenotypic changes, a benign lesion can transition into metastatic skin cancer (melanoma), where the mean survival after diagnosis is only 6-8 months. So far, present studies have only determined that patients' age as well as the size of their CMN are factors that play a role in progression from benign lesion to melanoma. Through next-generation RNA sequencing technology (RNA-seq), a set of genes has been shown to be differentially expressed across melanocyte, nevus, and melanoma tissues. Within this study, alternative analysis of sequencing data combined with validation through real-time quantitative PCR (RT-qPCR) analysis sets the basis for selection of the genes that are most indicative of a benign melanocytic or malignant melanoma profile.

Preliminary experiments assessed gene expression of three sample cohorts by performing RNA-seq on an Illumina HiSeq 2000 using paired end sequencing. Raw data was analyzed by combining DESeq, edgeR, and VROOM software packages in R. Validation of the differentially expressed genes, established by RNA-seq, was confirmed via RT-qPCR array. To allow for the most representative validation, the same RNA samples used in the previous RNA-seq study were used in the validation stage: melanocyte (n=3), nevus (n=4), melanoma (n=3). Also, an additional number of melanocyte, nevus, and melanoma RNA samples were harvested from both solid tissue and cell culture sources, which allowed added confidence to the validation result: melanocyte (n=6), nevus (n=8), melanoma (n=6). In the majority of pairwise comparisons of melanocyte, nevus, and melanoma, the RT-qPCR data was in concordance with the RNA-seq analysis. This result may be indicative of a clear relation to the reliability of a gene's expression in RNA-seq and the ability to validate it using RT-qPCR platforms.

The epigenetic role of Tip60 in environmental enrichment induced cognitive restoration

BB-20

BB

Songjun Xu

Co-Author(s): Eric Koza, Sahira Iqbal, Felice Elefant

Advisor(s): Felice Elefant

Graduate Student

College of Arts and Sciences

Environmental enrichment (EE) conditions have profound beneficial effects for reinstating cognitive ability in neuropathological conditions such as Alzheimer's disease (AD). While EE benefits involve epigenetic gene control mechanisms that comprise histone acetylation, the select HATs involved remain largely unknown. Here, we test the hypothesis that Tip60 HAT action is required for a beneficial neuroadaptative response to EE. We use the mushroom body (MB) as our cognitive model as this neural circuit in the adult fly brain is where Tip60 is robustly produced, is central for learning & memory (L&M), and exhibits beneficial morphological changes in response to EE. We initially tested whether EE promotes beneficial changes on MB morphology under AD neurodegenerative conditions and whether this response involves Tip60 HAT action. We observed a beneficial axonal outgrowth neuroadaptative response to EE in the AD MB that was dampened in comparison to wild-type flies and restored by excess Tip60. Wild-type flies with loss or gain of Tip60 HAT levels in their MBs displayed no significant response to EE. To test mechanisms underlying Tip60 involvement in EE rescue, we asked whether Tip60 HAT action is required to induce a neuroadaptative transcriptional response to EE. We FACs purified GFP tagged MB Kenyon neurons from conditioned wild-type and Tip60 HAT mutant fly brains, isolated RNA and assessed transcriptional changes using microarray analysis. Bioinformatics analysis of microarray data from EE vs. ISO conditioned wild-type control flies revealed significant differential expression of genes enriched for cognitive function that was attenuated in Tip60 HAT mutant brains. Together, our studies demonstrate that the fly MB undergoes a beneficial neuroadaptive response to EE and supports a critical role for Tip60 HAT action in this process.

Characterizing the Impact of 3D Bioprinting Parameters on Extruded Construct Properties

BB-21

Nathan Tessema Ersumo

Co-Author(s): Kara L. Spiller

Advisor(s): Kara L. Spiller

Undergraduate Student

School of Biomedical Engineering, Science and Health Systems

BS/MS in Biomedical Engineering

In recent years, advances in tissue engineering have brought about the development of 3D bioprinting. Despite efforts to improve the cytocompatibility and structural complexity of the extruded biomaterial, the effects of hydrogel bioprinting parameters on construct properties have yet to be comprehensively characterized. Using a pneumatically-driven Biobots 3D bioprinter, micro-computed tomography, finite element analysis, mechanical testing and various microscopy techniques, we systematically assessed the fidelity, stress distribution, rigidity, resolution and cytocompatibility of extruded hydrogel constructs. Gelatin methacrylate (GelMA) was selected as a hydrogel for characterization and lithium phenyl-2,4,6-trimethylbenzoylphosphinate (LAP) was selected as a crosslinker for photopolymerization under visible light (405 nm). As expected, we found that biomaterial composition plays a major role in structural rigidity: the Young's modulus of constructs increased approximately six-fold, from 64 ± 8 kPa to 360 ± 29 kPa, as GelMA concentration was raised from 10 w/v% to 20 w/v% with 0.25% LAP. Modulation of extrusion pressure also revealed the existence of optimal extruding pressures, which increased from 80 psi to 130 psi as GelMA concentration increased from 10% and 20%. Moreover, an increase in printing resolution was observed with both increasing GelMA concentration and increasing printing speed. The viability of human vascular endothelial cells encapsulated in 15% GelMA was found to be approximately 50% two hours after extrusion, in agreement with reports describing the relative fragility of these cells. These results reveal complex interactions between various bioprinting parameters and their effects on printing resolution. Such a systematic characterization will be instrumental in developing a versatile and modular biofabrication platform.

Repression of Tip60 cognition-linked gene expression in the APP induced neurodegenerative Drosophila brain is relieved by increased Tip60 HAT levels

BB-22

Priyalakshmi Panikker

Advisor(s): Felice Elefant

Graduate Student

College of Arts and Sciences

Biology Department

Neurodegenerative disorders are often associated with defects in epigenetic gene control mechanisms that result in cognitive impairment. One of the most well characterized cognition linked epigenetic mark is histone acetylation, that serves to control chromatin structure to mediate neuronal gene transcription profiles critical for cognitive ability. However, despite the importance of histone acetylation in higher order learning, the select cognition linked histone acetyltransferase (HAT) enzymes that generate these epigenetic marks remain largely unknown. We have shown that Tip60 HAT activity restores function in a number of cognition associated neuronal circuits negatively affected in an Alzheimer's disease (AD) Drosophila model. Our findings support a neuroprotective role for Tip60 under neurodegeneration conditions. However, the mechanism by which Tip60 rescues these defects remains unclear. We hypothesize that Tip60 functions in neuroprotection by beneficially epigenetically reprogramming gene expression programs essential for maintaining neuronal health and higher order brain function. We initially tested our hypothesis with a focus on cognition, by performing a pilot gene expression analysis screen on 15 Tip60 cognition linked targets (that have human homologs) that we identified as direct Tip60 gene targets in our Tip60 ChIP-Seq analysis. Remarkably, we found that while expression for all 15 genes tested was repressed in the APP flies, expression of 10 of these genes was restored in the presence of excess Tip60 HAT activity. We are also investigating mechanism(s) by which Tip60 positively reprograms such neuroprotective gene targets. Our findings should provide new insight into novel Tip60 HAT based neuroprotective mechanisms in neurological disorders.

Non-Thermal Plasma Stimulation of Immunogenic Cell Death

BB-23

BB

Abraham Lin

Co-Author(s): Billy Truong, Arthur Pappas, Lawrence Kirifides, Shuyang Chen, Nianli Sang, Shaojun Lin, Alexander Fridman

Advisor(s): Vandana Miller

Graduate Student

School of Biomedical Engineering, Science and Health Systems
Biomedical Engineering

Non-thermal plasmas are being developed as an adjuvant therapy for cancer; in vitro studies have demonstrated its efficacy in selectively killing tumor cells via apoptosis. However, immunogenic cell death (ICD) is an emerging modality for cancer treatment that works by stimulating a specific immune response against tumor cell antigens. ICD is mediated by danger associated molecular patterns (DAMPs) which include secretion of factors, such as adenosine triphosphate (ATP), and changes in cell membrane associated molecules due to endoplasmic reticulum (ER) stress. Here we explored the ability of uniform nanosecond pulsed dielectric barrier discharge (nspDBD) plasma to induce ICD in tumor cells. A nasopharyngeal carcinoma cell line (CNE-1) was grown in 24 well plates, treated with nspDBD, and co-cultured with PMA differentiated THP-1 macrophages in trans-well inserts. The viability of CNE-1 cells was measured 48 hrs post co-culture and compared to CNE-1 cells treated with plasma and cultured alone. Extracellular ATP measurements and Western blotting of ER stress proteins (ATF4 and STC2) were performed 1 hr post plasma treatment as indicators of ICD. We observed lower cell viability in co-cultured CNE-1 cells, with increased extracellular ATP. This suggests that post treatment CNE-1 cells release soluble factors that stimulate macrophage anti-tumor responses. ATF4 and STC2 proteins also increased following treatment, indicating that plasma treatment induced ER stress which may also contribute to ICD induction. Our results here show that at certain regimes, plasma can be tuned to induce ICD in tumor cells.

Combining Viral Delivery of Brain-Derived Neurotrophic Factor (BDNF) and Robot Rehabilitation in Treatment Regimens for Adult Spinal Cord Injury (SCI)

BB-24

John Lee

Co-Author(s): Veronica Tom

Advisor(s): Simon Giszter

Graduate Student

College of Medicine

(MD/PhD) Medical Engineering

A complete spinal cord injury (SCI) disrupts the normal, healthy architecture of the central nervous system, leading to impaired locomotor function. In the rat model, complete thoracic spinal cord transection at T8-T10 is a common model for studying SCI. In our previous work, using trunk-based robotic rehabilitation and treadmill training, we showed that rats spinalized as neonates can significantly recover locomotor function with robotic intervention at the pelvis, whereas rats transected as adults do not exhibit the same level of recovery. We believe this is due to the absence of autonomous reflex hindlimb stepping patterns in adult transection, resulting in an inability to incorporate and benefit from robot support.

Previous work by Boyce has demonstrated that use of adeno-associated virus-5 (AAV5) viral delivery of BDNF to enable reflex hindlimb stepping in the rat. We thus propose a combined treatment approach, using neurotrophin intervention to induce stepping, combined with robot training to achieve greater locomotor recovery. We prepared two groups of rats with microinjections caudal to transection site into the ventral horn of the spinal cord: one group receiving AAV5-BDNF and a control group. Animals were trained with robotic pelvic rehabilitation therapy for six weeks. We used the Antri, Orsal, and Barthes (AOB) bipedal stepping scale and robot data measuring the interactive force between the rat and the robot to characterize locomotor recovery. AAV5-BDNF-treated animals that received robotic rehabilitation significantly improved over with training, in both AOB ($p < 0.0001$) and robot interactive force ($p = 0.002$) when compared to the control group.

This work provides a foundation upon which to investigate further combinations of biological and bionic therapies for treating SCI.

This work is sponsored by the Craig H. Neilsen Foundation and the NS 54894.

Elucidating the Role of Oligomers in Insulin Aggregation Using Biophysical Methods

BB-25

Matthew Mawhinney

Advisor(s): Brigita Urbanc

Graduate Student

College of Arts and Sciences

Physics

Protein misfolding and aberrant fibrillization underlie many neurodegenerative conditions, such as Alzheimer's and Parkinson's disease. Insulin, which is composed of two covalently bonded peptide chains, exists in vivo mostly in a native hexameric state but becomes amyloidogenic under certain conditions: at high temperature with neutral pH (7.4) and agitation or with low pH (1.6) and quiescence. To investigate the mechanisms that drive insulin aggregation, we monitor its selfassembly into fibrils by kinetic fluorescence spectroscopy, which uses Thioflavin T (ThT), a fluorescent dye that binds to the cross β structure of amyloid fibrils. At low pH, insulin behaves similarly to other amyloid proteins; kinetic rate of fibrillization increases with concentration. At neutral pH, we observe an increase of the kinetic rate of fibrillization with low insulin concentration (2.5–25 μ M), whereas at higher concentrations (25–100 μ M) the opposite trend is observed. To explain this observation, we utilize photo induced crosslinking of unmodified proteins (PICUP) and Sodium Dodecyl Sulfate Polyacrylamide gel electrophoresis (SDSPAGE) to determine the oligomeric population of pre-fibrillar stages of insulin selfassembly. Preliminary results show a shift toward larger oligomers at insulin concentrations in the vicinity of 25 μ M. As selfassembly advances and fibrils start to form (as observed by ThT fluorescence), PICUP/SDSPAGE shows progressively decreased oligomer abundances. Insulin aggregation is also monitored via atomic force microscopy (AFM) to investigate differences in morphology between the two methods used to induce aggregation and the corresponding time evolution of oligomeric species. Our results are consistent with oligomer formation that is on the pathway to fibril formation, thereby elucidating a key interplay between oligomers and fibrils in insulin aggregation.

Barriers to HPV Vaccination in Women with Cervical Dysplasia

BB-26

Cheng Tou

Co-Author(s): Michael Podolsky

Resident/Fellow (MD)

College of Medicine

OB/GYN

Objective: To describe patterns of HPV vaccination as well as patient characteristics and outside factors in women with history of cervical dysplasia that may act as patient barriers to access of HPV vaccination

Methods: Three year (2010-2013) observational study of women aged 21-31yo from the Drexel College of Medicine Colposcopy Clinic. Survey was provided to patients at clinical encounter to assess for patient factors and self-perceived barriers to HPV vaccination

Results: There were 434 surveys completed by patients over this time period, among these 301 surveys fit into our study criteria. Of these patients, 190 were less than 26yo. Overall, 79% of women were unvaccinated. In the population, only 9% had received the full series. Among our population 58 percent of unvaccinated women expressed interest in vaccination. The most common reason women reported not being aware of vaccination was because their provider had never counseled them on it. No association of patient characteristics and HPV vaccination

Conclusion: In women with cervical dysplasia, the percentage of women in the vaccination age range who remains unvaccinated continues to be high. Lack of provider counseling continues to be one of the most common reasons women report not knowing or receiving HPV vaccination.

Does Metal Transfer Differ on Retrieved Ceramic and CoCr Femoral Heads?

BB-27

Eliza Fredette

Co-Author(s): Daniel W. MacDonald, Richard J. Underwood, Antonia F. Chen, Michael A. Mont, Gwo-Chin Lee, Gregg R. Klein, Clare M. Rimnac, Steven M. Kurtz

Advisor(s): Steven Kurtz

Undergraduate Student

School of Biomedical Engineering, Science and Health Systems

Metal transfer has been observed on retrieved femoral heads in total hip replacements, appearing dark and metallic in color. The mechanisms of metal transfer to the bearing surface are thought to include femoral head dislocation, impingement, or third body entrapment in the articulating zone. In vitro wear testing has shown increased wear of the polyethylene acetabular liner with the presence of metal transfer on femoral heads. Although metal transfer has been observed, there is little known about the effects that bearing surface materials may have on the morphology of metal transfer. This study sought to investigate the extent of metal transfer on the bearing surface of CoCr and ceramic femoral heads, and to identify prevalent patterns and morphologies. Three bearing couple cohorts: M-PE (n=50), C-PE (n=35), and C-C (n=15), were established and semi-quantitatively assessed for the presence of metal transfer. The morphology of femoral heads with visual evidence of metal transfer (score ≥ 2) was analyzed using direct measurement, digital photogrammetry, and white light interferometry. Metal transfer was observed on 75% (n=75/100) of the femoral heads. Surface area coverage and curved mean surface area were similar among the three cohorts (Mean Coverage 4.46%, $p = 0.90$; Mean Surface Area = 89.0 mm², $p = 0.977$). The most prevalent metal transfer patterns observed were random stripes (n = 21/75), longitudinal stripes (n = 17/75), and random patches (n = 13/75). The arc length was shorter in the M-PE cohort (mean difference C-PE = 5.7 mm, C-C = 7.11 mm; $p < 0.001$). The height of the metal transfer was greater for the M-PE cohort (mean difference C-PE = 0.77 μm , C-C = 0.84 μm , $p = 0.014$). Understanding the morphology of metal transfer may be useful for more accurate polyethylene wear studies through more realistic re-creation of metal transfer in in-vitro pin-on-disk and joint simulators studies.

Flow Properties of Sickled Red Blood Cells Within Microfluidic Chips: A Cost Effective Approach

BB-28

BB

Mark Davis

Co-Author(s): Anna Mohammad, Christopher Brown

Advisor(s): Frank A. Ferrone, Alexey Aprelev

Graduate Student

College of Arts and Sciences

Department of Physics and Astronomy

Sickle cell disease results from a mutation in hemoglobin leading to fibril formation and the rigidity of red blood cells. Vaso-occlusion arises from the inability of a red blood cell to deform in microcirculation leaving tissue aerobically exhausted. Microfluidics provide a means for the in vitro study and manipulation of fluids on comparable length and volume scales. However, the requirement of a well equipped clean room leaves microfluidic fabrication prohibitive either in cost or in the necessity of off site fabrication. The group has been developing a low-cost capability for producing these devices within the shared Biophysics prep facility. With a microwave oven, rotary vane pump, and plumbing supplies the final piece of the microfluidic fabrication process, the plasma bonding chamber, has been created. Devices can now be manufactured cheaply and conveniently by the lab allowing for the study of sickle blood. Such a microfluidic production facility could be of interest to any department with an interest in microfluidics coupled with a limited budget.

The Role of Astrocytes in Neural Circuit Formation

BB-29

BB

Sarah Griggs

Co-Author(s): Sarah Griggs, Jenil Baman, A. Denise R. Garcia

Advisor(s): A. Denise R. Garcia

Undergraduate Student

College of Arts and Sciences

Biological Sciences

The formation of neuronal circuits is essential in brain development and normal function of the central nervous system. Postnatal critical periods require intact sensory input, and are an important time during which the final circuitry of the nervous system is established. Astrocytes, the most abundant cell in the human brain, are involved in the regulation of synapse formation, maturation and elimination. Whether astrocytes play a role in critical period synaptic plasticity is not well understood. In preliminary studies, we induced sensory deprivation by trimming whiskers and examined synapse number and cortical structure. Our results in wild type mice show an increased synapse density in the sensory deprived hemisphere, consistent with previous studies. This suggests that experience greatly influences the synaptic architecture that forms during critical periods. In order to investigate the role of astrocytes in critical period plasticity, we will perform whisker trimming in transgenic mice in which the Sonic hedgehog (Shh) signaling pathway is selectively disrupted in astrocytes. Shh has previously been shown to play a critical role in astrocyte function, however the precise function of Shh signaling in astrocytes remains unknown. This study will shed light on the importance of astrocytes in neural circuit formation. Our understanding of neural connectivity and implications of astrocyte function is essential to the greater understanding of brain function.

Interaction Analysis of HIV BG505.SOSIP.664 trimer with peptide triazole UM15

BB-30

Kriti Acharya

Co-Author(s): Adel Ahmed, Francesca Moraca

Advisor(s): Irwin Chaiken

Graduate Student

College of Medicine

Biochemistry

Human Immuno Deficiency Virus Type 1 (HIV-1) is a global health problem with over 33 million people infected worldwide and over 2.7 million new infections annually. Host cell infection by HIV-1 is mediated by cell receptor (CD4) interactions with the envelope glycoproteins consisting of a trimeric complex (env) of gp120 and gp41. The env thus presents itself as an attractive target to attack the virus directly in order to block the cascade events that lead to host cell infection. Peptide Triazoles (PT) are a class of entry inhibitors developed in our lab that put gp120 in an inactive state and suppress the binding of CD4 and co-receptor CCR5 leading to complete inhibition of viral entry. However, most of our past biophysical investigations on the mechanism of PT involved monomeric gp120 protein. While studies on monomeric gp120 have been crucial in our understanding of the mechanism of action of PT they do not necessarily mimic the spikes expressed on the virion surface. Therefore, here we wanted to understand the mechanism of HIV mediated viral entry using the HIV env trimeric protein BG505.SOSIP.664. To do this we utilized a 6 amino acid peptide (UM15) with a proline conjugated ferrocenyl-triazole residue. BG505.SOSIP.664 binding to UM15 was studied using SPR competition assay. In the presence of increasing concentrations of UM15, there was a significant reduction in SOSIP binding to CD4. Strikingly, the calculated IC₅₀ value of 280nM was observed, indicating a highly specific interaction between the trimeric env protein and UM15. To further elucidate the binding mode of PT onto the trimeric env protein, docking studies were done onto the BG505.SOSIP.664 structure (PDB: 4NCO). Docking results showed that UM15 can bind (in silico) to trimeric protein at the CD4 site similar to that of monomeric gp120. Thus, these results provide a framework for optimization of PT entry inhibitor as well as understanding the mechanism of PT binding to HIV envelope protein.

Measuring thermal physiology to predict animal responses to directional climate change

BB-31

BB

Kaitlin Baudier

Co-Author(s): Catherine D'Amelio

Advisor(s): Sean O'Donnell

Graduate Student

College of Arts and Sciences

Biodiversity Earth & Environmental Science

How will different animal species respond to climate change? Will climate change have the same effects across species' geographic ranges? Current models that address these important questions are limited by the assumption that species at a given location experience the same thermal environment, and by lack of data on geographic variation in thermal tolerances. We used army ants to test whether habitat use (above versus underground activity) and elevation (different temperature regimes caused by adiabatic cooling) were associated with animals' temperature sensitivities. Army ants are ecologically dominant, small-bodied, temperature-sensitive, and span wide elevation ranges in the tropics. Army ant species differ in above versus below ground activity. We examined the effects of three factors on the thermal tolerance of Neotropical army ants: 1. elevation, 2. body size, 3. microhabitat use. We expected these three factors to be associated with thermal tolerance ranges. We measured maximum and minimum thermal tolerance across elevations in fourteen army ant species that vary in body size and surface activity levels. We also measured surface and sub-surface temperatures at the collection sites, and we measured surface temperatures at foraging sites. We found small workers were more thermally sensitive. Species relative surface activity level was a strong predictor of thermal tolerance, and thermal tolerance varied with elevation. Even 10 cm of soil provided a significantly less extreme foraging environment for the below-ground army ants. Foraging temperatures, even at our highest sites, were near or exceeding the thermal tolerances of the most sensitive ants, indicating that even a small increase in temperature at some sites could deleteriously impact army ant species. Our data show species at the same site will likely experience different climate change effects, and species will respond differently to directional climate change.

Examination of the structure and phylogeny of the fibronectin binding protein in cyanobacteria

BB-32

Katherine Berman

Advisor(s): Shivanthi Anandan

Undergraduate Student

College of Arts and Sciences

Biological Sciences

Cyanobacteria are free-floating, prokaryotic organisms known to perform oxygenic photosynthesis in virtually all aquatic habitats on earth. Certain species of cyanobacteria have been shown to form toxic biofilms, which have been responsible for creating deoxygenated zones and harm the aquatic life in those areas. Preliminary bioinformatic analyses carried out in this laboratory, has shown the existence of a gene encoding a cyanobacterial protein similar in sequence to the Fibronectin binding protein (FnBP) found in the pathogenic bacteria, *Staphylococcus aureus* in the genomes of several cyanobacteria. In *S. aureus*, FnBP plays an important role in the formation of biofilms, which has devastating consequences in disease progression. Therefore the presence of a similar protein in non-pathogenic, free-floating bacteria is surprising and intriguing. Based on the role FnBP plays in biofilm formation in *S. aureus*, it is possible that it plays a similar role in biofilm formation in Cyanobacteria. In this project, a phylogenetic tree of FnBP in cyanobacteria was created to gain insight into the evolution of the FnBP in cyanobacteria as a strategy to understand its function in this group of organisms. Additionally, the predicted structures of several FnBP proteins in both cyanobacteria and pathogenic bacteria were compared using the protein structure modeling software, I-TASSER, to gain insight into the function of this protein in biofilm formation in these organisms.

Porosity Modeling of an Inexpensive Device for the Rapid Detection of Sickle Cell Disease

BB-33

Christopher Brown

Co-Author(s): Alexey Aprelev, Frank A. Ferrone

Advisor(s): Frank A. Ferrone

Graduate Student

College of Arts and Sciences

Physics

Sickle cell disease is a single mutation in hemoglobin that causes it to form stiff polymer strands in red blood cells upon deoxygenation. These polymers rigidify the cell, leading to painful crises and shortened life-spans. The genetic disease affects nearly 100,000 people in America. In Africa, where the disease is most prevalent, roughly 300,000 children with sickle cell disease are born yearly, many of which do not have access to resources required for modern detection techniques. We have devised a Bead-Chamber Device to detect the presence of sickle blood by passing the blood through a porous bed of packed glass spheres. We have found that deoxygenated sickle blood flows considerably slower through the device than oxygenated sickle blood, permitting rapid and accurate diagnosis. To rationalize the basis for this decrease in flow rate we have developed a model in which the porosity of the bead chamber effectively shrinks. The basis for this change is our assumption that cells increase their effective radius when they become sickled. Since the center of mass of such a rigidified cell cannot extend as far as the normal flexible cells, the pore spaces effectively shrink. To account for the observed flow differences requires the sickle cell average radius to be $4.5 \mu\text{m}$ in contrast to the effective size of the cell when flexible, taken as $1.0 \mu\text{m}$. We interpret the above-normal sickle cell radius to be cellular protrusions caused by the stiff polymer strands. In this model, viscosity of the flowing solution is taken as a constant. Details of the model, as well as the rationale supporting our assumptions will be presented.

Spatiotemporal and cell-type specific changes in ephrin-B2 in ALS

BB-35

Daniel Scura

Co-Author(s): Mark Urban, K Li, W Zhou, J Rothstein, M Dalva, A Lepore

Advisor(s): Angelo Lepore

Graduate Student

College of Medicine

Master of Medical Science

Amyotrophic lateral sclerosis (ALS) is a neurodegenerative disorder characterized by motor neuron (MN) loss, ultimately resulting in patient death as a result of respiratory compromise. The exact causative mechanism of this disease is unknown; however, studies allude to a multitude of pathological events - one of which is altered Eph/ephrin signaling. We evaluated the role of this pathway by examining the levels of ephrin-B2 and its receptor EphA4 in both the SOD1G93A mouse, an established rodent model of disease, and human ALS post-mortem spinal cord tissue. Our results indicate that ephrin-B2 and EphA4 are up-regulated in astrocytes and MNs, respectively, in diseased spinal cord samples. Additionally, we have shown in preliminary studies that knockdown of ephrin-B2 via intraspinal shRNA injection prolongs disease duration and extends survival of SOD1G93A mice, implicating a potential therapeutic target for ALS patients.

PEGylated Ultrasound Contrast Agents for Drug Delivery to Pancreatic Tumor Cells

BB-36

BB

Stephen Zachariah

Co-Author(s): Averie Palovcak, Jaap Patel, Timothy Hoang, Rebecca Sheridan, Lauren Jablonowski, Margaret Wheatley

Advisor(s): Dr. Margaret Wheatley

Undergraduate Student

School of Biomedical Engineering, Science and Health Systems

Pancreatic cancer treatment has proven ineffective due to excessive interstitium and connective tissue (stroma) surrounding the tumor, impeding drug access. Ultrasound (US) irradiation used with drug-loaded contrast agents provides a means of combating this by targeted delivery of the drug gemcitabine (GEM), increasing tumor vasculature permeability and loosening the stroma. The drug-delivery platform consists of micron-sized, biodegradable poly(lactic acid) (PLA) microbubbles (MBs) that shatter into nano-sized drug-loaded fragments (n-Sh). However in circulation, MBs and n-Sh are recognized as foreign and quickly tagged by the C3 complement system for immune clearance, reducing the potential for maximal drug delivery. This work seeks to design MBs that retain the properties of traditional US contrast agents (echogenicity and capacity to shatter), incorporate GEM into the shell, and manifest poly(ethylene glycol) (PEG) chains on the surface to create a steric barrier that obstructs surface binding of C3 proteins. Using data from previous studies, concentration ranges for maximal GEM (3 and 6 wt%) and PEG (1, 2, 5, 10, and 15 wt%) incorporation were tested. MBs were loaded with GEM, evaluating the acoustic enhancement and stability in the US beam, surface morphology, average diameter, and zeta potential. C3 activation in serum was assessed with a specialized ELISA kit. Acoustic evaluation and SEM suggest that GEM encapsulation does not significantly affect MBs morphology and n-Sh production upon US exposure. All groups were able to reflect a clinically-relevant signal, and GEM-loaded MBs reduced in stability compared to blank controls suggesting they are more likely to shatter into n-Sh. The C3 assay results show that PEGylation successfully reduced MBs immunogenicity compared to blank control MBs. We found that the 5 wt% PEG and 3 wt% GEM MBs best met the design criteria, providing the most viable agent for targeted drug delivery to pancreatic cancer.

A Validation of a Newly Developed Food Frequency Questionnaire to assess Magnesium Intakes

BB-37

BB

Alicia Lamoureux

Co-Author(s): Victoria Smith, Sarah O'Connor

Advisor(s): Deeptha Sukumar

Undergraduate Student

College of Nursing and Health Professions

Nutrition Sciences

Magnesium (Mg) is the fourth most abundant mineral in the body and adequate dietary intakes have been associated with positive health outcomes. However, it has been reported that 60% of adults do not meet the dietary requirements. Estimating dietary Mg intakes in population is an important screening tool for assessing disease risk. A food frequency questionnaire (FFQ) is needed as a quick, inexpensive, and accurate tool to estimate Mg intakes in population compared to complete dietary recalls. A FFQ was developed listing commonly consumed foods that contained at least 10% of the daily value for Mg according to the USDA's National Nutrition Database. Participants completed the FFQ and a 14-day food diary and Mg intakes were obtained from each. Pearson's correlations to estimate correlation coefficients, means, standard deviations, and ranges were calculated. The agreement between the two methods was assessed by calculating the coefficient of variation. P value < 0.05 was considered significant. Seven participants met the inclusion criteria and completed the 14-day food diary and the newly developed Mg FFQ. The mean age of participants was 30 ± 13 years and BMI was 25 ± 4 kg/m². The average of Mg intakes reported from the FFQ was 377 ± 134 mg, and that of the 14-day food diary was 347 ± 140 mg. The average coefficient of variation was $10.9 \pm 8.2\%$. Mg intake calculated from the FFQ also positively correlated with the 14-day food diary ($r = 0.85$, $p < 0.02$). Although the sample size is small, it reveals a strong positive correlation between the 14-day food diary and the FFQ. By validating the FFQ, a tool is being created for clinicians and researchers to use that accurately assesses Mg status and predicts disease risk.

Metabolic Side Effects on the Rise: The Use of Metformin to Counteract Clozapine-Induced Adverse Reactions-A Case Report

BB-38

Celia Varghese

Co-Author(s): Munjerina A. Munmun, Donald Kushon, MD, Joanna Beyer, Rachel Hess, Yiqing Miao, MS

Resident/Fellow (MD)

College of Medicine

Psychiatry

Clozapine has been the most effective medication in treatment resistant schizophrenia. In the past decade, there has been growing concern among psychiatrists that the use of clozapine may be related to adverse metabolic effects. For example, in the phase 3 of the CATIE schizophrenia trial, those who took prolonged periods of clozapine reported weight gain, upsurge in the blood levels of glucose, triglycerides and glycosylated hemoglobin. We will discuss a case report of a patient taking metformin whose metabolic parameters was stabilized so patient could be maintained on clozapine. Case: 23-year-old African American female presented with acute psychosis as manifested by disorganized behavior and thought. She was prescribed chlorpromazine 50 mg TID; divalproex sodium 1250 mg q12 hours, haloperidol 20 mg BID and benztropine 2 mg q 12 hours. However, she continued to have disorganized thoughts, auditory hallucination. The decision was made to give her clozapine. She was started on metformin 500 mg BID with meals. Her initial weight was 77.1 kg (171 lbs), BMI 29, Glucose 84 mg/dl and triglyceride was 90 mg/dl. She gained 1.3 kg after 3 weeks after starting clozapine. Her HbA1c was 5.2%, glucose 80 mg/dl, and triglyceride was 52 mg/dl. During the latter 3 weeks, the metformin was increased to 1000 mg BID with meals to maximize stabilization. At the end of 6 weeks, her weight was 79.2 kg (174 lbs), BMI 32 and glucose 93 mg/dl. Clozapine was 150 mg q 12 hours at the end of 6 weeks. Her psychotic symptoms decreased. One of the challenges faced by clinicians today is dealing with adverse side effects from long-term anti-psychotic medications. Sustaining a healthy metabolic control becomes difficult especially on an inpatient psychiatry unit when patients have sedentary lifestyles and poor diet. Due to this growing concern, more studies are needed to establish metformin as based intervention needed to fight medical complications from long-term anti-psychotic side effects.

ALLN induces accumulation of novel amyloid precursor protein (APP) fragments

BB-39

BB

Haizhi Wang

Co-Author(s): Nianli Sang, Can Zhang, Ramesh Raghupathi, Rudolph Tanzi

Advisor(s): Aleister Saunders

Graduate Student

College of Arts and Sciences

Neuroscience

Alzheimer's disease (AD) is a progressive neurodegenerative disease characterized by the deposition of amyloid β peptide ($A\beta$). $A\beta$ is a proteolytic product of amyloid precursor protein (APP). In this study, we investigated whether protein degradation plays a role in the processing of APP. We found that inhibiting protein degradation with ALLN induces the accumulation of novel APP fragments. This effect is independent of cytotoxicity and protein synthesis. We further showed that inhibition of cathepsin, and not calpain or proteasome mediates the accumulation of novel APP fragments. Our data suggests that APP undergoes alternative processing which generates the novel fragments; these fragments undergoes rapid clearance/degradation via cathepsin (most likely cathepsin L) under physiological conditions.

Iterative design of a real-time information display for a high-risk, fast-paced medical setting

BB-40

Nicole Ferraro

Co-Author(s): Dr. Aleksandra Sarcevic, Dr. Sage R. Myers

Advisor(s): Dr. Aleksandra Sarcevic

Undergraduate Student

School of Biomedical Engineering, Science and Health Systems

Biomedical Engineering

Trauma resuscitation is a high-risk, fast-paced and team-driven emergency medical event requiring rapid and accurate documentation about the patient evaluation and treatment steps. Currently, at most trauma centers documentation occurs on a paper flowsheet, with one dedicated scribe receiving reports from the team and manually entering them into the record. There is no mechanism for the rest of the team to access the flowsheet information during the resuscitation, and there are multiple instances in which errors can occur. To improve information sharing and facilitate treatment decisions during trauma resuscitation, we designed a display that could read in information from multiple sources and display it in real-time to the team. Our research site was Level 1 trauma center at The Children's Hospital of Philadelphia. The first iteration of the display design was created based on feedback from trauma team members taking part in two participatory design workshops. This design was then evaluated in three simulation sessions with entire trauma teams. Feedback from these sessions was used to create the next iteration of the design, which includes more focused information, such as patient background, survey findings, timed vital signs with trends, medications and fluids with dosing and times, blood gas results, and any consults that were called for the patient. This new design was again tested in individual interview sessions with eight trauma team members representing different roles on the team (documentation, bedside and medication nurses, surgical residents, respiratory therapists, anesthesiologists, and attending physicians). We asked for feedback on the information presented on the display, the layout, the labeling, and what parts of the display would be most useful. This feedback was incorporated to create a third iteration of the display design for further testing and eventual implementation.

Novel Biological Methods for Decontamination of Flowback Water

BB-41

BB

Saeed Keshani Langroodi

Co-Author(s): Sean-Erik O'Donnell, Melika Riley

Advisor(s): Christopher Sales

Graduate Student

College of Engineering

Civil, Architectural and environmental engineering

Hydraulic fracturing is used to extract natural gas and oil from shale layers deep underground. This process generates large volumes of high-salinity flowback water, often contaminated with organic constituents such as phenols and PAHs. Different approaches are suggested to remediate this water; among them, biological degradation is proposed as an alternative to remove the contaminants from the flowback water. In the current study, salt tolerant bacterial species were chosen to study their potential ability for removal of selected contaminants from the simulated flowback water. Initially, lab testing evaluated their ability to grow at varying salinity levels, followed by an evaluation of their ability to grow on selected organic contaminants without salt (i.e., metabolically), and finally an evaluation of their ability to degrade the contaminants co-metabolically. Preliminary results show that *Haloferax volcanii*, *Rhodococcus* sp. RR1, *Janibacter* sp., *Marinobacterium georgiense*, and *Pseudonocardia dioxanivorans* CB1190 were able to grow at salinity levels over 10%. Further results indicate that, none of these bacteria are able to grow on or in the presence of pentachlorophenol (PCP), when 1mM pure PCP was added as the sole source of carbon. Co-metabolic studies performed with PCP and fructose demonstrated that *Rhodococcus* sp. RR1 and *Haloferax volcanii* were capable of removing 20% of the spiked PCP over a period of 7 days.

Tuning the temperature of live cells using laser temperature-jump (T-jump) method

BB-42

BB

Kaho Long

Co-Author(s): Balaganesh Natarajan, Shuting Zhang, Chaitali Vyas, Hairong Ma

Advisor(s): Dr. Hairong Ma

Graduate Student

College of Arts and Sciences

Physics

Thermal stress is one of the more prevalent environmental stressor that can affect many cellular activities from proliferation to apoptosis. Understanding the early events induced by temperature perturbations can lead to greater insights into the different conditions that can cause a cell to either institute self repair or spiral into self programmed death. This effort however is stymied by the lack of appropriate tools that can induce a wide range of temperatures with an appropriately scaled time resolution. To address these concerns we have created a novel technique combining a fast infrared laser induced temperature jump and inverted fluorescent live cell microscopy, where upon we can tune the temperature of either single cells or cell populations up to a 60 degrees Celsius elevation millisecond resolved time resolution.

Identifying Contributions of Wasps, Diptera, and Bees to the Pollination of *Parsonsia alboflavescens*

BB-43

BB

Bonnie Wiedel

Co-Author(s): Lumi Mema

Advisor(s): Tatyana Livshultz

Undergraduate Student

College of Arts and Sciences

The Pollination Syndrome Hypothesis proposes that one can predict the pollinators of a flower from its traits because different pollinators are attracted to different characteristics and exert selection pressure on their floral hosts. *Parsonsia alboflavescens* (Apocynaceae – milkweed family), a Southeast Asian vine, has traits indicative of the wasp pollination syndrome: exposed nectar and greenish flowers. Wasps, bees, Diptera, and Lepidoptera were all observed as frequent floral visitors in the field in Taiwan.

To determine which visitors are legitimate pollinators and nectar thieves, virgin flowers were enclosed with a single insect: 12 wasp, 8 fly, 1 bee, and 7 control enclosures. The insect was allowed to nectar for 1-4 hours and then both the insect and flowers collected. Four flowers from each enclosure were scored for the number of pollen clumps and pollen grains on the stigma.

Stigmas from wasp enclosures had an average of 98 +/- 98 pollen grains, compared to 13 +/- 30 for Diptera, 7 +/- 6 for bee, and 19 +/- 38 for control enclosures. Pollen clumps were present on 15 wasp-exposed stigmas, none of the fly- or bee-exposed stigmas and 1 control stigma. Wasp-exposed stigmas are significantly more likely to be pollinated than control stigmas ($\chi^2=8.933$, $p=0.0028$). However only 6 of 12 wasp enclosures averaged more pollen grains per stigma than control enclosures.

Wasps pollinate *P. alboflavescens*, as predicted by its pollination syndrome, but flies appear to be nectar thieves. There is insufficient replication of enclosures with bees to draw conclusions. The variation among wasp enclosures indicates that not all wasp species necessarily pollinate *P. alboflavescens*. Wasps collected from the enclosures are being studied to determine if there are consistent differences between pollinating and non-pollinating wasps. Further enclosure experiments (using large flight cages for Lepidoptera) are needed to determine if bees and Lepidoptera are pollinators.

Drosophila BK channel regulates mitochondrial function and aging

BB-44

Kajol Shah

Co-Author(s): Gurjaap Singh, Harpreet Singh

Advisor(s): Shubha Gururaja Rao

Undergraduate Student

College of Arts and Sciences

Biological Sciences

Large conductance calcium and voltage activated potassium channels (BK/ MaxiK/slo), are known for their role on the plasma membrane but recently shown to be present on intracellular organelles, including mitochondria. It is known that expression of BK goes down with age in coronary artery smooth muscle cells without affecting the biophysical properties, however a direct role for BK in aging is not established. To investigate the possible role of BK channels in aging involving mitochondria, we used *Drosophila* as a model system extensively used for such studies, using the classical slo1 mutant.

We found that the lifespan of slo1 mutant flies is significantly reduced to 25+5 days, (n=6, 30 flies each) as compared to wild type (Canton-S) flies (60+5 days, n=6, 30 flies each). Since mitochondrial ROS is directly involved in aging, where BK is present, we investigated the effect of mitochondrial ROS on slo1 mutant flies. We fed young and old slo1 mutant flies with Paraquat (PQ), an oxidative stressor, and found that the slo1 become increasingly PQ-sensitive with age (n=3, 50 flies each). We further tested whether BK could be involved in regulating mitochondria during aging, and thus we studied mitochondrial structure and function with age. Morphological analysis by electron microscopy showed that slo1 mutants flies accumulate abnormal mitochondria (swirls) right on the first day of eclosion and the abnormality increases as they age (n=3 each age group). The mitochondrial sizes were comparable at young age but the older slo1 mitochondria were enlarged with disorganized cristae. We further probed mitochondrial function by measuring reactive oxygen species (ROS) produced by electron transport chain, and found that complex II-III in slo1 mutant mitochondria generate higher levels of ROS as compared to wt with succinate or pyruvate as a substrate but not glutamate/malate. Thus, we have shown that BK plays a crucial role in aging possibly via mitochondrial regulation.

NeuroLink: Thought Based Control of a Computer- An Assistive Technology for Persons with Physically Debilitative Neurodegenerative Diseases

BB-45

Andrew Black

Co-Author(s): Kenneth Fox, Eric Loi, Matthew Bodofsky

Advisor(s): Greg Hislop

Undergraduate Student

College of Computing and Informatics

computer Science

NeuroLink is a low cost, modular Brain Control Interface (BCI) for use by persons physically incapable of operating a mouse and keyboard. In particular, it is being developed as system to allow advanced stage ALS patients to communicate with the outside world using a computer. People with ALS gradually lose their voluntary motor functions -- the ability to move an arm, finger, or toe, to make a face, to speak or move ones lips, or to blink one's eyes -- they become trapped in a non-functioning shell. By restoring (on even a limited basis) their ability to communicate, NeuroLink will drastically improve their quality of life without the extreme cost of the existing commercial solutions. There are systems available that allow ALS patients to use computers and control some devices attached to the computer (to change the channel on a television for instance); however, they are prohibitively expensive (as much as \$17,000.00) and generally not covered by the government Medicare or Medicaid programs. At the same time, Moore's law has invaded the realm of bio-electronic devices, and real-time EEG data capturing devices are rapidly becoming available in the mid-range consumer market with prices ranging from \$300 to \$1000 - markedly more affordable. While not specifically EEG capturing devices, Fitbits and the like are perfect examples of how massive consumerization of bio-electronic devices will either increase the quality and quantity of the data (better filtering and more sensors) or decrease cost per sensor point. The initial goal of the project is to develop a modular interface to allow a person to control a general purpose computer (PC) using one or more BCI technologies -- the idea being that as less expensive or higher quality BCIs become available these can be swapped in or out in much the same way that Mice and keyboards are replaceable as a result of their common interface (typically USB but formerly DIN, P/S2, or Serial Ports).

Effectiveness of Preservatives in Tropical Muffins

BB-46

BB

Perri Steinfeld

Advisor(s): Rose Trout

Undergraduate Student

Center for Hospitality and Sport Management

Culinary Science

In this study a tropical muffin made with ingredients such as pineapples, bananas, and, non-fat yogurt will be prepared with several different preservatives. The tropical and healthful ingredients in these muffins have high levels of water activity, which put the product at risk of spoiling quickly. Mold growth is the most frequent cause of bakery product spoilage (Guynot et al). Preservatives such as Propionates, Sorbates, Benzoates, and Acetic acid are mold inhibitors that can also decrease the pH of baked products, extending shelf life. Typically these preservatives work better in low pH products (Guynot et al). Essential oils can also act as natural preservative. Essential oils are volatile natural substances containing organic compounds. They are made from aromatic plants and have a strong odor. Essential oils are known for their antimicrobial properties (Abay et al). Samples made with the essential oils can be marketed as a clean label product, which would appeal to a mass market. Preservative will be dosed at 0.3%, and compared to a control. Samples will be observed and noted for sensory attributes to include texture, moisture and general taste as observed by a sensory panel of students and faculty.

A Diffusion Tensor Imaging Analysis of the Hippocampus and Emotion

BB-47

Tawny Meredith-Duliba

Co-Author(s): Kristina E. Patrick, J. Michael Williams, Karol Osipowicz

Advisor(s): J. Michael Williams, PhD

Graduate Student

College of Arts and Sciences

Psychology/MS in Cognitive Neuroscience

The current study was designed to test the hypothesis that a major function of the hippocampus is to encode the emotional tone of memories. The emotional valence of memories is an important component of recall and influences the impact of memories on future behavior. This study determined the pathways from memory encoding in the hippocampus to cortical areas using Diffusion Tensor Imaging (DTI). Twenty healthy, neurologically normal participants, between the ages of 18 and 25, underwent DTI and functional Magnetic Resonance Imaging (fMRI) scans in a Siemens Trio 3T MRI scanner. fMRI data were obtained during a scanning session in which participants were exposed to and asked to remember neutral and emotionally salient pictures (e.g. a cow grazing in a field, a dog growling). DTI images were also obtained, for both whole brain volume and Regions of Interest (ROI's). Fractional Anisotropy (FA), Mean Diffusivity (MD) and white matter tracts were modeled using multiple regression to predict memory performance for the neutral and emotional stimuli. Diffusion Tensor Imaging (DTI) was conducted to examine the anatomical connectivity of white matter pathways associated with the fMRI activations. The correlation between DTI tracts and stimulus properties of the memory testing were depicted as white matter tracts. Hippocampal involvement for total memory scores was primarily posterior with the left hippocampus being more integrated than the right. No tracts were correlated with neutral stimuli. The relationship between memory performance and tractography was driven by memory for emotional stimuli. This suggests that emotional stimuli are processed differently by the hippocampus and there is a separate mechanism for encoding and storing information with emotional salience.

Spatial and Temporal Genetic Variation in a Fungal Pathogen of a Sap-Feeding Insect Pest

BB-48

Narayan Wong

Co-Author(s): Cassandra Chatwin

Advisor(s): Jacob Russell

Graduate Student

College of Arts and Sciences

Biology

Selective pressures from natural enemies in the form of parasitoids, pathogens and parasites are known to drive the evolution of host organisms. Many animals and plants have developed intimate associations with symbiotic microorganisms, some of which have evolved the capability of bolstering their host's defensive capabilities. Evolutionary theory predicts that pathogen pressures can drive the maintenance of host genetic diversity, given existing genetic variation in the pathogen. Our system focuses on a suite of seven microbes that inhabit the pea aphid, *Acyrtosiphon pisum*. Four of these endosymbionts have been shown to confer resistance against the aphid-specific pathogen, *Pandora neoaphidis*, which causes spectacular epidemics in susceptible populations. We hypothesize that the diversity of pea aphid endosymbionts may be driven by variation in pathogen genotype. To address this, we used a DNA-sequencing based single-nucleotide-polymorphism (SNP) genotyping method of seven SNP sites across three conserved genes to determine the extent of genetic diversity of *Pandora neoaphidis* in natural pea aphid populations from New York State and Pennsylvania in 2011 and 2012. Our analysis of 128 fungal specimens revealed the presence of 22 distinct genotypes, suggesting that pea aphid populations face a diverse range of pathogens. We theorize that temporal and spatial heterogeneity in the genetic landscape of this fungal pathogen may be important in driving the maintenance of microbiome diversity in the pea aphid host.

A socially parasitic acorn ant and its effect on the foraging rate of its host workers

BB-49

Kevin Purce

Advisor(s): Sean O'Donnell

Graduate Student

College of Arts and Sciences

Biodiversity, Earth and Environmental Science

In parasite-host interactions, the host is a part of the extended phenotype of the parasite and thus acts, often to its own detriment, in such a way that increases the parasite's fitness. This study examines how an obligate, socially parasitic acorn ant (commonly called a slave-maker) alters the foraging rate of its host worker ants. After comparing the foraging activity of colonies with and without the parasite, parasitized host workers have greater odds of leaving the nest to forage for food and greater odds of reaching a food source compared to non-parasitized workers. This novel behavioral manipulation may be explained in part by the greater depletion of fat reserves in the host worker force (thus making the host worker hungrier and more likely to forage) due to a disproportionate number of mouth-to-mouth food exchanges between the parasite and the host or by repeated aggressive interactions between parasite and host. Further research is needed to determine if the increased foraging by the host increases the fitness of the parasite.

Renal Mechanisms of Hypertension in RGS2 Knockout Mice

BB-50

Li Jie

Co-Author(s): Li Jie, Satoru Eguchi, Harpreet Singh, Kendall Blumer

Advisor(s): Patrick Osei-Owusu

Graduate Student

College of Medicine

Pharmacology and Physiology

Regulator of G protein signaling 2 (RGS2) controls G protein coupled receptor (GPCR) signaling by acting as a GTPase-activating protein for heterotrimeric G proteins. Certain *Rgs2* gene mutations have been linked to human hypertension. Renal RGS2 deficiency is sufficient to cause hypertension in mice; however, the pathological mechanisms are unknown. Here we determined how the loss of RGS2 leads to renal dysfunction. We examined renal hemodynamics and tubular function by monitoring renal blood flow (RBF), glomerular filtration rate (GFR), sodium channel expression and localization, and pressure natriuresis in wild type (WT) and RGS2 null (RGS2^{-/-}) mice. Pressure natriuresis was determined by increasing renal perfusion pressure (RPP) stepwise with increases in blood volume to the kidneys, or by systemic blockade of nitric oxide synthase with L-NG-Nitroarginine methyl ester (L-NAME). Baseline GFR was markedly decreased in RGS2^{-/-} mice compared to WT controls (1.8 ± 0.1 vs. 1.1 ± 0.1 ml/min/g kidney weight, $p=0.004$). RBF was reduced (3.3 ± 0.3 vs. 2.3 ± 0.2 ml/min/g kidney weight, $p<0.05$) while renal vascular resistance (RVR; 14.9 ± 2.2 vs. 20.2 ± 1.3 mmHg/ml/min/g kidney weight, $p<0.01$) was elevated in RGS2^{-/-} compared to WT mice. RGS2 deficiency caused decreased sensitivity and magnitude of change in RVR and RBF after a step increase in RPP. The acute pressure–natriuresis curve shifted rightward in RGS2^{-/-} relative to WT mice. Sodium excretion rate following increased RPP by L-NAME was markedly decreased in RGS2^{-/-} mice accompanied by increased luminal translocation of epithelial sodium channel protein. We conclude that RGS2 deficiency impairs renal function and autoregulation by increasing renal vascular resistance and reducing renal blood flow. These changes impair renal sodium handling by favoring sodium retention. The findings provide a new line of evidence for renal dysfunction as a primary cause of hypertension.

When you hit rock bottom, ketamine to the rescue in treatment refractory depression in elderly population - A case report

BB-51

Munjerina Munmun

Co-Author(s): *Celia Varghese, Wei Du, MD, Mitali Patnaik, Shimon Waldfogel, MD*

Resident/Fellow (MD)

College of Medicine

Psychiatry

Depression is a multifactorial illness, where trials of treatment have been implemented, with hopes of establishing better quality of life. Ketamine is an innovative drug for the rapid resolution of symptoms in patients with refractory depression. Majority of the studies published demonstrate the effectiveness of ketamine in middle age demographics. There is a sparse amount of data available for effectiveness of ketamine in elderly population. Our case will demonstrate the safety and efficacy of ketamine in geriatric population showing resolution of symptoms in treatment refractory depression for significant duration of time. 81 yr old female with 40 years history of depression and multiple inpatient admission, presented for evaluation of worsening symptoms of depression despite being on 3 antidepressants. She exhibited low energy, poor appetite, increase sleep and apathy. Since May 2011, she had total of 4-inpatient psychiatric admission. She received 10 sessions of ECT in May 2011 without improvement. Despite the ECT treatment, patient was re- admitted to inpatient unit the following month for the exacerbation of depressive symptoms. The patient was started on Zyprexa 2.5 mg at bedtime. Her Prozac was up titrated to 30mg oral daily. Patient was given ketamine 100 mg/ml, injectable 45 mg at a rate of 70 ml/hr IV continuous over 45 minutes. After 1st day of infusion, depression improved by brighter affect and mood, increased motivation, improved energy and concentration. She was monitored one week following infusion where she had shown significant clinical improvement. Multiple studies demonstrated how ketamine establishes rapid improvement of depressive symptoms after receiving a single infusion. In patients who failed to respond to conventional antidepressant treatment and ECT, the safety and efficacy of ketamine in geriatric population showed resolution of symptoms in treatment refractory depression paving the way for future investigation.

Analysis of DNA Damage in Forensic Blood Evidence Exposed to Swimming Pool Water Using Neutral and Alkaline Agarose Gel Electrophoresis

BB-52

Joseph Batte

Advisor(s): Monika Jost, Ph..D.

Graduate Student

College of Medicine

Forensic Science

There have been several criminal investigations in which victims and evidence were exposed to swimming pool water. Many cases remain unsolved, in part due to inconclusive results of trace evidence DNA typing. Swimming pools are usually disinfected using chlorine or bromine derivatives, which are chemicals known to hydrolyze or oxidize DNA. Often, insufficient amounts of disinfectants are added into the pool water, resulting in incomplete binding and inactivation of contaminants, such as ammonia, and the formation of disinfectant byproducts (DBPs), which have been shown to be genotoxic, carcinogenic and mutagenic. We therefore hypothesize that trace amounts of chlorine, bromine and their corresponding DBPs in swimming pool water could interfere with forensic DNA analysis by inducing double and/or single strand DNA breaks. We studied the effect of pool water on cellular DNA using bovine anti-coagulated whole blood and blood stains. DNA was extracted after exposure of samples to varying volumes of pool water or control purified water for 24hrs, using phenol-chloroform, and aliquots analyzed by neutral and alkaline gel electrophoresis to detect double and single strand DNA breaks, respectively. Compared to controls, we observed more prominent DNA double-strand breaks in pool water-treated blood, in most samples displaying a laddering consistent with cellular apoptosis. In alkaline electrophoresis, ssDNA strand breaks were observed to a similar extent in pool water and control samples. Based on these observations we conclude that pool water chemicals enhance apoptosis, but our analysis method is not sensitive enough to detect differences in chemically induced dsDNA breaks or ssDNA breaks in excess of controls. Further studies need to be performed to determine whether the dsDNA breaks introduced by pool water chemicals will result in DNA typing failure.

HIV-1 Tat and/or morphine exposure alters tight junction protein expression in an in vitro blood-brain barrier model

BB-53

Monique Maubert

Co-Author(s): Katherine A. Kercher, Marianne Strazza, Vanessa Pirrone, Wei Lin, Rui Feng, Brian Wigdahl, Michael Nonnemacher

Advisor(s): Michael Nonnemacher, Brian Wigdahl

Graduate Student

College of Medicine

Microbiology and Immunology

Injection drug use is suspected in the acquisition of approximately one-third of human immunodeficiency virus type 1 (HIV-1) cases resulting in acquired immunodeficiency syndrome (AIDS) in the United States. Moreover, opioid abuse within this population is a confounding factor in disease progression in multiple ways, including increased viral replication and peripheral viral load, as well as incidence and severity of neurocognitive impairment and the development of dementia, as compared to non-users. Compromise of blood-brain barrier (BBB) integrity is involved in the pathological progression to HIV-1-associated neurocognitive disorders (HAND). HIV-1 proteins, as well as various drugs of abuse, have been implicated in the observed breaching of the BBB. Previous studies suggest that exposure to both HIV-1 Tat protein, as well as mu-opioids, alters BBB permeability, resulting in increased cellular transmigration, as well as overall barrier leakiness. In this study, a human brain microvascular endothelial cell line, hCMEC/D3, was utilized to establish an in vitro model of the BBB to investigate the effects of chronic Tat and/or morphine exposure on tight junction protein (TJP) expression of the BBB. Changes in mRNA transcripts of TJPs were seen throughout the course of chronic exposure to morphine. Differences in TJP expression and localization was also observed on the protein level following cellular fractionation and western immunoblot analysis of chronic Tat or morphine exposure. Overall, these studies demonstrate that exposure to Tat and/or morphine induces changes in TJP expression patterns at both the mRNA and protein levels. This work is supported by R01 NS32092, R01 DA19807, P30 MH092177, T32 MH079785, and R01 NS089435.

Targeting of ACSA Fibroblast Cells in the Repair of Rabbit Achilles Tendons

BB-54

Ryan Hoffman

Co-Author(s): Dr. Mark Wang

Advisor(s): Andrzej Fertala

Medical Student

College of Medicine

To date, methods for the repair of tendon injuries have been somewhat limited, as modes pertaining to surgery, physical therapy, or injection have been largely utilized; however, these approaches possess several adverse consequences. Previously used in cancer research, Antibody-based artificial collagen-specific anchor (ACSA) has proven effective in the delivery of cells to collagen sites. This information was used as a foundation to help improve collagen repair mechanisms. In this study, targeting of fibroblast cells with ACSA presents a better way of localizing collagen cells to areas of injury—an issue of difficulty seen in past orthopedic experimentation with similar aims. This approach proves unique in that it reveals a potential, non-surgical method for repairing tendon injuries, thus reducing the potential for accumulation of excessive scar tissue and improved healing. Due to near uniformity in biological structure to those of humans, rabbit Achilles tendons were used to study the effects of localizing ACSA labeled fibroblast cells to pre-formed injury sites, thus mimicking conditions experienced in vivo. Scaffolds immersed in ACSA cells were inserted into injury sites and placed in a bioreactor in vitro. Through histological analysis, it was revealed that ACSA cells successfully interlaced with native collagen fibers, a feature not seen in the control. Furthermore, use of a bioreactor will ideally provide information on the elasticity and tension of experimental tendons. These results should further reveal this method as both functionally and structurally successful in areas of tendon repair.

Single Institution Robotic vs Laparoscopic Nissen Fundoplication Surgical Time and Total Operating Time Comparison as a Measure of Cost Analyses

BB-55

Colin McGuire

Co-Author(s): Jorge Uribe, Lawrence Greenawald, Francisco Couto, D. Scott Lind, Patricia Shewokis

Advisor(s): Andres Castellanos

Graduate Student

College of Medicine

Interdisciplinary Health Science

Objective: Laparoscopic Nissen Fundoplication (LNF) is the gold-standard for surgically treating reflux disease even with the increasing use of Robotic Nissen Fundoplication (RNF). Data has shown that outcomes are similar, but LNF is still the procedure of choice due to lower cost via lower surgical times. There is a necessity to readdress the cost of the RNF based on surgical times.

Methods: A single institution retrospective review of patients undergoing anti-reflux surgery from May 2013 to September 2014 was conducted. Patients were divided into two groups based on whether they received an RNF (n=46) or LNF (n=9). RNF cases were conducted by one surgeon while LNF cases were performed by two different surgeons. The total surgical operating time (from incision to closure) and total operating time (from the moment the patient enters the operating room to when the patient leaves the operating room) were calculated in minutes. We assessed differences in cost and time between RNF and LNF cases by using a Mann-Whitney U non-parametric test after determining that the data was non-normally distributed with a 95% confidence interval.

Results: The RNF group has a significantly lower surgical time, total operating time, surgical time costs and total operating time costs than the LNF group. Total Operating Time (min): Robotic = 122 ± 59 , Laparoscopic = 219 ± 88 , Mann-Whitney U = 54.0 ($p < 0.001$), MCI = 118, 162. Surgical Time Costs (\$): Robotic = 1441 ± 1180 , Laparoscopic = 2779 ± 1712 , Mann-Whitney U = 68.50 ($p = .002$), MCI = 1267, 2116. Total Operating Time Costs (\$): Robotic = 1723 ± 1213 , Laparoscopic = 3671 ± 1569 , Mann-Whitney U = 38.50 ($p < 0.001$), MCI = (1549, 2451).

Conclusion: RNF in our institution has a lower surgical and total operating time resulting in a lower surgical and total operation cost than the LNF with an emphasis on time reduction. These findings have an implication on the gold-standard for Nissen Fundoplication.

Enhancement of photoluminescence of aqueous ZnSe QDs by addition of ammonium chloride

BB-56

BB

Shi Fang

Co-Author(s): Cheng-Hsin Lu

Advisor(s): Wei-Heng Shih, Wan. Y. Shih

Graduate Student

College of Engineering

Materials Science Engineering

Quantum dots are excellent tools for bioimaging due to its photostability and photoluminescence properties. Among them, ZnSe has a potential for in vivo imaging because Zn is nontoxic to human. We have developed an aqueous method to synthesize ZnSe quantum dots (Aqueous ZnSe QDs) previously. It was found that with the addition of ammonium chloride during the synthesis, both the edge state and trap-state emissions can be increased, shifting from a mostly broad trap emission to one that includes narrow edge-state emission, enhancing the quantum yield from 15% to 25%. Preliminary analysis showed that the addition of ammonium chloride favors the incorporation of S in the QDs, thus passivating the QDs' surface and resulting in more edge-state emission.

HIV-1 Tat genetic polymorphisms associated with neurocognitive impairment impact the binding interface with the NMDA receptor

BB-57

Gregory Antell

Co-Author(s): Uri Hershberg, Sandhya Kortagere, Vanessa Pirrone, William Dampier, Gregory Schwartz, Benjamas Aiamkitsumrit, Jean Williams, Shendra Passic, Katherine Kercher, Wen Zhong, Jeffrey M. Jacobson, Brian Wigdahl, Michael Nonnemacher

Advisor(s): Brian Wigdahl, Uri Hershberg, Michael Nonnemacher

Graduate Student

School of Biomedical Engineering, Science and Health Systems
Microbiology and Immunology

The current studies seek to identify and characterize genetic sequence variation within HIV-1 Tat on the basis of neurocognitive impairment (NI) and anatomical source, at the nucleotide, codon, and amino acid level. HIV-1 Tat sequences were obtained from the Drexel Medicine CNS AIDS Research and Eradication Study (CARES) Cohort as well as from autopsied brain tissue regions obtained from the National NeuroAIDS Tissue Consortium (NNTC). Sequences acquired from the CARES Cohort were amplified from PBMCs, while NNTC samples were amplified from six regions of the brain and spleen. Tat nucleotide sequences were translated and aligned to the HXB2 reference genome in order to compare sequence similarity across anatomical compartments and degree of NI. Multiple sequence alignments were evaluated for evidence of episodic positive selection using a mixed effects model of evolution (MEME) and evolutionary conservation using the bioinformatics tool ConSurf in order to elucidate amino acid positions of structural and functional importance. These phylogenetic analyses were followed by an in-depth evaluation of the amino acid diversity at each position, with special consideration towards residues with altered side chain chemical properties. Overall, this study identified altered amino acid usage within multiple domains of Tat using a Euclidean distance metric when comparing between impaired and non-impaired individuals and PBMC and brain tissue. Of greatest interest were the variants C30S and C31R, which were enriched in brain tissue and non-impaired individuals, respectively. These polymorphisms were computationally modeled for docking with the NMDA-receptor and the P-TEFb complex. Overall, these analyses have resulted in the identification of distinct patterns of amino acid usage in relation to NI and CNS compartmentalization, which may contribute to HIV-1 neuropathogenesis. This work is supported by R01 NS32092, R01 DA19807, P30 MH092177, T32 MH079785, R01 NS089435.

Life After Drexel: Behavior and Short-term Survival of Captive-reared Gopher Tortoises Following Release Back into the Wild

BB-58

Thomas Radzio

Co-Author(s): Michael O'Connor

Advisor(s): Michael O'Connor

Graduate Student

College of Arts and Sciences

Biodiversity, Earth, and Environmental Science

Captive-reared animals often exhibit difficulty adjusting to life when released into the wild. This can impede research or conservation efforts that depend upon raising animals in captivity. We collected hatchling gopher tortoises from natural nests in southwest Georgia and raised them in the laboratory at Drexel University for physiology experiments designed to understand how environmental changes may influence this threatened species. Upon completing the lab work, we outfitted 30, one-year old individuals with radio transmitters and hard-released them in late summer at their nest sites to determine post-release behavior and survivorship. Most constructed burrows soon after release, and, like wild tortoises, released tortoises disproportionately placed burrows under deadwood. Video cameras located at tortoise burrows indicated normal activity patterns. Tortoises slept in burrows at night, emerged during warm daylight hours, basked extensively at burrow entrances, and limited time spent foraging away from the safety of burrow areas. Importantly, simulated predator approaches revealed that released tortoises exhibited normal antipredator responses by reliably hiding inside their burrows in response to perceived predation threat. We will share video observations of tortoise activity and antipredator behavior in our presentation. Released yearling tortoises exhibited survivorship similar to that of wild yearlings, 63-77% survived until the following spring. All known mortalities were due to predators. Despite having been raised inside plastic boxes and having daily contact with laboratory personnel for the first year of their life, captive-reared yearling tortoises retained critical traits necessary for success in the wild. These findings indicate that young gopher tortoises used in lab studies or captive-reared in efforts to augment wild populations may be successfully released back into nature.

Evolution of the HIV-1 Promoter in the cART era: Single nucleotide polymorphisms (SNPs) correlate with clinical disease parameters

BB-59

Neil Sullivan

Co-Author(s): Michael R. Nonnemacher, Vanessa Pirrone, Rui Feng, Brian Moldover, William Dampier, Shendra Passic, Jean Williams, Benjamas Aiamkitsumrit, Sonia Shah, Wen Zhong, Brandon Blakey, Jeffrey Jacobson, Brian Wigdahl

Advisor(s): Brian Wigdahl, Michael R. Nonnemacher

Graduate Student

College of Medicine

Microbiology and Immunology

The HIV-1 genome including the long terminal repeat (LTR) is continuously under selective pressure, even in well-controlled individuals on HAART. Single nucleotide polymorphisms (SNPs) in the LTR are of interest due to their role in regulating viral transcription and overall viral fitness. Previous work has demonstrated SNPs in particular transcription factor binding sites (TFBSs) can alter viral transcription and virus production in a cell type-specific manner. Furthermore, disease severity was correlated with an increased frequency of SNPs in C/EBP site I and Sp site III from LTRs derived from cells of the peripheral blood. To further understand patient LTR signatures and SNPs that correlate with advanced stage and/or neurologic disease, the Drexel Medicine CNS AIDS Research and Eradication Study (CARES) Cohort in Philadelphia, PA was used to conduct a prospective, longitudinal study on 489 HIV-1-seropositive patients. Numerous SNPs were strongly correlated with clinical disease parameters, such as CD4+ T-cell count and viral load. One the SNPs identified, SNPs at position 108, a confirmed COUP/AP1 binding site, increased in frequency in patients with high viral loads and low CD4+ T-cell counts. The in silico transcription factor binding prediction algorithm JASPER, demonstrated that nucleotide changes away from the consensus nucleotide adenine to either thymine, cytosine or guanine resulted in a reduction in COUP-2 binding. JASPER also indicated position 108 as a novel TFBSs for other transcription factors. Current studies using electrophoretic mobility shift assay (EMSA) are being performed to confirm the in silico prediction analysis and determine if there is differentially utilization in selected cellular phenotypes. This work is supported by R01 NS32092, R01 DA19807, P30 MH092177, T32 MH079785.

Behavioral Variation in Prey Odor Responses in Northern Pine Snake Neonates and Adults

BB-60

BB

Kevin Smith

Co-Author(s): M. Rockwell Parker, Walter F. Bien

Post-Doctoral Fellow (PhD)

College of Arts and Sciences

Biology

Squamate reptiles (snakes, lizards, amphisbaenians) rely heavily on chemosensory cues to identify, locate and choose between suitable prey items, but comparatively little research has focused on the chemical ecology of threatened squamate species. Such knowledge highlights ecologically important aspects of their survival. Due to gape limitations, squamates often demonstrate ontogenetic shifts in their diet where they consume larger prey as they grow older and their gape size increases. This shift enables squamates—especially snakes—to exploit new resources in their environments, usually mammalian prey. To test for ontogenetic variation in prey odor responses of a threatened snake species, the Northern pine snake (*Pituophis melanoleucus melanoleucus*), we presented food-naïve neonates and food-experienced adults with potential prey and non-prey animal scents and quantified their behavioral responses. Our data indicate a strong response to rodent scents from both neonates and adults. Further, neonates showed more frequent investigative probing and retreating behaviors from scented swabs and a higher rate of tongue-flicking than adults. We also developed a new metric for measuring snake responses to prey odor, a tongue-flick reaction score (TFRS), that incorporates investigative behaviors that may be unique to constrictor-type snakes. The TFRS did not differ between age classes and was highest when rodent odors were tested. A canonical discriminant analysis confirmed the relationship between TFRS behavioral components and tested chemical signal reactions. Based on our data, *P. melanoleucus* may fall into a category of snakes that exhibit an ontogenetic telescope rather than a general ontogenetic shift in their prey odor responses.

HSV-1 replication kinetics and immune response in the lip scarification model of infection

BB-61

Kevin Egan

Co-Author(s): Pamela Turner, Brian Wigdahl, Stephen R. Jennings

Advisor(s): Stephen Jennings, Brian Wigdahl

Graduate Student

College of Medicine

Microbiology and Immunology

Herpes simplex virus type 1 (HSV-1) is a human pathogen, which replicates in epithelial cells of mucosal surfaces before establishing a lifelong latent infection within the trigeminal ganglion. The immune system is critical with respect to the establishment and maintenance of latency. HSV-1 disease occurs with a spectrum of severity and can include corneal scarring and blindness to recurrent mild lesions following infection of the eye and lip, respectively. There is an established ocular infection model in the laboratory mouse, which reproduces primary infection and latency observed in humans. However, the majority of primary human infections occur within the lip and latency is established within a different branch of the trigeminal ganglion from ocular tissue. In this regard, we set out to define the kinetics of HSV-1 replication and immune cell response in the lip scarification model. The lower lip of 3 month old mice were scarified and inoculated with HSV-1 and tissue was collected at 7 time points up to day 60 post infection for detection of infectious virus and responding immune cells. We found high virus titers in the lip at early time points that resolved after 8 days of exposure. The virus infiltrated the trigeminal ganglion during primary infection in the lip and latency was established by 30 days post infection. T cells were observed infiltrating the trigeminal ganglion 8 days post infection. T cells could be found in the trigeminal ganglion 60 days after infection. These results demonstrate that the lip scarification model can be used to study viral kinetics and the role of immune cells in the trigeminal ganglion.

Implications of macroinvertebrate community response to a baseflow gradient on water quality assessment practices for streams in Pennsylvania

BB-62

Lia Domico

Co-Author(s): Richard Horwitz

Advisor(s): Stefanie Kroll

Undergraduate Student

College of Arts and Sciences

BEES

Aquatic macroinvertebrate communities are widely studied in aquatic ecosystems. The Macroinvertebrate Index of Biotic Integrity (MIBI) is one of many indices used to characterize water quality in Pennsylvania. While there is much research focusing on the tolerance of specific taxa to environmental variables (e.g. pollution, sediment loading, etc.) there is a lack of knowledge in how macroinvertebrate communities respond to flow variables. Current PA macroinvertebrate IBI scores do not consider flow regime and are used universally in all streams and rivers of PA. In this study we compared sampled macroinvertebrate communities in the Delaware River Basin in Pennsylvania at sites with various mean monthly baseflows to see if the average stream baseflow effected which taxa were present. PCA was used to represent which species were most important, which were rare, and how the species were distributed across the flow gradient. This study is important because it has implications on the current standards for calculating IBI scores. Results of this study indicated whether or not it was accurate to compare the health of streams using a universal IBI score when macroinvertebrate communities varied based on the average baseflow of the streams.

Biomaterial-Mediated Control over Macrophage Behavior in Bone Regeneration

BB-63

Pamela Graney

Co-Author(s): Dr. Hala Zreiqat, Dr. Seyed-Iman Roohani-Esfahani

Advisor(s): Dr. Kara L. Spiller

Graduate Student

School of Biomedical Engineering, Science and Health Systems

Biomedical Engineering

Approximately 6 million bone fractures occur annually in the U.S., and 5-10% of these fractures fail to heal adequately. Macrophages, the primary cells of the inflammatory response, are recognized as crucial regulators of healing. We have shown that M1 (classically activated) macrophages are required at early stages of healing to initiate blood vessel formation, while M2 (alternatively activated) macrophages are needed at later stages to facilitate blood vessel stabilization and tissue maturation. Similarly, a rapid - but temporary - period of increased inflammation has been shown to enhance bone regeneration. Recently, Roohani and Zreiqat engineered novel ceramic-based scaffolds using Baghdadite ($\text{Ca}_3\text{ZrSi}_2\text{O}_9$) and Strontium-Hardystonite-Gahnite (Sr-HT Gahnite, $\text{Ca}_2\text{ZnSi}_2\text{O}_7\text{-ZnAl}_2\text{O}_4$), and demonstrated enhanced ability to regenerate large bone defects under load compared to clinically utilized tricalcium phosphate-hydroxyapatite (TCP-HA) scaffolds. We hypothesized that interactions with macrophages contribute to the success of these scaffolds to promote tissue regeneration.

We evaluated the behavior of primary human monocyte-derived macrophages on these ceramic scaffolds in vitro in terms of gene expression for a panel of markers indicative of the M1, M2a and M2c phenotypes. Interestingly, while TCP-HA scaffolds induced increasing expression of M1 markers over time, Baghdadite promoted a mixed M1/M2 phenotype early and induced M2-like behavior later, consistent with the M1-to-M2 transition observed in normal healing. Sr-HT Gahnite promoted M2 behavior early and suppressed M1 behavior later. These results suggest that part of the success of these scaffolds may be due to modulation of macrophage behavior, while TCP-HA scaffolds promote chronic inflammation. Improved understanding of the interactions between novel scaffolds and cells of the inflammatory response will aid in the design of biomaterials to facilitate bone repair and regeneration.

Rapid Micro-measurement of oxygenation levels of blood

BB-64

BB

Albina Jamikesheva

Co-Author(s): Alexey Aprelev, Frank A. Ferrone

Advisor(s): Alexey Aprelev

Undergraduate Student

School of Biomedical Engineering, Science and Health Systems

Sickle Cell Disease (SCD) it is the most common inherited blood disorder in US. Despite 104 years of extensive research there is only one FDA approved treatment and no cure for the disease. Partially that is because of absence of convenient method for rapid evaluation of clinical status of SCD patients. Such a method is necessary for improvement of patient care and for clinical trials of potential drugs.

We have recently developed a device that uses the diminished flow rate of deoxygenated blood to determine if a patient has sickle cell disease. In order to adapt the device to the task of determining the clinical status of a sickle cell patient several steps are necessary. One is to be able to follow the degree of deoxygenation rapidly in the small devices we employ. We report here the use of a unique spectrometer which can measure 10 nano liters of volume, measured 50 times a second in a capillary (ID 100um) that is integrated into our existing device. With this device we can measure the degree of oxygenation within 2%. The details of its operation will be discussed.

Comparison of P-gp surface densities and P-gp elementary kinetic rate (binding and transport) constants in Caco-2 and MDCKII-hMDR1 cells

BB-65

Zhou Meng

Co-Author(s): Harma Ellens, Philip Clark

Advisor(s): Joseph Bentz

Graduate Student

College of Arts and Sciences

Biology

P-gp has been extensively studied as a human multidrug resistance transporter. Typically, transport kinetics are fitted using the classical Michaelis-Menten steady state parameters. These parameters do not extrapolate between cell lines or to in vivo. Previously our kinetic analysis has fitted the elementary P-gp on-, off- and efflux rate constants (k_1 , k_r and k_2) and the P-gp efflux active surface density using MDCKII-hMDR1 confluent cell monolayers. Our question is whether these elementary kinetic parameters are reliable to be extrapolated between cell lines and for in vitro/in vivo extrapolation.

In the present study, Caco-2 cells grown for 21 days were used for experiments. Transport of amprenavir, quinidine and loperamide was measured as a function of time and drug concentration. P-gp surface density and elementary rate constants were fitted as described previously. P-gp mRNA levels and protein levels were also measured in both MDCKII-hMDR1 and Caco-2 cells.

The results show that the elementary rate constant for the above P-gp substrates obtained in Caco-2 cells are very similar in magnitude (within 4 fold difference) to those obtained previously in MDCKII-hMDR1 cells. Similarly, the total P-gp protein level is almost the same between two cell lines. On the contrary, the fitted efflux active P-gp surface densities and measured mRNA levels are substantially different between the cell lines. Efflux active P-gp surface density was 6 fold and mRNA levels 8.7 fold lower in Caco-2 compared to the MDCKII-hMDR1 cells. The similarity in P-gp elementary rate constants in two different cell lines shows these can be extrapolated between systems. The ratio inconsistency of P-gp expression level and the efflux active P-gp surface density suggest that only P-gp on the tip of microvilli contributes to the terminal removal of substrate from cells and it is important to use efflux active P-gp level instead of total P-gp level for the robust PBPK model building.

BUSINESS RESEARCH

Streaming is the New Black: A Consumer-based Examination of Netflix Inc. Original Programming and Streaming Strategy

BR-01

Lindsay Strott

Advisor(s): Lydia Timmins

Graduate Student

Westphal College of Media Arts & Design

Television Management

BR

Founded in 1997, Netflix Inc. was originally a DVD-by-mail service, providing an alternative option to big box rental stores and their accompanying late fees. Foreseeing the potential in over-the-top Internet streaming and the fall of DVDs, Netflix began offering on-demand Internet streaming of licensed films and television programs in 2007. By 2010, Netflix's streaming business transformed the company from the most rapidly growing customer of the US Postal Service's mail service to the largest source of evening Internet traffic in North America. That same year, streaming became a separate subscription option from DVD rentals, marking the company's shift in focus towards streaming. In 2014, Netflix further defined its streaming strategy with the stated goal of releasing original content every two and half weeks. This transformed Netflix from a content aggregator into a major content creator, potentially redefining the company's business model. However, it is unclear if this strategy modification has been successful in customer acquisition and retention as Netflix releases very little subscriber data. It is also unknown if viewers are taking to Netflix originals with the same alacrity as other content services known for such content. Though Netflix openly compares itself to HBO, a company known for quality originals, there is no data to back up this comparison. Additionally, in the face of rising content costs, it is critical that major content investments are proven to be stimuli for growth. If originals are proven to be important to users and beneficial to the company, this could legitimize the large budgets of some of the Netflix originals. This thesis examines Netflix streaming users habits, preferences, and opinions on Netflix streaming and original programming via survey to determine how important original programming is for the company and if it will help achieve the company's wider goal of becoming the world's first Internet-only premium content network.

The effect of Advertising Models' Body Size on Consumers' Perceptions of Self and the Ad

BR-02

Hoori Rafieian

Advisor(s): Hyokjin Kwak

Graduate Student

LeBow College of Business

Marketing

BR

In line with tenets of social comparison theory, this research aims to show that using average-sized models in clothing advertisements is beneficial for both clothing manufacturers and women's public health. Not only can such strategy increase women's self-esteem and provide them with a more realistic body evaluation, it can also bring about more favorable attitude towards the advertisement because of the perceived similarity between them and the models featured in advertisements.

Starting a Price Promotion: Retracting It in One Step or Phasing It Out Gradually

BR-03

Anubhav Aggarwal

Advisor(s): Daniel Korschun

Graduate Student

LeBow College of Business

Marketing

BR

Launching a product with an introductory offer is a common marketing tactic. But the type of introductory offer to be used can also impact how potential consumers perceive the product once the discount ends. In this paper, we study the impact of two types of introductory offers on the attitude towards the regular price of the product. In study 1, we show that providing sequentially decreasing the discount amount over the discount period leads to better attitude towards the regular price of product than providing the same level of discount throughout the discount period. Study 2 shows that the effect of introductory offers on price attitude is moderated by the type of product attributes made salient to consumers.

How Social Crowding Affects Price Comparisons of Bundling Promotions

BR-04

Jeonggyu Lee

Advisor(s): Rajneesh Suri

Graduate Student

LeBow College of Business

Marketing

BR

This research examines the effect of social crowding on price liking or deal liking toward bundling promotions offered in a store. This relationship is moderated by types of bundling promotion (free-gift vs. price discount). I believe that consumers in uncrowded environments are more likely to choose free-gift than price discount promotion when a unit price of bundling is only displayed. Because consumers would make their cognitive efforts to compute the total cost of bundle depending on the unit price. Therefore, they will prefer free-gift to price discount due to less allocation of cognitive resources for number processing. On the other hand, consumers in crowded environments are more likely to choose price discount than free-gift promotion because social crowdedness creates high level of avoidance tendency, which, in turn, leads people to prefer reducing losses to gains. Therefore, consumers form favorable attitudes toward price discount promotions since they are perceived as a reduction in losses according to the prospect theory. I also assume that high extent of social crowding can arouse the feeling of anxiety which mediates the relationship between social crowdedness and price liking or deal liking of bundling promotion.

Electronic Word-Of-Mouth (eWOM) In Online Shopping: Does Conscientiousness Play a Role?

BR-05

Siddharth Bhatt

Advisor(s): Rajneesh Suri

Graduate Student

LeBow College of Business

Marketing/PhD

BR

Online shopping is growing at an unprecedented rate across the globe. The next big wave of online shopping, as predicted by several market research firms, is going to be in Asia. And while buyers rely on opinions from experts, friend and family while making purchase decisions, there is evidence that such word-of-mouth assumes greater importance in the online buying context. After conducting a review of the literature on this subject, four variables of study are proposed. The paper examines the impact of electronic word-of-mouth (eWOM). The effect of reviewer's expertise and the level of detail of the review on the evaluation of the review by buyers is evaluated. The conscientiousness of the buyer is proposed to moderate these effects.

Sensory Study of Ready-To-Eat Meats with Natural Antimicrobials

BR-06

Shannon Bonelli

Advisor(s): Jacob Lahne

Undergraduate Student

Center for Hospitality and Sport Management

Culinary Science

BR

Within the last few years, there has been and continues to be an increasing consumer demand for minimally processed, “natural”, “organic” or “clean-label” food products. The USDA Food Safety and Inspection Service has identified “natural” meat and poultry products as those without artificial flavoring, coloring ingredient, or chemical preservatives. Therefore, approved and commonly utilized synthetic antimicrobials effective in the inhibition of *L. monocytogenes* are prohibited under that definition. This requires moving away from chemical additives and toward natural ingredients as replacements. “Clean-label” foods have simple ingredients easily understood and recognized by consumers. The ingredients originate from a nonchemical or plant source. New effective strategies must be developed by food industry producers that will inhibit *L. monocytogenes* growth in RTE meats while meeting clean-label, natural, or organic labeling criteria. One method may be the use of organic acids, which are successful with inhibiting growth, such as acetic acid present in vinegar.

For this study, a commercial processor will provide samples. The uncured ham and frankfurters will be formulated to contain 1 level of vinegar, a food grade antimicrobial to enhance safety, increase shelf life, and reduce costs. They will also formulate their standard ham and frankfurters to contain 1 level of regular/standard chemical antimicrobial. These products may or may not be processed using high-pressure processing method. All samples will be clearly identified by the processor.

Therefore, the objectives of this study are to determine consumer acceptability of ham and frankfurters processed with the use of vinegar and/or high-pressure processing as natural antimicrobials as well as determine how each sample compares to the control samples processed with chemical preservatives.

Can Negative Word Of Mouth Go Beyond from Merely Catching Attention to Generating Actual Purchase?

BR-07

Jung Ah Han

Advisor(s): Eleanor Feit

Graduate Student

LeBow College of Business

Marketing

BR

The notion of Word Of Mouth (WOM), or the voice of the customer, has received considerable attention in both business and academic research. Numerous studies have been conducted to examine the effectiveness of WOM marketing tools and valence of the WOM. This study further examines how and when the Negative Word Of Mouth (NWOM) can be beneficial, and how NWOM can go beyond from merely catching customer's attention to actual increase in sales. The author tries to examine if the firm's maturity and product category play moderating role for NWOM to be beneficial. This will give implication to the firms faced with NWOM to make controversial moves to increase their visibility and brand awareness. This study will investigate the impact of NWOM using difference in differences analysis to account for unobservable firm's specific characteristics.

Examine the Effect and Conditions of Negative word-of-mouth on Consumer Perceived Risk and Purchase Intention

BR-08

Zhen Yang

Advisor(s): Chen Wang

Graduate Student

LeBow College of Business

Marketing/Ph.D

Online shopping has been perceived as risk taking behavior. Internet shoppers nowadays are increasingly relying on online word-of-mouth to reduce perceived risks and make right purchase decisions. Word-of-mouth can serve as an effective risk reliever to mitigate consumer's anxiety and uncertainty associated with product purchase, however, the negative word-of-mouth may actually intensify the negative emotions. I propose that when facing the negative word-of-mouth, consumer perceived risk will increase, and their purchase intention will decrease. I then examined the effect transmission mechanism to better understand the interrelationship between these three factors. I also identified the circumstances under which the effect of negative word-of-mouth will be significant, and under which it will be likely to be dismissed by the reviewers. A laboratory-based experiment has been proposed to test the causal effect and hypothesis, and analysis procedure is given to test the moderated mediation effects.

The Gap for Accounting Students in a Real-world Project From a Perspective of the Comprehensive Skills

BR-09

Yue (Doris) Li

Co-Author(s): Shaikh Al Mamun

Graduate Student

LeBow College of Business

Master of Science in Accounting Program

As a language of business, accounting has been a popular major for millions of students to choose. As long as there is business, it needs accountants. However, as time changes and technology popularizes, the current business entity needs more comprehensive people to handle their financial information. Therefore, accounting is no longer traditional book keeping, especially for those who pursue a career in industry rather than accounting firms. In this research paper, we would like to explore the comprehensive skills for accounting major students based on our project experience, and some problems we have come across from previous experiences. The measurement is based on the top companies' job descriptions in the finance industry. The aim of this project is to help accounting major students in developing their comprehensive skills combined with the M.S Accounting Program at Drexel University.

TRANSLATIONAL & CLINICAL

Uveitis Demographics in an Indigent Population

TR-02

Meghan Berkenstock

Co-Author(s): Jessica Ackert

Advisor(s): Jessica Ackert

Resident/Fellow (MD)

College of Medicine

Ophthalmology

Patients with uveitis require treatment with topical and oral medications to adequately resolve inflammation and side-effect monitoring with frequent lab studies. For patients with no insurance or minimal coverage, suboptimal compliance may result. There have been no studies examining the types of uveitis and visual outcomes at large hospitals serving indigent populations in need of low-cost care.

A database of uveitis-related ICD9 codes from 9/2011 through 9/2014 at Drexel Eye Physicians was created. Charts of 647 patients were retrospectively reviewed. Primary endpoints were determining the anatomic location of the uveitis and demographic factors, such as race and gender.

647 charts were reviewed and 249 patients were included. Patients were excluded if there was no documentation of endogenous anterior, intermediate, posterior, or panuveitis. Anatomic location and activity was graded according to SUN. The most common anatomic location was anterior (76.3%), followed by panuveitis (14.9%), posterior (6.8%), and intermediate (2%). In affected patients, the most commonly represented ethnic groups were African-American (65.5%), Caucasian (16.9%), and Hispanic (10%). Patients with anterior uveitis did well with the majority achieving 20/20 vision. Patients with pan or posterior uveitis had a higher rate of vision loss. The most common disease entities were post-op inflammation (13.65%), sarcoid (6.4%), toxoplasmosis and HZO (2% each). In cases of anterior uveitis, 144 cases were acute (75.79%) and 46 chronic (24.21%). Unilateral was more common than bilateral, 62.25% versus 37.75%. There were more females, 65.5%, than males, 34.5%. The prevalence rate was based on a total of 23,290 office visits, which totaled 0.77% of patients.

We now understand the diseases seen in our practice, and know the most affected were African-Americans with anterior uveitis. We can obtain low-cost drops and enroll patients in drug assistance programs to improve clinical outcomes.

TR

Extracorporeal Shock Wave Therapy: A New Therapeutic Strategy for Coronary Artery Disease

TR-03

Yang Chen

Advisor(s): Masaru Teramoto

Undergraduate Student

College of Nursing and Health Professions
Health Sciences

Coronary artery disease (CAD) is the leading cause of death in the United States. Annually, 370,000 people die of CAD; in addition, around 5.8 million people experience heart failure due by CAD, with recently elevated new diagnoses up to 760,000. Besides traditional medicine, including surgical procedures, researchers are continuously seeking new treatments in terms of facilitating patients' heart functions. Extracorporeal shock wave therapy (ESWT), one type of acoustic pulses related to high energy treatment, has been applied widely in improving plantar fasciitis, tennis elbow, and breaking down kidney stones. With the constant efforts dedicated in research, this therapy has been considered as a new therapeutic strategy for treating patients with end-stage CAD who may not be the suitable candidates for percutaneous coronary intervention and coronary artery bypass graft surgery. This literature review aims to examine the efficacy and safety of ESWT on treating patients with CAD. Recent studies have demonstrated that ESWT with a modified low energy level has its capacities to improve symptoms of myocardial infraction by suppressing inflammatory responses, enhancing development of vascular endothelial growth factor, and ameliorating revascularization for ischemic necrosis and angina pectoris. In addition, patients could have similar therapeutic outcomes with a shorter length of the treatment. Overall, research suggests that ESWT could be a non-invasive, safe and effective treatment for CAD. It is health care providers' roles to understand the mechanisms of ESWT and practice based on its evidence as well as to provide adequate information to patients who could receive progressive medical services and options in terms of life saving. Further research is necessary to assess potential adverse effects of ESWT for patients with CAD by recruiting larger sample size and preparing longer period of follow-up assessments and analysis.

TR

The effect of maternal obesity on birth weight: a retrospective cohort study

TR-04

Roxanna Irani

Co-Author(s): Ruofan Yao, Bo Young Park, Damien J Croft, Lauren A Plante

Resident/Fellow (MD)

College of Medicine

OB/GYN

Objective: To characterize fetal growth throughout gestation in obese pregnant women as compared to those of normal weight by using birth weight data as proxy.

Methods: This retrospective cohort study used birth data from the Texas Vital Records Database from 2006-2011. After exclusion criteria were applied, 1,849,773 births were used in analysis. Linear regression assessed the rate of fetal growth throughout gestation. The percentage of large and small for gestational age (LGA and SGA) deliveries for each body mass index (BMI) class at each gestational week was compared that of non-obese women. Logistic regression was used to obtain the adjusted odds ratio for deliveries of LGA and SGA infants within each BMI class. STATA 12 was used for statistical analyses.

Results: Birthweight differs throughout gestation in infants born to overweight and obese women compared to those of normal BMI. This is most apparent at 37 weeks where infants born to Class III obese women are 206g larger than those born to a woman with a normal BMI. During 32-37 weeks gestation, the mean rate of fetal weight gain per week is accelerated (229.7g (95%CI 221.6-237.7g) in Class III obese women versus 198.3g (95%CI 196.6-200.0g) in patients with normal BMI, followed by a decline in the rate of growth. This pattern of rapid acceleration then deceleration results in a parallel increase in LGA infants among obese women; OR 2.62 (95%CI 2.54-2.71) in Class III obese from 36-39 weeks gestation. An inverse pattern is observed for deliveries of SGA infants.

Conclusion: In obese pregnant women, there is a period of rapid fetal growth and increased incidence of LGA infants in the late preterm and early term, followed by slowed growth and decreased LGA deliveries with an increase in SGA deliveries. This dose-dependent pattern may suggest that placental function may be outstripped in obese women.

Sponsored by the Drexel University College of Medicine Department of Ob/Gyn Seed Grant.

TR

Identifying Gaps in Hospital Discharge Documentation as a Step Towards Implementation of a Standardized Discharge Process

TR-06

Alexandra Schieber

Co-Author(s): Alison Petrie, Lian Peter, Kris Cheng, Sharandeep Takhar, Timothy Gill, Daniel DeJoseph

Advisor(s): Daniel DeJoseph

Resident/Fellow (MD)

College of Medicine

Family Medicine

In the United States one in five Medicare patients discharged from the hospital experience an adverse event within three weeks. Nationally, 75% of hospitals receive monetary penalties for readmissions. Project RED (Re-Engineered Discharge) is a discharge checklist developed at Boston University shown to reduce adverse events associated with the discharge process. In our center, there is a perception that the current discharge process is inefficient and does not follow a validated process. Currently, we do not use the project RED checklist. Our aim is to quantify the perception of the family medicine department regarding the current discharge process to determine if implementing a validated discharge template is warranted. We gathered qualitative data through a survey of 18 Drexel Family Medicine residents and 7 attending physicians regarding clinician satisfaction with the current discharge process at Hahnemann University Hospital. More than 70% of all residents felt the current discharge summary does not meet the Project RED goals. The majority of residents and attendings cited the current system to be redundant, disorganized and incomplete. In addition, 72% of residents and 100% of attending physicians believe incorporating the discharge template will facilitate improvement in quality and efficiency of dictations, and 100% of both residents and attendings feel implementation of a revised and standardized discharge process will improve patient care. Currently, the family medicine department is not satisfied with discharge process. We believe that it is appropriate to change the discharge summary by incorporating a standardized discharge template based on the validated Project RED checklist with the aim of improving efficiency and effectiveness. Future QI projects will determine if implementing this template will improve patient care by creating more consistent transitions of care with decreased adverse events and readmissions.

TR

Visualizing Design Trends by Mapping the Alzheimer's Disease Trial Space

TR-07

Timothy Schultz

Co-Author(s): Neal Handly

Advisor(s): Chaomei Chen

Graduate Student

College of Computing and Informatics

Disconcerting trends in clinical research have counter-intuitively shown that the failure to meet desired clinical trial endpoints has come at the cost of increased spending. This suggests the need for developing new ways in which clinical trials are designed, patients are recruited, and protocols are executed. One approach for addressing this issue is to provide research organizations a mechanism to proactively identify key clinical trial design patterns and trends within a therapeutic area through the utilization of novel visualization tools. At the heart of the clinical trial design lies the need to ensure appropriate selection of participants. The selection of patient attributes noted in inclusion/exclusion criteria, which aims at minimizing comorbid conditions that may confound treatment signals, can also be detrimental to the external validity of the study. By quantifying and qualifying thematic clinical trial design trends over time, we propose a framework for providing proactive guidance in designing more efficient clinical trials. For example, there is an interesting opportunity in Alzheimer's Disease research to visualize how our understanding of the amyloid cascade has evolved over time, and the many ways researchers have since proposed the best means to engage it.

TR

Drug-coated balloon: A new device for peripheral vascular interventions

TR-08

Ruchi Patel

Co-Author(s): Joanne Ilustre, DO, Selvin Sudhakar, MD, Gary Ledley, MD

Resident/Fellow (MD)

College of Medicine

Cardiovascular Disease

Patency following lower extremity peripheral interventions remains a challenge. Patency rates following plain old balloon angioplasty (POBA), bare metal (BMS) and drug-eluting stents (DES) are reported in the range are 40%, 65%, and 75% respectively.

Restenosis in DES is caused by inflammation of the vessel wall secondary to material left behind. The drug-coated balloons (DCB) are new FDA approved technology that avoid inflammation by leaving no hardware behind at the lesion site.

A 63 year old woman with coronary artery disease and peripheral arterial disease presented with worsening claudication. Three years earlier she received overlapping BMS (6.0mmx100mm and 6.0mmx150mm) in her left superficial femoral artery (SFA). Angiography this time revealed diffuse severe in-stent restenosis (ISR). The lesion was treated with DCB angioplasty with an excellent result.

DCB offers homogeneous drug delivery into the endothelium and avoids inflammation to the vessel. The balloon is coated with the drug paclitaxel, which inhibits cell division, cell growth, and intimal hyperplasia. The Lutonix drug-coated balloon is the first such FDA approved device. Anatomically difficult lesions can be treated without the fear of jailing the branch vessel or causing stent fracture.

Studies have shown the superiority of DCB over POBA in treating lesions as well as ISR in femoral artery. In such studies the 1 year patency rates are comparable to patency rates of DES. Comparison of DES and DCB are still lacking. Nonetheless, with comparable patency rates to DES, DCB offer a very valuable tool in challenging lesions such as in the case mentioned above.

TR

Evaluating the Native Length-Tension Relationship in Arthroscopic Suprapectoral Biceps Tenodesis: An MRI Assessment of Contralateral Shoulders

TR-09

John Prodromo

Co-Author(s): Mary K. Mulcahey, Raymond Hong, Tal S. David

Resident/Fellow (MD)

College of Medicine

Orthopaedic Surgery

Purpose: To evaluate the position of the musculotendinous junction of the long head of the biceps (LHB) following arthroscopic suprapectoral biceps tenodesis and compare the position to the nonoperative limb.

Methods: All patients undergoing arthroscopic suprapectoral biceps tenodesis between January 2013 and May 2014 at one center were evaluated for inclusion in the study. Patients undergoing concomitant rotator cuff repair, labral repair for instability, or with contralateral biceps tendon pathology were excluded. Additional exclusion criteria included any patient whose tenodesis was noted to have failed either clinically or on diagnostic imaging at follow up. Patients included in the study underwent a postoperative MRI of bilateral shoulders. The distance from the superior portion of the humeral head to the LHB MTJ was measured bilaterally. One musculoskeletal-trained radiologist made all MRI measurements using the same MR magnet. The measurements from each matched pair were compared using a paired t-test to determine if arthroscopic suprapectoral biceps tenodesis anatomically restored the LHB length-tension relationship.

Results: A total of 17 patients met the inclusion criteria. Fourteen of the seventeen patients underwent a postoperative MRI of bilateral shoulders. The distance from the superior portion of the humeral head to the LHB musculotendinous junction was significantly larger on the operative side when compared to the nonsurgical side (operative side mean 98.3mm, standard deviation 13.4mm; nonsurgical mean 87.3mm, standard deviation 9.1mm; mean difference 11.1mm; $p=0.0105$).

Conclusion: The musculotendinous junction of the LHB in patients who underwent arthroscopic suprapectoral biceps tenodesis was located more distal than the contralateral control, as measured on MRI.

TR

Trichomonas Vaginalis Infection in a Tertiary Care Vaginitis Center

TR-10

Maria Keating

Co-Author(s): Paul Nyirjesy

Resident/Fellow (MD)

College of Medicine

Obstetrics & Gynecology

Trichomonas vaginalis infection (TVI) is one of the most common STDs in the United States. Considered a minor nuisance and often ignored, it can pose unique challenges. We sought to determine the features of TVI in a referral-based vaginitis center, focusing on diagnosis and treatment regimens for difficult cases.

We conducted a retrospective review of all patients with TVI, based on ICD-9 codes, seen at the Drexel Vaginitis Center between January 2008 and November 2013. Information collected on each study subject included demographics, symptoms, physical exam findings, diagnostic tests, and treatment regimens.

80 subjects were identified. Of those, 20 subjects presented with known TVI. Diagnosis was confirmed by saline microscopy in 45%, OSOM rapid test in 40%, and clinical history in the remaining 15%. Treatment regimens varied: 20% received single 2 g dosing of either metronidazole or tinidazole, 50% received high dose regimens, and 20% received therapy with vaginal paromomycin. The remaining 10% had nitroimidazole allergy and underwent desensitization. In the 60 newly diagnosed TVI cases, 35% were diagnosed by saline microscopy, 41.7% by OSOM rapid test, and 23.3% by PCR. Treatment regimens for these subjects, included single 2 g dosing in 88.3%, high dose regimen in 8.3%, and other formulations in the remaining 3.4%. Follow-up was available in 80% of subjects; all of whom were cured.

TVI in a tertiary clinic reflects either prior misdiagnosis or difficulties finding effective treatment.

TR

Application of Facial Proportion Indices and the Golden Ratio in Determining Attractiveness and Changes By Age in the Pediatric Population

TR-11

Fareed Cheema

Advisor(s): Nicholas M Bastidas, MD

Medical Student
College of Medicine

The “ideal” face in the pediatric population has not been determined—it can be useful when applied to facial reconstruction in this population. One method is to correlate standard facial proportions indices (FPI) with lay perception of attractiveness.

Photographs of 40 children were divided into four age groups: infant (0-1 years), early childhood (1-7 years), late childhood (7-14 years), and teenager groups (14-18 years). Facial proportion indices (FPI) were measured and photographs divided into “attractive” versus “average” groups. T-test and two-tailed ANOVA were used to compare FPIs between attractive versus average subjects and among age groups ($p < 0.05$). Correlation of subjects to the “Golden Ratio” (1.618:1) was determined using PhiMatrix.

There were no significant differences in FPIs between attractive and average subjects in the pediatric population as a whole. However, average teens had a larger face-width to lip-width ratio compared to attractive teens. Attractive young adults had greater facial-width asymmetry from facial edges to alae compared to average young adults. Irrespective of attractiveness, the following FPIs increased with age: face-height to face-width, face-height to philtrum, mouth-width to philtrum, alar-width to philtrum, nose-length to alar-width, and mouth-width to alar-width. The following FPIs decreased with age: forehead-height to nose-length, face-width to lip-width, and face-width to interocular-width.

The golden ratio correlated to the pediatric population as a whole in all 18 measurements. Increasing age correlated with improved approximation to golden ratio for the following: eyes to nostril::nostril to center of lips and top lip height::bottom lip height. In attractive subjects, top lip height::bottom lip height better matched the golden ratio than in average subjects.

FPIs and the “Golden Ratio” can thus be used in analysis of facial attractiveness and to assess trends by age within pediatric plastic surgery populations.

Design and Implementation of the Exo-Skin Soft Robotic Rehabilitation Exoskeleton

TR-12

Michael Koerner

Advisor(s): Genevieve Dion, Andrew Cohen, Jane Fedorczyk

Undergraduate Student

School of Biomedical Engineering, Science and Health Systems
Biomedical Engineering/ Biomedical Devices and Imaging

The hand is the most complicated mechanical unit of the human body. It is capable of tasks ranging from dexterous manipulation of objects to powerful grip strength. When the hand no longer functions properly, a person's ability to interact with their environment is severely impaired. Hand injuries, both neurologic and orthopedic, account for one fifth of most hospital emergency room visits and require over \$18 billion annually for rehabilitation just in the U.S. Patients that have sustained hand injuries as a result of trauma or disease spend on average 3-10 hours/week in a hand therapy clinic.

The use of wearable technology shows great potential to assist the hand specialist in improving range of motion, strength, and function without the need for direct care in the clinic. If the patient is able to use the device to assist with a home exercise program, the costs of care are reduced and patient outcomes are enhanced. Wearable hand augmentation technology also has potential to reduce recovery times as greater compliance may be achieved with the required exercise program.

We have developed a completely new wearable system that may enhance the recovery of function following hand injury. The Exo-Skin soft robotic exoskeleton is a tendon actuated device capable of exerting flexion and extension forces unique to each digit of the hand. The Exo-Skin's biomimetic structure is based on the kinematic function of the hand. This is made possible by using Shima Seiki Whole Garment machines knitting thermoplastic yarns to create the exoskeleton. Using data collected by the glove, a full kinematic model of the user's hand can be reconstructed in a computational space. This can be incorporated into a web-based patient-clinician link where both parties can monitor progress and the clinician can analyze outcomes. Initial lab testing indicates that the Exo-Skin glove may greatly improve therapeutic rehabilitation following traumatic hand injury.

The use of wearable technology shows great potential to assist the hand specialist in improving range of motion, strength, and function without the need for direct care in the clinic. If the patient is able to use the device to assist with a home exercise program, the costs of care are reduced and patient outcomes are enhanced. Wearable hand augmentation technology also has potential to reduce recovery times as greater compliance may be achieved with the required exercise program.

We have developed a completely new wearable system that may enhance the recovery of function following hand injury. The Exo-Skin soft robotic exoskeleton is a tendon actuated device capable of exerting flexion and extension forces unique to each digit of the hand. The Exo-Skin's biomimetic structure is based on the kinematic function of the hand. This is made possible by using Shima Seiki Whole Garment machines knitting thermoplastic yarns to create the exoskeleton. Using data collected by the glove, a full kinematic model of the user's hand can be reconstructed in a computational space. This can be incorporated into a web-based patient-clinician link where both parties can monitor progress and the clinician can analyze outcomes. Initial lab testing indicates that the Exo-Skin glove can greatly improve therapeutic rehabilitation following traumatic hand injury.

TR

Long-Term Virologic Outcomes Following Bariatric Surgery in HIV-Infected Patients

TR-13

Steven Zivich

Co-Author(s): Margaret A. Cauterucci, Sara Allen, Marion Vetter

Advisor(s): Christopher Vinnard

Resident/Fellow (MD)

College of Medicine

Family Medicine

The management of morbid obesity and its metabolic complications among HIV infected patients requires a multi-disciplinary approach, with surgical interventions as one option. We sought to assess the long-term durability of ART among HIV-infected patients undergoing bariatric procedures for the management of morbid obesity. We performed a single-center retrospective cohort study of HIV-infected patients who underwent bariatric surgery for the management of morbid obesity. We collected data from the electronic medical record regarding virologic, immunologic, and metabolic parameters. For our primary objective, we measured the effect of bariatric procedures on the proportion of undetectable HIV viral loads, and examined changes in metabolic parameters as secondary objectives. During the study period, 7 patients underwent a bariatric surgery procedure for the management of morbid obesity: 3 patients underwent sleeve gastrectomy, 2 patients underwent laparoscopic banding, and 2 patients underwent Roux-En-Y gastric bypass surgery. Overall, the proportion of undetectable HIV viral load levels did not change after the bariatric procedures. 59% of all HIV viral load measurements were undetectable prior to the procedure, compared with 63% of measurements following the procedure ($p=0.76$). There were no significant changes in CD4+ T cell counts pre and post-procedure ($p=0.35$). Two patients did require temporary cessation of medications due to procedure-related complications. There was no loss of virologic efficacy among morbidly obese HIV-infected patients following bariatric procedures. Prospective studies will be required to determine whether bariatric procedures lead to changes in the gastrointestinal absorption and oral bioavailability of HIV medications.

TR

Prostatic Carcinoma, Which Is Indolent?

TR-14

Yulan Gong

Co-Author(s): Fernando U. Garcia

Resident/Fellow (MD)

College of Medicine

Pathology

Background: Active surveillance (AS) is a treatment option for patients with Prostate Carcinoma (PCa). Gleason 6 PCa (low grade) can behave as two different diseases: one indolent, eligible for AS; the other aggressive. Previously, we showed that Gleason pattern 3 (G3) with lipofuscin could identify indolent PCa (low tumor volume and organ-confined disease) and had Cathepsin-D (C-D) expression (Garcia FU, 2006). We wanted to further delineate indolent PCa G3 expressing C-D from metastatic PCa using PTEN, ERG and p53.

Design: 54 G3 PCa from radical prostatectomies and 13 metastatic PCa were retrieved from IRB approved tissue bank. Tissue microarrays were constructed for primary PCa. 5 μ m sections were immunostained with C-D, p53, ERG, PTEN and Ki-67. Sudan Black/Nuclear Red (SB) stain was also performed to identify lipofuscin. C-D and SB were considered positive if >10% tumor cells were positive. p53 was scored as negative or positive. ERG in >5% tumor cells was scored as positive. PTEN was scored as positive when cytoplasmic staining was similar to an adjacent benign prostatic gland.

Results: 10/54 G3 PCa expressed C-D, lipofuscin and were negative for ERG; 6 (11.1%) were positive for C-D and PTEN and 4 (7.4%) were only positive for C-D. SB stain was concordant with C-D results, but difficult to read. All G3 PCa had low Ki-67 (mean 0.84% \pm 1.66) and negative p53. All metastatic PCa had high Ki-67 (mean 28.3% \pm 30.8) and 7/13 (53.9%) expressed p53. ERG was negative in all cases including 2 cases that were focal weak positive (<5%) with positive internal endothelial cells. 5/13 (38.5%) were positive for PTEN.

Conclusion: 1. G3 PCa expressing C-D are heterogeneous with regard to PTEN expression. 2. C-D expression can be used in combination with ERG and PTEN to identify indolent PCa for selecting patients for AS. 3. ERG protein expression is significantly lower in distant metastatic PCa compared to primary PCa, while p53 expression is the opposite.

TR

Cystatin C as a marker of renal function in the Hypertensive and the Diabetic

TR-15

Adeola Tomi-Olugbodi

Co-Author(s): Dr. AA Olugbodi, Dr. OO Oladipo, Dr. B Seamonds

Advisor(s): Dr. Bette Seamonds

Resident/Fellow (MD)

College of Medicine

Pathology

Serum creatinine/creatinine clearance despite all its well-known limitations has been the analyte of choice in the assessment of renal function. The possibility of Cystatin C to be a preferred marker of the glomerular filtration rate over to the widely used serum creatinine has been suggested. The aim of this study was to compare the accuracy of Cystatin C with that of serum creatinine in the assessment of the glomerular filtration rate in patients with hypertension and diabetes.

Twenty hypertensives and twenty diabetics were compared with forty age-matched healthy controls. Serum Cystatin C and serum creatinine were estimated in all study subjects and compared with the actual glomerular filtration rate as estimated by the Cockcroft and Gault's algorithm. The strength of significance of correlation was assessed using Pearson correlation (a value of < 0.05 was accepted as significant).

The serum Cystatin C correlated well with serum creatinine ($R = 0.757$, $p < 0.01$) and with the estimated GFR ($R = -0.733$ and -0.710 respectively; $p < 0.01$). However, in the receiver operating characteristics (ROC) analysis, the area under the curve (AUC) of serum Cystatin C (0.727) was found to be superior to that of plasma creatinine (0.539).

Serum Cystatin C and serum creatinine were well correlated in evaluating glomerular filtration rate in hypertensive and diabetic patients. However, serum Cystatin C was more closely correlated with the glomerular filtration rate and may therefore be a more accurate test of renal function in hypertensive and diabetic patients.

Comparison Study of Glaucoma Eye Care Follow-Up Adherence in a High Risk Population and vision-related Quality of Life

TR-16

Paul Gentile

Co-Author(s): Lisa Hark

Advisor(s): Anneclaire De Roos

Graduate Student

School of Public Health

Quality of Life (QoL) is a very important factor for individuals diagnosed with some form of glaucoma. Prior research has explored and examined factors that are related to QoL in this specific population. This study was proposed to identify factors related to QoL among a high-risk group of patients with a variety of different glaucoma-related diagnoses. The Wills Eye Hospital has conducted a study entitled, Comparison Study of Glaucoma Eye Care Follow-up Adherence in a High-Risk Population, which has been recently extended to explore vision-related QoL. The study uses healthcare services with assistance of a patient navigator to improve knowledge, awareness, and follow-up adherence among patients diagnosed with glaucoma. The extension of this study will assess relationships between visual QoL and glaucoma. The overall goal is to investigate differences in QoL between patients with different diagnoses related to glaucoma. As a secondary goal, we wish to investigate how baseline assessment of QoL, demographics, and type of glaucoma might together provide useful information on whether or not future patients might benefit from additional services such as a patient navigator or social worker to address their overall QoL.

As of November 18, 2014, a total of 279 patients were enrolled in the study from previous community sites that were used during the previous CDC-funded project titled: Improving Access to Eye Care among High-Risk Persons for Glaucoma in Philadelphia. Patients have completed a series of questionnaires developed to assess QoL, including: the National Eye Institute (NEI) Vision Function Questionnaire (VFQ-25), the Geriatric Depression Scale-15 (GDS-15) and the research participation questionnaire (RPQ). Reviews of patient QoL scores were compared to subscale scores from both the NEI-VFQ-25 and the GDS-15. The findings from the scales of measurement in this study emphasize the need continue early detection of glaucoma in order to maintain a high QoL.

Resting State Functional Connectivity of the Hippocampus in the Context of Emotional and Neutral Stimuli

TR-17

Kellie McWilliams

Co-Author(s): Dr. Michael J. Williams, Dr. Karol Osipowicz

Advisor(s): Dr. Karol Osipowicz

Graduate Student

College of Arts and Sciences

Psychology

The objective of this study was to investigate the whole brain functional connectivity of the hippocampal formation in the context of emotional and neutral stimuli. Twenty neurologically healthy adults between the ages of 18 and 25 underwent scanning. A seed based correlation approach was used to examine whole brain resting state functional connectivity patterns of the hippocampi. For each participant, Pearson correlation coefficients between the average time series of each seed region and that of each individual voxel were computed. A voxel-wise random effect one-sample t test was used to identify brain regions that showed significant correlations with the seed regions. Multiple comparisons were corrected for using family wise error with a threshold of $p < .05$. We observed hippocampal resting state functional connectivity with several brain regions involved in the processing and regulation of emotionally salient events including the amygdala, regions of the default mode network and the medio-dorsal attentional network. Additionally, we observe decreases in connectivity are associated with poorer memory performance. We interpret our findings as supporting functional connectivity differences between emotional and neutral stimuli.

TR

Evaluation of the Effectiveness of the Nutrition Education Program at EAT.RIGHT.NOW

TR-18

Allison Smith, Jaclyn Conley, Viktoryia Kuzmitskaya

Advisor(s): Judith Ensslin, MS, RDN, LDN, Ann Marsteller, MBA, MS, RDN, LDN

Undergraduate Student

College of Nursing and Health Professions
Nutrition Sciences

Many research studies have shown that nutrition education has significantly improved nutrition knowledge and behaviors in elementary and middle school students. There are minimal nutrition education lessons that have been evaluated which target high school students. Eat.Right.Now. (ERN) is a nutrition education program for elementary, middle, and high school students who are eligible to receive Supplemental Nutrition Assistance Program (SNAP) benefits. This program is funded by the Pennsylvania (PA) Department of Human Services (DHS) through PA Nutrition Education Tracks, a part of USDA's SNAP. ERN educators as part of the Nutrition Sciences Department at Drexel University provide nutrition lessons and demonstrations to students attending SNAP-eligible schools in The School District of Philadelphia.

The objective of this research was to evaluate the effectiveness of nutrition education to improve nutrition knowledge, attitudes, and behaviors in high school students after receiving a series of lessons from the Drexel University ERN High School Curriculum, administered by the ERN staff. The evaluation consists of a pre-intervention survey, the five lesson series and a post-intervention survey. Eight schools, with a minimum of fifty students in each school, participated in the 2014-2015 school year education lessons. The pre-intervention surveys were administered at the beginning of the school year in October. A series of five education lessons were then given to the students the next two to three months. The post-survey was administered at the completion of the series. The results of these surveys were reviewed to indicate significant changes. The major findings of the surveys indicated that the students ate more vegetables and drank more 100% fruit juice overall. These findings prove that through the implementation of nutrition education lessons, the knowledge and behaviors of high school students has improved, as was hypothesized.

TR

Self-management strategies for monitoring fluid intake in heart failure patients: a literature review

TR-19

Zachary Hathaway

Co-Author(s): Rose Ann DiMaria-Ghalili

Advisor(s): Rose Ann DiMaria-Ghalili

Undergraduate Student

College of Nursing and Health Professions

Nursing 5-Year Coop

Background: Heart failure (HF) is the fastest growing cardiovascular disorder in the United States with 5.1 million people affected. Since HF is a chronic condition, patients need to perform self-care strategies on a daily basis related to medication management, fluid and dietary restrictions, exercise, and symptom recognition. Many HF patients are placed on a fluid restriction and need to monitor fluid intake daily. The purpose of this review was to explore current research examining self-management and fluid intake in HF.

Methods: Searches were conducted on two electronic databases: PubMed and CINAHL. To be considered, articles had to be published in English, after 2000 and the abstract had to include either of these terms in the text, “self-management heart failure” or “fluid restriction heart failure.” Of the 1,639 articles generated from self-management heart failure, 39 were selected for review and of the 164 articles generated for fluid restriction heart failure, 7 articles were selected.

Results: In HF patients, effective self-management strategies can lead to a reduction in hospital readmission, improved quality of life, and reduced severity of symptoms. Despite these benefits, standardized patient education regarding self-management strategies is lacking. Several studies found HF patients report difficulty in adhering to self-management practices, including monitoring fluid intake. Also, many HF patients following a fluid restriction complain of thirst.

Discussion: It is difficult to discern whether a patient is following their fluid restriction because much of the data collected regarding fluid intake is patient self-reported and subject to error. Of the trials conducted on fluid restriction, few provide evidence of the measurement tool used and many lack validation of their findings. Further research is needed to develop a valid and reliable approach to monitoring fluid intake.

Dynamometer Elbow Strength and Endurance Testing After Distal Biceps Reconstruction with Allograft

TR-20

William Ryan

Co-Author(s): Laith M Jazrawi, Eric J Strauss, Robert J Meislin, Nimrod Snir, Alan McGee, Maxwell Weinberg

Advisor(s): Laith Jazrawi

Medical Student

College of Medicine

The purpose of the current study is to investigate the functional strength outcomes of late distal biceps reconstruction using allograft tissue. Patients who underwent distal biceps reconstruction with allograft tissue between May 2007 and May 2013 were identified. Charts were retrospectively reviewed for post-operative complications, gross flexion and supination strength, and range of motion (ROM). Isokinetic strength and endurance in elbow flexion and forearm supination were measured in both arms. Tests were conducted using a dynamometer at 60° per second for isokinetic strength and 240° per second for endurance. Isometric strength testing was also measured for elbow flexion and forearm supination. Paired t tests were used for statistical analysis. Ten patients with a mean age of 48 years were included in the study. Distal biceps reconstruction was performed using an Achilles tendon allograft in 9 patients and a combination of tibialis anterior allograft and gracilis allograft in 1 patient. Of the reconstructions, 50% involved the dominant arm. Full ROM was observed in all patients at the time of their final follow up assessment. The mean follow-up for dynamometer strength testing was 34 months (13-81 months). No statistical differences were noted between data obtained from operative and contralateral extremities. The average peak torque of the operative limb (38.5 ± 5.9 Nm) was 91.7% of that of the contralateral limb (41.8 ± 4.9 Nm) in flexion and 93.4% (operative, 5.7 ± 1.3 Nm; contralateral, 6.1 ± 1.0 Nm) in supination. No significant differences were found in fatigue index between operative or contralateral limbs for flexion (operative, $34.1 \pm 17.1\%$; contralateral, $30.8 \pm 17.1\%$; $p = 0.29$) or supination (operative, $38.2 \pm 16.5\%$; contralateral, $42.1 \pm 11.9\%$; $p = 0.65$). The only complication observed was a transient PIN palsy which resolved by 3 months post-operatively. Dynamometer testing shows near normal return of strength and endurance of elbow flexion and supination.

TR

Myeloproliferative Neoplasms: Treatment Approach and Outcomes; The Drexel University Experience

TR-21

Sukhdeep Kaur

Co-Author(s): Courtney Ackerman, MD, Hareesha Chakunta

Advisor(s): Michael Styler, MD

Resident/Fellow (MD)

College of Medicine

Hematology/Oncology and Internal Medicine

Myeloproliferative neoplasms are a group of clonal disorders that arise from a transformation in a hematopoietic stem cell. We analyzed the outcomes of patients treated in the practice of I. Brodsky Associates diagnosed with ET, PCV and PMF, who received a variety of treatments, and compared their clinical courses to determine if there is a superior treatment.

This is a retrospective cohort study in which we examined the medical records of patients treated for the diagnoses of ET, PCV and PMF from January 1960 to December 2013. The treatment categories analyzed were: Busulfan Only, Hydroxyurea Only, Aspirin only, Busulfan with Hydroxyurea, and Phlebotomy Alone.

119 patient charts were reviewed and categorized based on treatment. 24 patients were given aspirin alone, eleven received aspirin and phlebotomy, and one patient received interferon with aspirin. 34 patients were given Busulfan with an average dose of 321mg during the course of the disease. 26 patients were given hydroxyurea, with two patients receiving hydroxyurea with anagrelide and five receiving hydroxyurea and phlebotomy. 24 patients were given busulfan and hydroxyurea together during their course of treatment, with one patient receiving interferon, busulfan and hydroxyurea.

Myeloproliferative neoplasms have been treated in much the same way for many years. Our study set out to discover if the uncommon practice of treating with Busulfan correlated with improved survival and less treatment toxicity. Busulfan and hydroxyurea given together proved to have the lowest rate of progression to leukemia or myelofibrosis when compared to other standard therapies. The median survival of patients treated with both busulfan and hydroxyurea was 17 years. Patients treated with hydroxyurea and intermittent busulfan, were shown to have the best long-term outcomes. This suggests that physicians should include the use of busulfan in treating myeloproliferative neoplasms.

DNA isolation for performance at point-of-care using a smartphone enabled real-time polymerase chain reaction (RT-PCR)

TR-22

Chris Cox

Co-Author(s): Sandra Wolf, MD, Sarah E. Foster, MD, Maria Chacon-Heszele, PhD, Jesse vanWestrienen, PhD, Jessa Tunacao, BS

Advisor(s): Sandra Wolf, MD, Sarah E. Foster, MD, Maria Chacon-Heszele, PhD

Undergraduate Student

School of Biomedical Engineering, Science and Health Systems

Nucleic acid amplification testing (NAAT) is standard for the diagnosis of sexually transmitted infections (STIs), such as *Chlamydia trachomatis* (Ct), *Neisseria gonorrhoeae* (Ng), and *Trichomonas vaginalis* (Tv). However, NAAT is time and labor intensive which delays diagnosis. These curable diseases have serious health consequences; therefore, point-of-care (POC) diagnosis is invaluable. The objective of this study was to compare Biomeme's innovative rapid DNA isolation method with commercial sample prep for use with RT-PCR.

Patients undergoing urine STI screening at Drexel Women's Care Center were offered participation in the IRB approved study. Over 9 months 900+ samples were collected. DNA was purified using Qiagen's DNeasy kit (QSP) and Biomeme's fast, syringed-based DNA isolation kit (BSP). Both methods were compared by analyzing the resultant purified DNA and RT-PCR experiments in the detection of Ct/Ng/Tv. A human gene was used as an internal positive control (IPC).

Disease prevalences were Ct 8.03% and 7.48%; Tv 10.45% and 10.56%; and Ng 0.44% and 0.77% with QSP and BSP, respectively. With QSP, the IPC was detected in 91% of samples; whereas it was detectable in nearly 99% of BSP samples. Sample preparation was significantly more time intensive with QSP vs. BSP, on average, 2 hours vs. 4 minutes, respectively.

An ideal POC test is affordable, accurate, user-friendly, robust, mobile and deliverable. Our results indicate that under the conditions tested, Biomeme's DNA purification method is comparable - if not better - at efficiently detecting STIs in urine samples by RT-PCR. Biomeme's DNA purification method does not require specialized lab equipment and can be used in tandem with Biomeme's smartphone based thermocycler at POC. Subsequently, facilitating diagnosis, treatment and counseling for this high risk population in one timely visit.

In vivo Characterization of a Novel Dopamine D3 Receptor Agonist to Treat Motor Symptoms of Parkinson's Disease

TR-23

Daniel Huettner

Co-Author(s): Sherise Simms

Advisor(s): Sandhya Kortagere

Medical Student

College of Medicine

Synthetic dopaminergic agents have found utility in treating neurological and neuropsychiatric disorders since the beginning of 19th century. The discovery of Levodopa (L-dopa) to effectively treat motor symptoms of Parkinson's disease (PD) revolutionized the therapy and remains a gold standard for treating PD. However, long term L-dopa therapy leads to plasticity and development of abnormal involuntary movements (AIMs) that are collectively called dyskinesias. In response to these severe side effects, a range of dopaminergic agents from partial agonists to antagonists have been tried either as L-dopa replacement agents or as adjuvants with L-dopa therapy with limited success. Recent studies in rodents, non-human primates, and post mortem studies on PD patients have implicated that dopamine D3 receptors may play a role in the etiology of both the motor symptoms and L-dopa induced dyskinesias. We have recently developed SK609, a selective dopamine D3 receptor agonist with atypical signaling properties. In this study, we further characterized this novel small molecule using the unilateral lesioned rodent model of PD. In forepaw stepping test paradigm, SK609 significantly improved the performance of the impaired paw and also normalized the bilateral asymmetry associated with the hemiparkinson rat. In addition, a chronic treatment of SK609 did not induce any AIMs and when used as an adjuvant with L-dopa, it significantly reduced L-dopa induced AIMs. Furthermore, an optimal dose combination of SK609 with L-dopa was determined by dose dependent titrations of both SK609 and L-dopa that produced minimal AIMs and maximized the effect on improving motor symptoms.

TR

Botulinum Toxin A Injections into Pelvic Floor Muscles Under Electromyographic Guidance for Women with Refractory High Tone Pelvic Floor Dysfunction

TR-24

Darlene Morrissey

Co-Author(s): Natasha Ginzburg, Dominique El-Khawand, Salim Wehbe, Peter O'Hare III, Kristene Whitmore

Advisor(s): Kristene Whitmore, MD

Resident/Fellow (MD)

College of Medicine

Female Pelvic Medicine and Reconstructive Surgery

High tone pelvic floor dysfunction (HTPFD) is a debilitating chronic pain disorder for many women with significant impact on their quality of life (QOL). Our objective is to determine the efficacy of electromyography (EMG) guided botulinum toxin A (BTA) injections in treating pelvic pain and improving QOL.

This is a prospective pilot open label study of women with chronic pelvic pain and HTPFD who have failed conventional therapy between January 2011 and August 2013. Botox A (BTA) injections (up to 300 units) were done using needle EMG guidance to localize spastic pelvic floor muscles (PFM). Data was collected at baseline, 4, 8, 12, and 24 weeks after injections.

Out of 28 women who enrolled in the study, 21 completed the 6 months follow up and qualified for analysis. Overall, 61.9 % of subjects reported improvement on Global Response Assessment at 4 weeks, and 80.9% at 8, 12, and 24 weeks post injection, compared to baseline. Of the subjects who were sexually active at baseline, 58.8% (10/17), 68.8% (11/16), 80% (12/15), and 83.3% (15/18) reported less dyspareunia at 4, 8, 12, and 24 weeks, respectively. Dyspareunia VAS significantly improved at weeks 12 (5.6, $p=0.011$) and 24 (5.4, $p=0.004$) compared to baseline (7.8). Sexual dysfunction as measured by the Female Sexual Distress Scale (FSDS) significantly improved at 8 weeks (27.6, $p=0.005$), 12 weeks (27.9, $p=0.006$), and 24 weeks (22.6, $p<0.001$) compared to baseline (34.5). Short Form 12 (SF-12) showed improved QOL in the physical composite score at all post injections visits (42.9, 44, 43.1, and 45.5 vs 40 at baseline; $p<0.05$), and in the mental composite score at both 12 and 24 weeks (44.3 and 47.8, vs 38.5, $p=0.012$). Vaginal manometry demonstrated significant decrease in resting pressures and in maximum contraction pressures at all follow-up visits ($p<0.05$). Digital assessment of PFM showed decreased tenderness on all visits ($p<0.001$) compared to baseline.

TR

The Effect of Multiple Sclerosis (MS) on Sleep

TR-25

Priyanka Nair

Co-Author(s): Ann-Marie Raphail, Dr. Maria Schultheis

Advisor(s): Dr. Maria Schultheis

Undergraduate Student

College of Arts and Sciences

Psychology

Research has demonstrated that multiple sclerosis (MS) is a neurodegenerative disease that can impact a variety of physical and cognitive abilities. One area that has not been closely examined is impact on an individual's sleeping patterns and behaviors. To study whether there is a relationship between MS and sleep, the Pittsburgh Sleep Quality Index was administered to individuals with MS and a healthy control group to measure their self-reported quality of sleep, the number of hours that they slept, and whether they used medicine to help them sleep over the past month. The results indicated there was a significant difference between the MS group and the healthy control group in the self-reported quality of sleep, $t(68.71) = 2.74$, $p < 0.01$, as well as in whether they take medication to help them go to sleep, $t(61.64) = 3.35$, $p < 0.01$. The MS participants reported having worse quality of sleep and they also reported taking more sleep medication as compared to the healthy participants. However, there was no significant difference in the number of hours of sleep reported between MS and healthy participants, $t(69.93) = .78$, $p = .44$. This data may suggest that although individuals with MS get the same amount of sleep as their healthy counterparts, their sleep quality may still be worse and they may be more likely to take medication to help them reach the same number of hours of sleep. Overall, the findings suggest that MS may have a negative impact on sleep, which is a concern given that sleep is an important daily activity that can greatly effect functioning throughout the rest of the day.

TR

Comparison of two conditioning regimens for hematopoietic stem cell transplant in patients with multiple myeloma

TR-26

David Cho

Co-Author(s): Michael Styer, MD, Marc Kim, MD, Parshva Rajnikant Patel, Leyland Robinson

Resident/Fellow (MD)

College of Medicine
Hematology/Oncology

Multiple Myeloma is a plasma cell malignancy that is considered incurable. However, survival has improved dramatically with drugs such as thalidomide, bortezomib and lenalidomide and the use of autologous stem cell transplantation (ASCT). At Drexel University, a significant number of patients with multiple myeloma were treated with autologous stem cell transplantation. ASCT allows the administration of high doses of myeloablative chemotherapy to kill tumor cells and rescue the patients' bone marrow reserve with their own stem cells. Our myeloma patients received one of two conditioning regimens: busulfan/cyclophosphamide or melphalan. In our study, we compared the outcomes of patients receiving these two regimens, specifically the survival of patients and toxicities from each regimen.

This is a retrospective cohort study in which we examined the medical records of 106 patients treated with ASCT for multiple myeloma at Drexel University College Medicine in the practice of I. Brodsky Associates from 1990 to 2008. The data was collected retrospectively from paper and electronic charts and then categorized based on type of conditioning regimen. Data was analyzed using Statistical Analysis Software and the number of observations, percentages, means, standard deviation, were obtained for all measurements.

Age, sex, and demographics were compared. Median time to death for the melphalan and BuCy group were 971 and 752 days, respectively. Time to relapse was also compared. Mucositis was increased in the BuCy group versus the Melphalan group (45 to 31%). Veno-occlusive disease, infection, hemorrhagic cystitis; peak Cr, peak liver enzymes, and cytopenias were similar between the two groups.

Based on this retrospective study, median survival is increased with the melphalan group while toxicities were similar between the two groups. Melphalan is the current standard myeloablative chemotherapy and is supported by this retrospective study.

Comparison of Water and Air-Charged Transducer Catheters in the Evaluation of Cystometrogram Pressures

TR-27

Nima Shah

Co-Author(s): Timothy McKinney, Elizabeth Babin, Kristene Whitmore, Natasha Ginzburg, Darlene Morrissey

Resident/Fellow (MD)

College of Medicine

OB/GYN

Introduction: Air-charged (AC) and water-perfused (WP) catheters have been evaluated for differences in measuring pressures for voiding dysfunction. We believe that a single, dual catheter, and the same experience clinician throughout the study will provide analogous point pressures for coughs and valsalva movements in both AC and WP catheters when analyzed during cystometrogram (CMG). **Objective:** The primary objective is to demonstrate the reproducibility of AC versus WP catheters when measuring stress point pressures, such as coughs and valsalva movements, in urodynamic studies (UDS). **Methods:** This IRB approved prospective study included women above the age of 21 with complaints of lower urinary tract symptoms who required UDS. A commercially available AC catheter was utilized to form a dual catheter to simultaneously read water and air pressures within the bladder and urethra. A transducer evaluates water pressure and sends electrical signals to a urodynamics machine. The water-filling channel serves both as a bladder filler and water pressure sensor. The patient is evaluated with an empty bladder on CMG, followed by cough and valsalva maneuvers at bladder volumes of 50 mL, 200 mL, and functional maximum capacity. A comparative analysis was performed on the maximum stress peak pressures for valsalva movements and coughs. **Results:** Forty women with a mean age of 57 years were recruited. Significant correlations were observed between AC and WP pressures. Trendline equations comparing AC and WP measurements over distinct bladder fill regions for cough and valsalva showed a high correlation (average $R^2=0.91$). We did note an average bias (4.7 cmH₂O for coughs and 4.1 cmH₂O for valsalva) throughout the measurements. Visual impression of the two overlying measurement methods shows virtually identical tracings. **Conclusions:** Cystometric pressures measured using air-charged catheters are comparable with water-filled catheters and clinically can be equally beneficial.

TR

Body Weight Supported Treadmill Training and Cerebral Palsy: A Literature Review

TR-28

Nahida Sultana

Co-Author(s): Masaru Teramoto

Advisor(s): Masaru Teramoto

Undergraduate Student

College of Nursing and Health Professions

Health Sciences

Cerebral palsy (CP) is a congenital disorder with unknown causes that affects the movement or muscle tone of children. Currently researchers are investigating to improve the locomotion of CP patients via body weight supported treadmill training (BWSTT) in which the upper extremity of the patients are supported while patients are running on the treadmill. The Center for Disease Control and Prevention estimates that an average of 1 in 303 children in the U.S suffer from cerebral palsy. Cerebral palsy is known to be the most common motor disability disease in children. This literature review takes into consideration 10 articles done by various researchers and examines the relationship between BWSTT and improvement in locomotion of CP adolescents. Common tests used to obtain data from the trials were Gross Motor Function Measure (GMFM) and Pediatric Evaluation of Disability Inventory (PEDI). The GMFM are a series of dimensions (i.e. rolling, crawling, etc.) that are measured to portray the improvement if any at all from therapies. The PEDI is a measurement tool that helps to evaluate the locomotion with score forms and manual that is easily comprehensible. The trials reviewed had very similar results with the data portraying that BWSTT helps to improve locomotion in children. None of the studies reported any complications by the participants and neither did the disorder get worse. Although, CP does not get worse over time it is beneficial to help CP patients earlier in the years after diagnostics for long-term effects in later years. Due to the studies lacking a sufficient group of participants, the trials cannot be taken into consideration for long-term effects. Future studies should be conducted to include more numbers of participants and to examine the longitudinal effects on locomotion in patients with CP.

TR

Treatment Options in an Adult with Extensive Deep Vein Thrombosis

TR-29

Penn Tong

Co-Author(s): Mitch Storace

Advisor(s): Alex Trebelev

Resident/Fellow (MD)

College of Medicine

Radiology

Deep vein thrombosis (DVT) is the occlusion of venous vasculature, usually resulting in swelling and pain of the affected limb. Prolonged bed rest, surgery, pregnancy, birth control, genetic blood disorder, obesity, smoking, and cancer are a few of the common risk factors for a DVT. This is a serious condition because of the possibility that the thrombus will dislodge and find its way into the pulmonary arteries resulting in a pulmonary embolism. In this case report a 32 year old male with an unknown coagulopathic disorder presents with an acute onset of left lower extremity edema. He was found to have an acute extensive DVTs in his left deep veins and external iliac veins, along with chronic DVTs in his inferior vena cava (IVC) and right common iliac vein. The standard treatment for uncomplicated DVTs is anticoagulation for at least 3 months, however in a more complicated patient/scenario, further therapy options are required. Endovascular procedures become vital in this situation and requires a surgical specialty such as Interventional Radiology (IR). In this particular case, a complex combination of chemical and mechanical thrombectomy were utilized to treat this complicated patient.

TR

Enabling Wheelchair Mobility for Individuals with Impaired Dexterity: A 3D Printing Manufacturing Process to Produce Customized Joysticks

TR-30

Jacqueline Gerhart

Co-Author(s): Claudia Gutierrez, Meaghan Paulosky, Dan Resnic

Advisor(s): Dr. Fred Allen

Undergraduate Student

School of Biomedical Engineering, Science and Health Systems

BME Senior Design

In the United States, over one million people suffer from neurological disorders. These debilitating disorders severely limit muscle strength, compromising independent living. Although power wheelchairs can restore mobility, these patients have difficulty maneuvering standard power wheelchair joysticks due to their reduced hand dexterity. Further, replacement of joysticks is expensive as the price starts at \$40 and require frequent replacement due to loss or damage. In partnership with Inglis House, a residential home for individuals with neurological disorders, a manufacturing process has been designed to enable the occupational therapists (OT) to 3D print customizable joysticks in-house. Our novel joystick design encourages the functional hand position, a clinically established safe hand position, and relieves the thenar muscles and median nerve, thus minimizing pain in the hand and arm. Manufacturing of a customized joystick comprises 1) a consultation phase to quantify a patient's hand dexterity and safely collect anthropometric data of the hand, 2) a computer-aided design generation phase in which the OT inputs the patient's anthropometric data into our graphical user interface tool that calculates joystick dimensions that are customized to the patient's hand, 3) a delivery phase in which the joystick is 3D printed and tested by the patient via a clinical Wheelchair Skills Test. This manufacturing process, currently in testing at Inglis House, is completed in less than twelve hours with a production cost of \$1 per joystick.

TR

COMPUTATION & BIO MODELING

Prokaryotic nucleotide composition is shaped by both phylogeny and the environment

CB-01

Erin Reichenberger

Co-Author(s): Ruth Hershberg, Gail Rosen

Advisor(s): Uri Hershberg

Graduate Student

School of Biomedical Engineering, Science and Health Systems
Bioinformatics/Computational Biology

The causes of the great variation in nucleotide composition of prokaryotic genomes have long been disputed. Here we use extensive metagenomic and whole-genome data to demonstrate that both phylogeny and the environment shape prokaryotic nucleotide content. We show that across environments, various phyla are characterized by different mean GC values as well as by the extent of variation on that mean value. At the same time, we show that GC-content varies greatly as a function of environment, in a manner that cannot be entirely explained by disparities in phylogenetic composition. We find environmentally driven differences in nucleotide content not only between highly diverged environments (e.g. soil, vs. aquatic vs. human gut), but also within a single type of environment. More specifically, we demonstrate that some human guts are associated with a microbiome that is consistently more GC-rich across phyla, while others are associated with a more AT-rich microbiome. These differences appear to be driven both by variations in phylogenetic composition and by environmental differences -- which are independent of these phylogenetic composition differences. Combined, our results demonstrate that both phylogeny and the environment significantly affect nucleotide composition and that the environmental differences affecting nucleotide composition are far subtler than previously appreciated.

A Computational Study of Amyloid β -Protein Assembly in Crowded Environments

CB-02

Matthew Voelker

Co-Author(s): Mark Betnel

Advisor(s): Brigita Urbanc

Graduate Student

College of Arts and Sciences

Physics

Alzheimer's disease is strongly associated with aberrant amyloid β -protein ($A\beta$) assembly into heterogeneous, metastable oligomeric assemblies with structures that have not been experimentally characterized yet. The 40 and 42 amino acids long $A\beta_{40}$ and $A\beta_{42}$ are the two predominant $A\beta$ alloforms in the brain. Whereas $A\beta_{40}$ and $A\beta_{42}$ oligomer formation from monomeric state is still inaccessible to fully atomistic explicit-solvent molecular dynamics, $A\beta_{40}$ and $A\beta_{42}$ oligomers were structurally characterized using discrete molecular dynamics (DMD) and an intermediate-resolution protein model within the DMD4BHYDRA implicit solvent force field, and the corresponding oligomer size distributions well matched the available in vitro data. In vivo, however, $A\beta$ coexists with other biomolecules in a rather crowded environment. To understand the effect of crowding on $A\beta$ oligomer formation, we used the DMD4B-HYDRA force field and added to an ensemble of 32 monomeric $A\beta_{40}$ or $A\beta_{42}$ peptides inert spherical "crowders" with a diameter of 0.5 nm at a peptide:crowder ratio of 1:100 to examine their effect on $A\beta_{40}$ and $A\beta_{42}$ oligomerization pathways. Our results show that crowding shifts oligomer size distributions towards smaller oligomer sizes and increases solubility of both peptides. The effect is stronger for $A\beta_{42}$, where crowding abolishes the multimodal character of the oligomer size distribution. Our structural analysis revealed that the stability of larger oligomers is compromised by effective osmotic pressure exerted by the crowders, resulting in an increased rate of assembly breakage. While in vivo crowding agents are not inert as the crowders in our study, we here reveal that crowding induced osmotic pressure strongly affects protein assembly dynamics, which is of significance to the disease.

CB

Mathematical Model of Macrophage Polarization in Wound Healing

CB-03

Tony Yu

Co-Author(s): Sina Nassiri

Advisor(s): Kara Spiller

Graduate Student

School of Biomedical Engineering, Science and Health Systems

Biomedical Engineering

Macrophages play an essential role in regulating the wound healing process. Understanding and modulating the macrophage dynamics could potentially aid in the design of new treatments for dysfunctional wound healing. Therefore, a mathematical model was developed to describe the dynamics of pro-inflammatory M1 and anti-inflammatory M2 macrophages in wound healing. The system of equations that describes the macrophage populations takes into consideration the polarization, transition, proliferation, and death rates of each macrophage phenotype. The parameters and rate constants were calculated based on experiments in which primary human monocyte-derived macrophages were cultured over 11 days in vitro under conditions that polarized them to the M1, M2, or sequential M1-to-M2 phenotypes. Macrophages were characterized over time for cell viability and the expression of CCR7 (M1 marker) and CD206 (M2 marker) via flow cytometry. The model accurately described the macrophage behavior in normal wound healing over time, which typically starts with an inflammatory response or a peak in the M1 macrophages, followed by the pro-healing response or the accumulation of the M2 macrophages. This model also described chronic wounds when the M1-to-M2 transition term was deleted, which has previously been posited to play a central role in the impairment of healing. Finally, the model accurately predicted the effects of various wound healing treatments, including the administration of anti-inflammatory drugs and infusion of M2 macrophages in chronic wounds. Thus, this model is useful for increasing understanding of the dynamic role of macrophage phenotype in wound healing.

CB

Reevaluating the dependence of bursting properties on potassium concentration: a mathematical modeling study

CB-04

Bartholomew Bacak

Co-Author(s): Yaroslav Molkov

Advisor(s): Ilya Rybak

Graduate Student

School of Biomedical Engineering, Science and Health Systems

Many neurons, or populations of neurons, in the brain are capable of producing rhythmic bursting activity. This ability is putatively responsible for rhythmogenic functions like breathing and locomotion. In vivo, rhythms are generated by synaptically interconnected neuronal networks, whereas rhythmic bursting behavior is often induced in vitro by elevating the extracellular potassium concentration (K_o). It is known that increasing K_o raises the reversal potentials of potassium and leak currents. However, the complete nature of how these effects underlie bursting activity has yet to be uncovered. A mathematical modeling study was performed to elucidate the interplay between these factors and their roles in a neuron's transition from quiescence to rhythmic bursting. A conductance-based model of a neuron from the pre-Bötzinger Complex (pre-BötC) was used as a basis. A potassium ion component was incorporated into the leak current, and model behaviors were investigated at varying concentrations of K_o , taking into account its effect on delayed rectifier potassium current responsible for after-spike hyperpolarization. Model parameters were constrained to match previous experimental findings. The results generated by our model indicate that: (i) in vitro bursting behavior with elevated K_o may occur due to attenuation of the delayed rectifier potassium current and (ii) no oscillations are generated at physiological levels of extracellular potassium.

CB

Climate Change, Air Quality and Urban Health in China

CB-05

Xuan Yang

Co-Author(s): Hui Liu, Jess Dow, Haoyang Guo, Feng Jia, Longjian Liu, Arthur Frank, Charles Nathan Haas

Advisor(s): Longjian Liu, Arthur Frank, Charles Nathan Haas

Graduate Student

School of Public Health

Department of Epidemiology and Biostatistics

Background: As the largest developing country in the world, China is undergoing rapid expansion of urbanization and industrialization. Outdoor air pollution has become one of the top environmental concerns in China. Apart from the emission of air pollutants, changes in climate may also affect air quality.

Objective: The study aimed to evaluate the impacts of the changes in climate and social environmental factors on air quality, and associations between air quality index and health outcome using data from multi-cities and regions across the mainland China in years of 2012 to 2013.

Methods: We applied panel data analysis, with adjustment for time-varying related factors and location-specific factors, to estimate associations between weekly Air Pollution Index (API) and meteorological factors for 120 cities in China. Multivariate linear regression was used to examine associations between annual mortality rates and API across 8 economic regions, adjusting for meteorological and city-level demographic factors.

Results: The annual average value of API in 2013 was significantly higher than that in 2012 (75.99 vs. 65.05, $p < 0.0001$). Southern coastal region of China had the lowest annual average API (46.00 +/- 18.93 in 2012 and 49.94 +/- 21.49 in 2013). In both 2012 and 2013, API decreased from Jan to July, and then increased from July to December. Panel data analysis showed that API was negatively associated with heat index (estimated by temperature and relative humidity), and precipitation. This association remained significant after adjustment for sunshine hours and pressure. As API increased by 10 points, the average all-cause mortality rate would increase by 0.74%.

Discussion and Conclusion: Significant variation in API across 120 cities of China was observed. This variation was affected by meteorological indicators. Heat index and precipitation were significantly and negatively associated with air pollution. API is positively associated with all-cause mortality.

Minimal Pathway Enumeration to Predict Gene Knockout Effects in Microbial Pathways

CB-06

Steven Pastor

Co-Author(s): Yemin Lan

Advisor(s): Gail Rosen

Graduate Student

School of Biomedical Engineering, Science and Health Systems

We hereby introduce a software that simulates the effect of one or multiple gene knockouts on the microbiome's ability to generate a particular metabolic product. Studies on the functional composition in human microbiomes have revealed diverse metabolic activities performed by our microbial residents. However, tracing the metabolic activities back to the contributing organisms or genes has been challenging. To understand how one or a set of genes would contribute to the overall metabolism in a microbiome, we try to simulate the effect of gene knockouts, which was typically employed to elucidate gene functionality in one or only a few organisms of interest. We construct a supraorganism model encompassing a metabolic network from the enzymes, intermediates, products, and genes of all members in the community using existing databases (e.g. KEGG and MetaCyc). Our software requires two inputs from the user: (1) an end product metabolite of interest and (2) a list of gene knockouts. The program utilizes a minimal pathway enumeration algorithm to count metabolic pathways contributing to the end product, and outputs the number of pathways that are eventually affected under the specified gene knockouts. The software allows researchers to observe how gene knockouts may perturb the system's ability to generate a user-specified product, provides experimental guidance for gene knockout experiments in a complex microbial environment and provides further insights into the division of labor in metabolism exhibited in community metabolism.

CB

Prediction of Host Traits through Microbiota Composition via Supervised LDA

CB-07

Stephen Woloszynek

Co-Author(s): Gail Rosen

Advisor(s): Gail Rosen

Graduate Student

College of Engineering

Electrical and Computer Engineering

The human microbiome is composed of trillions of organisms occupying the gastrointestinal, genitourinary, and respiratory tracts, the skin, and the oral cavity. Its influence in both health and disease is just beginning to be elucidated, but it's clear that it is a key player in immunity, vitamin production, digestion, and maintenance of intestinal mucosa. Given these benefits, it should be of no surprise that shifts in microbiota composition may have significant consequences in the homeostasis of the host. Changes in microbiota architecture have been linked to inflammatory bowel disease, autism, psoriasis, periodontitis, and cystic fibrosis. Implementation of machine learning models to describe microbial architecture is ubiquitous in current microbiome research, but attempts to use these models to predict host features is far less common. If successful, such methods would impact both disease diagnosis and the understanding of the microbiome's role in disease progression. Supervised latent Dirichlet allocation (sLDA) presents potential in analyzing OTU composition given its utility in interpreting topics reflecting functionally similar OTUs. Identifying clusters of OTUs that are predictive of specific host states is a unique strategy in supervised learning regarding modeling microbiome data, and it is also more physiologically relevant. Microbiota shifts in response to stimuli are not isolated events affecting a specific taxon; instead, they are large scale responses aimed to achieve a new set point to maintain ecological homeostasis. These shifts would affect multiple community members, with some decreasing in abundance, which, in turn, would directly affect the abundance of closely interacting community members. This interplay can be accurately modeled by topics, with shifts in specific topics being predictive of host states. The analysis shown here demonstrates that sLDA performs on par SVM and can accurately distinguish highly separable taxa.

Study of Water Behavior around Crowders and Aggregation of Amyloid Beta Fragment 16-22 with Crowders using All-Atom Molecular Dynamics

CB-08

Elizabeth Segelken

Advisor(s): Dr. Luis R Cruz Cruz

Graduate Student

College of Arts and Sciences

Physics

Alzheimer's disease is a neurodegenerative disease associated with the aggregation of the amyloid β peptide ($A\beta$). The fragment of the $A\beta$ peptide we are looking at, $A\beta(16-22)$, is prone to aggregation and by better understanding the behavior of this fragment, it is possible to better understand the peptide itself. Using all-atom molecular dynamics simulations in explicit solvent of $A\beta(16-22)$ and crowders, we can determine how placing crowders among $A\beta(16-22)$ fragments affects aggregation, both the amount of time it takes and the structures formed. In order to do this, we first need to explore the behavior of water around the crowders, including the density and lifetime, to determine a size and type of crowder to use. We use a single crowder of varying size and type to study this behavior. The types of crowders we use are hydrophobic fullerenes and hydrophilic frozen water. This allows us to determine how the hydrophobicity and size of the crowder affect the water behavior, possibly limiting the amount of space in which the $A\beta(16-22)$ can aggregate by forming a water barrier around the crowder. So far we find that the size of the crowder does make a difference in the behavior of the water and are exploring how the different types of crowders we use affect the water.

Modeling of Deep Brain Stimulation for Parkinsonian Networks

CB-09

Kelly Toppin

Advisor(s): Yixin Guo

Graduate Student

College of Arts and Sciences

Mathematics

The modeling of Parkinson's disease (PD) and deep brain stimulation (DBS) are important tools in the fight to improve the quality of life for parkinsonian patients. PD and experimental models of parkinsonian conditions are associated with changes in activity patterns in the basal ganglia. These changes include increased firing rates, bursting and synchronization. I will present some results from a computational study of how multi-site stimulation of the subthalamic nucleus (STN), within the basal ganglia, reduces these activities and improves the fidelity of thalamocortical (TC) relay in a large parkinsonian network model.

CB

COMPUTATION & MODELING (NON-BIO)

Primitive Lighting of the 17th and 18th Century for Digital Environments

CN-01

Ariel Evans

Advisor(s): Glen Muschio, John Berton, Patrice Jeppson

Graduate Student

Westphal College of Media Arts & Design
Digital Media

My research involved collecting wavelength and luminous data from a sampling of primitive lighting devices used in the English American Middle Colonies during the 17th and 18th Centuries. The raw spectral data collected was adapted for use in Autodesk's Maya to determine if it could be used as a guide for simulating quality of light when lighting historically accurate virtual reconstructions. Spectral data is of particular interest because past data collected has not been made readily available to digital artists. Documenting this data can aid future historical reconstruction efforts and preserve spectral data of light sources no longer commercially produced. The research builds on previous work conducted by Alan Chalmers and others utilizing spectral qualities of historic lighting to light digital environments. It strives to clearly present the process of collection and conversion of spectral data, to preserve the spectral data of my sampled lighting devices for future use, and document relevant production factors.

Idiographic Interpolation of Hippocampal fMRI

CN-02

Julie Petersen

Co-Author(s): Karol Osipowicz, J. Michael Williams

Advisor(s): Karol Osipowicz

Undergraduate Student

College of Arts and Sciences

Psychology

The depth of its location in the brain and tonic activity make fMRI activation of the hippocampus elusive. Traditional approaches to fMRI data processing typically normalize the data to an MNI atlas, with a resultant resolution of 2mm^3 . This typical preprocessing usually involves an upsampling and doubling in resolution, which is a good approach for most brain areas and has the advantage of smoothing minor inaccuracies in normalization, so that individual brains can be compared to one another in a standard space. However, this approach does not fully utilize the potential interpolated resolution of fMRI data. Whereas standard preprocessing can produce voxel sizes of 2mm^3 , the native resolution of Anatomical data can reliably reach $.5\text{mm}^3$. This increase in resolution would make finding activation of small, deep, and difficult to image structures, like the hippocampus, far less susceptible to beta-error. In this analysis, we compare the results of two processing schemes: standard and idiographic interpolated. We hypothesize that activation of the hippocampus will be evident in the idiographic interpolated and not in the standard data. Our results provide some support for the technique, but group level comparisons with this data are problematic, thus further research is necessary to establish the utility of this technique.

Mixing of Peracetic Acid with Wastewater in a LES Model: An Effective Transverse Injector Design

CN-03

Wangshu Wei

Co-Author(s): Philip Block

Advisor(s): Charles Haas, Bakhtier Farouk

Graduate Student

College of Engineering

Mechanical Engineering

A computational fluid dynamic model of the mixing and disinfection characteristics of peracetic acid (PAA) in a wastewater treatment pilot facility is developed. PAA is injected into the wastewater flow pipe with 2inch diameter via a transversely located injector with a small opening up to 1/4inch. The fluid dynamics of the spatial and temporal behaviors of mixing of PAA and the associated disinfection processes past the injector are studied by the large eddy simulation (LES) technique. LES is a three-dimensional, unsteady, computational approach where the unsteady Navier-Stokes equations are spatially filtered, the large scales are then directly computed, and the effect of the filtered scales on the resolved scales is modeled. We chose LES as it is considered very attractive for predicting scalar mixing and chemical reactions in turbulent reacting flows. The focus of this paper is a development of the capability to reliably perform LES of biologically reacting flows in geometries as complex as the PAA injector considered. The effect of swirls and baffle plates (with hole arrangements) placed within the water pipe on the mixing and disinfection behavior of the injected PAA are examined.

On some Jacobi Matrix Inverse Eigenvalue Problems with Mixed Given Data

CN-04

Yilin Yang

Advisor(s): Lei Cao

Undergraduate Student

College of Arts and Sciences

Mathematics

Jacobi matrices (real symmetric tridiagonal matrices) have a wide range of applications in physics and engineering, and are closely and non-trivially linked with many other mathematical objects, such as orthogonal polynomials, one dimensional Schrödinger operators, and the Sturm-Liouville problem. In the past couple of decades, constructing Jacobi matrices from different types of data was studied intensively. In this research, we construct Jacobi matrices from two new types of data, and thus providing some new methods for solving inverse eigenvalue problem of Jacobi matrices. Using its special structure, we firstly show that a Jacobi matrix can be reconstructed from two eigenpairs by solving a nonhomogeneous linear system. Secondly, we show that a unique Jacobi matrix J could be determined by the eigenvalues of J , the eigenvalues of the submatrix obtained by removing the first two rows and columns from J and an arbitrary entry of J . Furthermore, we summarize equivalent sets of parameters used to recover Jacobi matrices and show some direct connections among these sets.

Collaborative Access Control in WebdamLog

CN-05

Vera Moffitt

Co-Author(s): Julia Stoyanovich, Serge Abiteboul, Gerome Miklau

Advisor(s): Julia Stoyanovich, William C Regli

Graduate Student

College of Computing and Informatics

Information Science / Doctoral Program in Information Studies

The management of Web users' personal information is increasingly distributed across a broad array of applications and systems, including online social networks and cloud-based services. Users wish to share data using these systems, but avoiding the risks of unintended disclosures or unauthorized access by applications has become a major challenge.

We propose a novel access control model that operates within a distributed data management framework based on datalog. Using this model, users can control access to data they own and control applications they run. They can conveniently specify access control policies providing flexible tuple-level control derived using provenance information. We present a formal specification of the model, an implementation built using an open-source distributed datalog engine, and an extensive experimental evaluation showing that the computational cost of access control is modest.

MatBench: Towards a Data Management Platform for Materials Science and Engineering

CN-06

Akhil Kapoor

Co-Author(s): Julia Stoyanovich

Advisor(s): Julia Stoyanovich

Graduate Student

College of Computing and Informatics

Computer Science

We are presenting MatBench, a platform for the management and querying of experimental configuration files used in materials science and engineering research. Our system streamlines archiving and retrieval of configuration files, and keeps track of author information to maintain ownership, while allowing authorized users to view/reuse each other's work. Our project is motivated by the Materials Genome Initiative (MGI) by the White House, where the aim is to discover, deliver and deploy novel materials twice as fast and at a fraction of the cost. A key element of MGI is ensuring open access to and innovative uses of materials science data. We currently focus on managing configuration files for Abaqus, a commercial software for executing experimental workflows. MatBench parses these files and stores them in a relational database. MatBench also supports retrieving experimental configurations based on attribute-value pairs, both in command-line mode and through a Web interface built using Play, a state-of-the-art open source Web application framework. We are working on extending MatBench to auto-generate configuration files and automatically execute multiple Abaqus experiments. Upon completion of this project, modularized MatBench code will be made open source, allowing researchers to reuse and extend it.

Simulating Task Sharing with Delegation for Autonomy and Authority in Air Traffic Control

CN-07

Douglas Lee

Co-Author(s): Ellen Bass

Advisor(s): Ellen Bass

Post-Doctoral Fellow (PhD)

College of Computing and Informatics

Human agents in complex work environments frequently have to make decisions to determine how and when tasks are executed, while engaging in their own taskwork. An agent may prioritize specific tasks over others, and then either delay tasks or delegate them to others. These decisions are impacted by an agent's autonomy (capability) and authority for execution of a given set of tasks, as well as the autonomy and authority of collaborating agents.

This research presents a model of task sharing with delegation for human agents who either delay or delegate the execution of a task. Tasks are only delegated to agents capable of executing, and a communication and/or monitoring action accompanies each delegated task. We implement this model in a computational simulation framework for describing the distribution and processing of tasks across a team of agents. The simulation logs the time a task is performed, the agent performing the task, as well as whether the task is delayed, delegated, or required a communication and/or monitoring action.

We demonstrate the model using an aviation concept of operation called interval management, where following aircraft maintain a 60 second interval behind the aircraft in front. In this scenario, an air traffic controller agent and flight crew agents can have authority to execute all modeled control tasks. Using a case study approach, we investigate the emergent taskwork and coordination demands on agents for different levels of autonomy and authority, and different strategies for managing tasks. Results illustrate the tradeoff between reducing taskwork and the cost of coordination through delegation, across different forms of coordination and compared to delaying tasks.

Investigating the Spitzer Instability using AMUSE

CN-08

Michael Brewer

Co-Author(s): Steve McMillan

Advisor(s): Steve McMillan

Graduate Student

College of Arts and Sciences

Physics

We examine the behavior of a new module in the AMUSE framework designed for detailed handling of binary stars and other few-body systems within large N-body codes, applying the module to the study of mass segregation in two-component star clusters and a numerical investigation of the Spitzer mass segregation instability. We find that, using systems of total size $N = 5000$ and a number fraction for the heavy population of 0.01, the timescale for segregation, in which the heavy population separates from the background and sinks to a small characteristic radius from the center of the cluster, scales as $1/(\mu-1)$, where μ is the ratio of the mass of a heavy star to the mass of a background star. This scaling is in agreement with theoretical predictions and published results from other numerical simulations. We begin an exploration of the threshold for instability by evolving a series of globular clusters of size 32,000 particles with King model initial conditions, varying W_0 , the King Model core concentration parameter, Q , the number fraction of the heavy population, and μ , the mass ratio (as defined above).

A Reduced Dimensionality Model of Torsional Vibrations in Branched Molecules

CN-09

Evan Curtin

Co-Author(s): Karl Sohlberg

Advisor(s): Karl Sohlberg

Graduate Student

College of Arts and Sciences

Chemistry

Dendrimers and star molecules are interesting classes of molecules that show promise for application in polymer network scaffolds and molecular drug delivery devices. Such molecules also possess the feature that they can be constructed in a controlled, stepwise manner. Owing to this feature, such molecules are an ideal platform for the study of the properties of dendrimer-based nanomaterials by extrapolating from a systematic progression of smaller systems. Many properties of interest depend on vibrational motion within the backbone of the dendrimer, and therefore there is interest in determining these vibrational frequencies. Traditional vibrational analysis techniques are well established, but become intractable for large systems and are therefore impractical for application in the nano-regime. It is therefore desirable to have a simplified model, both to reduce the dimensionality of the system, as well as to eliminate the need for the costly generation of the Hessian matrix. Here we present a model to predict torsional vibrational frequencies of branched molecules. The molecule is first split into two chemically equivalent halves on either side of the plane normal to the principal torsion axis. Each half is then partitioned into lumped inertias constructed from atoms equidistant to the principal axis. A sensitivity analysis was performed on the force constants that connect neighboring inertias. The benchmark against which the force constants were developed was full normal coordinate analysis at the HFSCF/6-31G* level of theory. The best agreement occurred when including force constants between each concentric layer of the molecules, with one innermost torsional force constant and one outermost torsional constant. The numerical values of the optimized force constants also give insight into which interactions dominate torsional motions and the nature of torsional oscillations in nanostructures.



Correction of the PM7 method for predicting band gaps of semi-conductors

CN-10

Xiang Liu

Advisor(s): Dr Karl Sohlberg

Graduate Student

College of Arts and Sciences

Chemistry

The semi-empirical PM7 method has been established to have generally acceptable reliability in predicting the structure and formation energy of isolated molecules, as well as the structure of periodic crystals, at very small computational cost. By contrast, the accuracy of the PM7 method in predicting band gaps of semi-conductors remains questionable. In this work, we introduce a simple but promising correction term for the PM7 band gaps of transition metal semi-conductor oxides. The RMS error in predictions of band gaps of binary transition-metal oxides ($MxOy$) is reduced from 3.1 eV to 1.0 eV by this correction. This correction should make PM7 more valuable for solid-state and materials research.

Crack-induced Computational Model for Acoustic Emission

CN-11

Jefferson Cuadra

Co-Author(s): Antonios Kontsos

Advisor(s): Antonios Kontsos

Graduate Student

College of Engineering

Mechanical Engineering

The sudden release of energy as stress waves in solids is closely related to damage mechanisms and is referred to as acoustic emission (AE), which also defines the corresponding nondestructive evaluation method that targets the recording and post-processing of AE related information. Acoustic emission monitoring has been used extensively in material characterization, damage identification and structural health monitoring (SHM) applications primarily for qualitative assessment of damage evolution and failure prediction. However, the issue of quantification of AE information and its correlation with the initiation and evolution of specific damage mechanisms in real life applications is still an open research question that inhibits, in many cases, the reliable transition of this method from laboratory to actual engineering applications. In this context, an integrated computational engineering approach was implemented to quantitatively relate AE with fracture and plasticity effects. To this aim, a simulation approach based on the extended finite element method was used to model crack initiation in 3D and to perform both quasi-static and dynamic analyses. The static results were used to characterize the crack formation process and such information was used to identify the damage initiation point subsequently used in dynamic simulations. The computationally modeled AE sources and the associated wave propagation were evaluated using signal processing methods in both spatial and temporal domains which showed good agreement with relevant experimental results. Furthermore, investigations on the effect of plasticity on simulated travelling waves ahead of the crack tip were performed and revealed nonlinear interactions that had been postulated to exist. Finally, a fracture mechanics based approach on the quantification of energy associated with pre- and post-crack initiation conditions is presented to theoretically explain AE in solids.

Pore-Scale Transport Resolved Model Incorporating Cathode Microstructures and Peroxide Growth in Lithium-Air Batteries

CN-12

Charles Andersen

Co-Author(s): Han Hu, Gang Qiu, Vibha Kalra, Ying Sun

Advisor(s): Ying Sun

Graduate Student

College of Engineering

Mechanical Engineering and Mechanics

The electrode microstructure plays an integral role in the performance of the non-aqueous Li-air battery. Computational modeling has proven to be an indispensable tool in the analysis of battery systems, but previous macroscale, volume-averaged models that consider the porous electrode as a homogenous medium of uniform geometric properties are insufficient to probe the effect of precise electrode microstructures. Utilizing a pore-scale transport-resolved model of the Li-air battery, the complex electrode and Li_2O_2 morphologies can be directly incorporated and their effects on the system-level performance can be evaluated. A thickness-dependent electron conductivity of Li_2O_2 is considered in the model based on inputs from the density function theory. Model validation is presented along with a sensitivity study of the applied current density and the reaction rate coefficient. The effect of electrode geometry (e.g., nanostructure spacing and height) on cell performance, including its influence on pore blocking compared against electrical insulation, is investigated. Pore blocking is observed for cathodes with nanostructure spacing less than twice a critical insulating thickness of Li_2O_2 , suggesting the loss of active surface area as the mechanism for decreased cell performance. While for cathodes with larger nanostructure spacing, the discharge capacity is dictated by the electrical insulation of Li_2O_2 .

CN

Study of Polymorphic Sickle Hemoglobin Polymers

CN-13

James Amarando

Advisor(s): Frank Ferrone

Undergraduate Student

College of Arts and Sciences

Physics

Hemoglobin is a protein in red blood cells. Sometimes hemoglobin will abnormally form long polymer strands, which can cause sickle cell disease. These strands consist of stacks of hemoglobin molecules, connected via contact points on each molecule. These stacks have a slight twist to them within the polymer.

This project will test that if given an alternative set of axial contacts, a simulated polymer can be created that matches the electron microscopy of the sickle cell. This will be done via computer simulation involving both a quantitative way of checking contact points as well as a qualitative method of inspection.

A better understanding of where these molecules come together will lead to a better understanding of the disease. Knowing more about the contact points leads to a better framework for someone designing a drug to break up these polymers.

Representing Random Permutations as a Product of Two Involutions

CN-14

Charles Burnette

Advisor(s): Eric Schmutz

Graduate Student

College of Arts and Sciences

Mathematics

Endow the symmetric group over n elements with the uniform probability measure. Given a permutation s , let $N(s)$ denote the number of ways that s can be written as a product of two involutions. We will identify several properties of the random variable N , including an elementary derivation of the exact formula for N in terms of the cycle lengths of s , the maximum, minimum, and expected values of N over the symmetric group, and the asymptotic distribution of $\log(N)$, which resolves a conjecture of Michael Lugo. In particular, N is asymptotically lognormal. The proof of this draws on connections between $N(s)$ and $B(s)$, the product of the cycle lengths of s , as well as the Erdos-Turan law, which states that B is itself asymptotically lognormal.

Eigenmirrors and the Passenger Side Mirror Problem

CN-15

Sarah Rody

Co-Author(s): R. Andrew Hicks, Ronald K. Perline

Advisor(s): R. Andrew Hicks

Graduate Student

College of Arts and Sciences

Mathematics

The standard passenger side mirror on a motor vehicle has a limited field of view which results in a blind spot. Other mirrors, such as spherical mirrors, reduce the blind spot but distort the image. Our goal is to find a construction for a passenger side mirror with a reduced blind spot and less distortion than a spherical mirror. Our construction technique uses a virtual target surface to construct a mirror that we can an eigenmirror. The goal is to construct the eigenmirror so that the image seen by looking at the reflection of the surface in the eigenmirror and the image seen by looking directly at the surface are the same. For any rotationally symmetric mirror, a surface can be constructed to make the mirror an eigenmirror for that surface. In the non-symmetric case, which is the case that can be applied to the passenger side mirror problem, we have not yet solved the problem exactly ,but use numerical methods to approximate the solution. To apply the paired mirror system to the passenger side mirror problem, we take the surface to be a distant surface behind the motor vehicle. If the surface is at a great enough distance, and relatively flat, the resulting paired mirror functions as a passenger side mirror.

Time-series of Ejecta Mass in Strombolian Volcanic Eruptions

CN-16

Cameron Petersen

Advisor(s): Loyc Vanderkluyzen

Undergraduate Student

College of Arts and Sciences

Geoscience

Volcanic eruption plume formation is, currently, poorly understood, yet of paramount importance for eruption dynamics and volcanic hazard mitigation. Stromboli Volcano, in the Aeolian Islands (Italy), is a perfect location for the study of these eruption clouds for it displays a typically consistent, low energy, eruption style allowing for close proximity and an unobstructed view for thermal and visual imaging of ash and spatter ejecta. Analyzing these pyroclastic particles' sizes and mass, especially the amount of mass ejected over time, will give insight into how eruption clouds emerge from the volcano's conduit.

To calculate these values, we analyze data collected from images of Strombolian eruptions taken in 2008 through a forward looking infrared camera. These images are then processed to determine ash and spatter components and, consequently, the radii and mass of the ejecta with sub-pixel dimensions are measured with a radiance mixing technique. Through the analysis of these images, accurate masses could be determined for eruption ejecta with sub-pixel dimensions; however, going forward, the radii and mass of larger spatter (>1 pixel, i.e., larger than ~40 cm) must be calculated to receive a more precise time-series of ejected mass. These eruption ejection parameters serve as a basis to decipher eruptive column formation and magma dynamics in the last 250 m of the conduit before exiting the vent.

Product Development and Sensory Evaluation of Novel Sparkling Vinegar Beverage, A Healthier Option for Carbonated Beverages

CN-17

Jericho Turingan

Advisor(s): Rosemary Trout

Undergraduate Student

Center for Hospitality and Sport Management

CLSC - Culinary Science

The use of vinegar as a beverage has been practiced in Japan since the ancient times. Japanese warriors believed that consuming vinegar-based tonics supplied them with energy before going into battle, and served as a supplement to help them defeat their enemies. Vinegar has historically been recognized in having a number of health benefits due to its therapeutic compounds including: gallic acid, catechin, epicatechin, chlorogenic acid, caffeic acid, p-coumaric acid. Benefits from vinegar may include: antioxidative, antimicrobial, antiobesity, antihypertensive, and cholesterol-lowering properties. Due to its effectiveness against mycobacteria, vinegar has been used to treat infections throughout history. Vinegar has many important applications in the culinary world by incorporating sour taste components to savory dishes. It also acts as a natural preservative by lowering pH. When it is correctly incorporated into a beverage, it can result in a delicious and healthy carbonated beverage. In America, about half the population consumes soda on a regular basis. This study will focus on developing flavors for carbonated vinegar beverages that will be palatable for the average American consumer, and can be sold in local supermarkets in the future as a possible replacement to sugary carbonated beverages in the market today. To develop this product, existing flavor samples of vinegar beverages from existing companies as well as market research on beverage trends will be used in order to help formulate a novel flavor. The novel flavor will be incorporated into carbonated water with the use of Sodastream technology. After the beverage has been successfully developed, the product is tested using a sensory panel of college students and faculty members to determine if the product is palatable and can compete with beverages currently available in the market.

Analysis of Disease-ADR association

CN-18

Mengnan Zhao

Co-Author(s): Chris Yang

Advisor(s): Chris Yang

Graduate Student

College of Computing and Informatics

Information Studies

1. What is the research question? Define it in a couple of sentences.

The research is about the analysis of association between disease and Adverse Drug Reaction (ADR) by using social media data.

2. What is the motivation of studying this problem?

Drug repositioning is the application of known drugs to new indications and research on drug repositioning has grown in importance in recent years, both in academia and industry. Moreover, building the correlation between disease and ADR is the most significant step in drug repositioning.

3. Why is it important?

Firstly, the association between disease and ADR plays a significant role in drug repositioning, which suggest potential uses of drugs.

Secondly, the analysis of disease-ADR relationship is also important for explaining lots of symptoms and medical phenomenon. Since a majority of patients are affected by ADR problems every year, ADR research is very significant in drug safety surveillance.

In addition, traditional information resources of ADR are not effective enough to support the ADR research, while with the development of web 2.0, increasing people tend to discuss their diseases, health conditions and ADRs on social media and OHCs. Thus user-generated contents have become an important information resource of ADRs in recent years. Therefore, it is necessary and significant to take this advantage to conduct ADR research.

4. Methods

We extracted user comments from social by using web-crawler, then we computed the co-occurrence of disease, ADR and drugs. Lastly, we found out significant diseases to each ADR by using statistical tests.

Atomistic Simulations of Orientation Dependent Hardness in Aluminum

CN-19

Arulselvi Selvaraja

Co-Author(s): Dr. Christopher Weinbeger

Undergraduate Student

College of Engineering

Mechanical Engineering and Mechanics

Indentation is a popular method for probing the mechanical properties of a material in a non-destructive manner and can provide qualitative and quantitative information regarding material stiffness and strength. Hardness measurements can also demonstrate anisotropy using Knoop indenters, and is used to establish the slip planes in materials without direct observation. To see if this idea holds during nanoindentation where dislocation nucleation is prominent, we investigate hardness anisotropy using atomistic simulations. Our simulations are carried out in aluminum, a popular structural metal where the slip planes are well established, using a cylindrical indenter. The results show no definitive hardness anisotropy due the deficiency of orientation dependence in simulations, compared to experiments. Further analysis and improvement of methodology for acquiring precise data would help in better understanding of material properties and enable cost-efficient material selection.

A Push-Pull self oscillating mixer design based on foundry service

CN-20

Dewakar Madapuci Kanday

Co-Author(s): Olaniyi Jinadu

Advisor(s): Afshin Daryoush

Graduate Student

College of Engineering

ECE

Microwave local oscillators (LO) are used for frequency translation from baseband/intermediate frequency (IF) to radio frequency (RF) signals using mixers. The concept of self-oscillating mixers (SOM) is very attractive to achieve high dynamic range and conversion efficiency in mixers by combining both oscillation conditions in circuits and nonlinear mixing. Moreover, the self-oscillating mixer eliminates the need for a buffer amplifier that has to be used after conventional mixers. One of the major advantages of a SOM is that it eliminates the need for high LO output power which in turn leads to lower prime power consumption. It also has a higher frequency gain, reduced chip size and weight, extremely stable oscillation at certain range of frequencies, and reduced noise (i.e. increased isolation).

The push-pull self-oscillating mixer is a combination of both the oscillating and mixing functions, of an oscillator and mixer, into one low power consuming oscillator and efficient mixing circuit. The stabilized local oscillator portion of SOM is being used as stabilized source at the design frequency of 10GHz. In order to make the oscillator portion even more frequency stabilized, forced oscillation (e.g. dual self-injection locked and phase locked loops) can be used to reduce the 2nd harmonics.

To implement the SOM at the proposed design frequency of 10 GHz Si-Ge/Si HBT device parameters from IBM and Si CMOS technology from TSMC are considered. The foundry parameters are employed for DC I-V curve plots and design of load lines of the transistors. The push-pull amplifier is designed for operation in class AB as a building block of oscillator. The source current of push-pull amplifier is used for mixing of IF and LO signals to generate RF.

Evolution of a Metadata Application Profile for a Digital Data Repository

CN-21

Edward Krause

Co-Author(s): Erin Clary, Adrian Ogletree, Jane Greenberg

Advisor(s): Jane Greenberg

Graduate Student

College of Computing and Informatics

Health Informatics

Dryad is a curated, digital archive for data associated with scholarly publications. In an effort to facilitate the discoverability, reusability, and interoperability of archived content, Dryad has implemented a standardized set of metadata elements in the form of an application profile. Dryad metadata captures information about data packages, which are comprised of individual data files, the associated scholarly publication, and the relationships among these entities. This research examines the evolution of Dryad's application profile from its inception in 2007 as version 1.0 through the last update in 2013 as version 3.1, and documents current practice as version 3.2. We model the relationships between data packages, data files, and publications for each version of the application profile and perform a crosswalk analysis to map equivalent metadata elements across each version. Results covering versions 1.0 to 3.0 show an increase in the number of metadata elements used to describe data objects in Dryad. Results also confirm that Version 3.0, which envisioned separate metadata element sets for data package, data files, and publication metadata, was never fully realized due to constraints in Dryad system architecture. Version 3.1 subsequently reduced the number of metadata elements captured by recombining the publication and data package element sets. Version 3.2 represents the current metadata practices in Dryad and demonstrates changes in the content and functionality of the repository. This work aligns the application profile with current Dryad practices and informs a larger effort to meet the needs of Dryad's diverse community of stakeholders and its expanding scope.

Heat transfer characteristics of an evaporating meniscus on nanostructured surfaces

CN-22

Han Hu

Advisor(s): Ying Sun

Graduate Student

College of Engineering

Mechanical Engineering and Mechanics

Thermal management is becoming a severe bottleneck in ever-increasing demands toward miniaturization of high performance integrated circuits, power electronics, and lasers. Thin film evaporation has been demonstrated as a promising thermal management technique where the key challenge is to efficiently deliver the liquid to the heated surface. Recent efforts have focused on using nanostructured substrates to transport the liquid via capillary effects. However, there is still a fundamental lack of understanding regarding how nanostructures affect the overall heat transfer coefficient of thin film evaporation. In the present work, combined theoretical modeling and molecular dynamics (MD) simulations are used to investigate the overall heat transfer coefficient of an evaporating thin film on nanostructured surfaces. The overall heat transfer coefficient of thin film evaporation is affected by the Kapitza resistance at the solid-liquid interface, conduction resistance in liquid, and the evaporation resistance at the liquid-vapor interface. As nanostructure depth increases, the conduction resistance in liquid decreases due to smaller local thickness, the Kapitza resistance decreases due to smaller difference in vibrational properties between liquid and solid, but the evaporative resistance increases due to the enhanced disjoining pressure effect. The MD results show that the overall heat transfer coefficient decreases with nanostructure depth for very thin film (thickness $< 2\text{nm}$), but increases with nanostructure depth for thicker films: there exists a critical film thickness, only above which the heat transfer coefficient is enhanced by nanostructures. The critical film thickness as a function of nanostructure depth is theoretically predicted by balancing the decrease in Kapitza and conduction resistances with the increase in evaporation resistance due to nanostructures, and the model prediction is shown to agree well with the MD results.

CREATIVE ARTS & DESIGN

A Comprehensive Neurorehabilitation - Informed Art Therapy Approach for Individuals with Traumatic Brain Injury

CA-01

Tori Kline

Advisor(s): Elizabeth Hartzell

Graduate Student

College of Nursing and Health Professions

Creative Arts Therapies

According to the Centers for Disease Control and Prevention (2014), there are nearly 1.7 million people diagnosed with traumatic brain injury (TBI) annually. The diagnosis of TBI can lead to a number of complications, disabilities and even death. The presentation of such a diagnosis is vastly individualized, due to factors such as location and degree of damage, physical and emotional factors, therapeutic support and interventions, support systems and much more. In treating this population, comprehensive neurorehabilitation seeks to provide a postacute therapeutic milieu, psychotherapy, cognitive rehabilitation and retraining within an intensive and interdisciplinary treatment, along with continuing support. Within this context, art therapy can be utilized as a nonverbal method of assessment, means to gain insight and understanding of the client, and help structure the development of a treatment plan. Additionally, it can serve as a means of nonverbal communication and expression, creative exploration and engagement, community reintegration, and bilateral brain activation and integration to improve functioning and quality of life. This project explores how to implement an art therapy treatment with the TBI population, in order to support their interests, functioning and rehabilitation, while also considering the vast number of variables that may manifest in treatment as a result of TBI, associated challenges, and premorbid conditions.

Combining 3D Computer Graphics and Woodblock Printing

CA-02

Josh Hollander

Co-Author(s): Jen Blazina

Advisor(s): Jen Blazina

Undergraduate Student

Westphal College of Media Arts & Design

DIGM / ANFX

Woodblock printing is one of the oldest forms of printmaking, originating in Asia around 200CE. It has seen extensive use in decorative printing, book making, and the fine arts from its conception to the present day. Computer Graphics are a much newer form of image-making which began in the 1970s and continues to grow in both popularity and potential. Using 3D Computer Graphics in conjunction with Woodblock printing techniques, I sought to bring out my favorite aspects of both media and bridge these old and new art forms.

Architectural Origami: Creating Complex Forms Through Free Form Pleating

CA-03

Lela Thompson

Advisor(s): Geneviève Dion

Undergraduate Student

Westphal College of Media Arts & Design

Fashion Design

Fashion designers play with volume and structure to create interesting silhouettes; sculptural and origami style garments have become increasingly popular. Achieving these forms with a flat textile can be complicated and may require extensive patterning or understructures. An alternative way to create voluminous forms is through fabric manipulation, such as the pleating of fabric that can hold its shape. While testing a method used to create a chevron pattern on polyester organza, it was noted that this type of fold could be made permanent by heat setting the fabric. However, the fold constantly collapsed onto itself. Through the introduction of seams, it was observed that the textile could be held in a state between totally collapsed and fully stretched—creating unique twisting pleats. This research explores how to efficiently create an apparently complex structure and form by investigating types of seams, fabric choice, panel placement, and folding techniques.

Taking Steps - A Location-based game about positive outlook for HIV-positive LGBT Youth

CA-04

Tiantong Xu

Co-Author(s): Cassie Beasley

Advisor(s): Michael Wagner

Undergraduate Student

Westphal College of Media Arts & Design

Digital Media

Human immunodeficiency virus (HIV), the agent of acquired immune deficiency syndrome(AIDS), is the most talked about health issue for Lesbian Gay Bisexual Transgender(LGBT) community. LGBT youth who are first diagnosed with HIV face negative social stigmas that create mental burdens often bigger than the physical ones. Taking Steps, a location based mobile game, aims to demystify the disease by letting the players explore stories of other people with HIV in a safe environment. By engaging with virtual characters in different locations in Philadelphia, players will learn that being HIV positive does not define who they are, and there is always help when you reach out to the community.

Fractal Geometry: A Tactile Exploration Through Visual Media

CA-05

Karen Yee

Advisor(s): Jody Graff, Mark Willie

Undergraduate Student

Westphal College of Media Arts & Design

Graphic Design

Mathematics and art are considered by some to be in opposition. Math is perceived to be intimidating to artistically creative people. There are many visual elements of math most creative people are unaware of.

Fractals are mathematical patterns that infinitely repeat and have strong connections to nature and applications in daily life. My presentation will be on the design of an interactive print book, with an electronic tablet companion, to demonstrate how these tangible components can make learning mathematical concepts an accessible and rewarding and enjoyable experience.

The way in which a medium can convey research affects how wide of an audience it can reach. Through paper-based interactive elements housed in the book, including overlays, tabbed reveals, and paper folding, math concepts become a hands-on experience that facilitates learning and makes math a visually interesting and interactive experience for anyone, regardless of their knowledge of mathematics research affects how wide of an audience it can reach.

Through paper-based interactive elements housed in the book, including overlays, tabbed reveals, and paper folding, mathematical concepts become a hands-on experience that facilitates learning and makes math a visually interesting and interactive experience for anyone, regardless of their knowledge of mathematics.

Beyond the Big Top: The Art of the Polish Circus Poster

CA-06

Courtney Sabo

Advisor(s): David Raizman, Mark Willie

Undergraduate Student

Westphal College of Media Arts & Design

Graphic Design

Beginning in the 1960s, the Polish State Entertainment Agency (ZPR) commissioned poster artists to create promotional pieces for the circus, an import from the Soviet Union that was used as socialist propaganda. The ZPR opportunity presented itself during a time when artists were receiving national attention at the First International Poster Biennale and the Poster Museum at Wilanów, the first poster museum in the world. While Americans advertised the circus with realistic imagery of elephants, bears and ringmasters, Polish poster designers used abstract illustrations as visual metaphors in subliminal messages to communicate the event's political undertones. Warsaw's Jan Mlodozieniec and Wrocław's Jerzy Czerniawski were two of many artists who lined the streets with bold posters that served as voices for the people of Poland as well as timeless pieces of design.

An Innovative Navigation Device for Transportations

CA-07

Minsu Jin

Advisor(s): Michael Glaser

Undergraduate Student

Westphal College of Media Arts & Design

Product Design

The modern navigation is more diverse and fast than ever before. However, multiple travel stages are complex. The gaps are caused based on travelers' knowledge and the limited directions from the signages. Take 30th Street Station as an example, there are few signs pointing out the subway inside the station. The gap is created with the short of cooperation between Amtrak and SEPTA. Each company is only willing to be responsible for their own part.

After making research on the wayfinding system around the 30th Street station and interviewing travelers and transport experts, I looked for benefits to travelers and what's their needs and wants indeed in transferring. When people are faced with the disconnections, they are feared of the uncertainty. Even it is a short moment, people want to get security and comfort.

Based on the synthesis of all insights, I found the opportunity to design a short-distance navigation device, which is used in Airports and Train Stations to connect different transportations and eliminate connecting gaps. The product is portable, directive, and informative. It ensures exhausted travelers to efficiently find out their next steps.

Feeling Factory: An Educational Digital Game for Speech Prosody Improvement in Children with Autism

CA-08

Natalie Lyon

Advisor(s): Jichen Zhu

Graduate Student

Westphal College of Media Arts & Design

Digital Media

Children with Autism Spectrum Disorder tend to struggle with correctly identifying and producing prosodic speech cues, which allow for expressing emotion and intention and are a key aspect of all language learning. Traditional Autism intervention methods often fail to improve skills in this area, possibly due to a lack of motivation on the part of the child caused by Theory of Mind deficits common to Autism. Because of the motivational nature of educational digital game design and because children with Autism often have a demonstrated proclivity for computers, Feeling Factory combines traditional Autism intervention methods with educational digital game design techniques in a two-player game for iPad designed to encourage motivation and generalization of prosody production and reception skills.

Creating A Sustainable & Smart Household Water System

CA-09

Connor White

Co-Author(s): Mohamed Zerban

Advisor(s): Mike Glaser

Undergraduate Student

Westphal College of Media Arts & Design

Product Design

We, Tern, believe in a future in which homes are not merely consumers, but rather producers through the installation of modular products and systems. One of the greatest barriers to the ideal sustainable home is a severe lack of information about household systems and ultimately the potential for growth. The Smart Faucet is the first product in a series that will create an independent water system within the home. Users will finally have easy access to information about the contaminants in their water and their water usage efficiency while ensuring the highest quality of their tap water through innovative new approaches to water purification. Through user-centered research, expert interviews, survey data, personal interviews, and several other qualitative research methods, Tern has created an informed solution to introduce users to the home tomorrow.

It's Your Tern For A Sustainable Future.

Preserving History: Digital Reconstruction of the James Oronoco Dexter House

CA-10

Matthew Mlodzienski

Advisor(s): Glen Muschio

Undergraduate Student

Westphal College of Media Arts & Design

3D Animation & Visual Effects

The Dexter House was an 18th century dwelling occupied in the 1790's by James Oronoco Dexter a manumitted African American. The house is of historical significance because of meetings held in it that led to the formation of the African Episcopal Church of St. Thomas, the first African American Episcopal Church in the USA. The house was demolished in the early 19th century. The remains of the house foundation were discovered in an archaeological excavation conducted in 2001-2003 as part of the construction of the National Constitution Center in Independence National Park.

Since 2005 Drexel University Digital Media students have worked with faculty advisors to digitally recreate the house's exterior and first floor interior, including some historically appropriate furnishing as well as ceramic artifacts recovered from the archaeological dig believed to be associated with Dexter's occupation of the house.

As a STAR Scholar during summer 2014, I conducted research and expanded the 3D digital model of the house. A period insurance record was used as a guide to visualize the second floor which was described as being divided into two rooms with an open garret above the second floor. The recreation is also based on research into typical building techniques and styles of the period, as well as consultations with archaeologists who excavated the site. The brief insurance record is the only known written record that describes the house, leaving the exact layout ambiguous. Working digitally, it is possible to quickly modify and expand upon the model, as more information becomes available or as new interpretations of the possibilities are put forward. The digital model also allows multiple representations of the house to be shown, allowing viewers to interpret the imprecise nature of the reconstruction. Future plans for the 3D model are to use it as part of an interactive game for exploring 18th century notions of race, religion, slavery, and class and their 21st century legacy.

A Creative Approach to Artificial Intelligence; Engaging Ethics, Empathy and Speculative Design

CA-11

Jay Hardman, Elena Sabinson

Advisor(s): Nicole Koltick

Graduate Student

Westphal College of Media Arts & Design

Interior Architecture & Design

The field of artificial intelligence and socially interactive robotics has been dictated by pragmatic investigations concerned predominantly with consumerism and function. The resultant technological products favor human centered systems and ideologies. However, as these intelligent autonomous systems continue to develop there has been a growing interest in examining the more abstract abilities of their behavior. Questions surrounding the conceptual qualities of their existence offer the potential for new models of mutually beneficial relationships between humans and technology. This novel approach operates at the boundaries of computation and engineering research, but also incorporates philosophical and psychological concerns by contemplating new possibilities for autonomous technologies. What if a robot had a hobby? What role will these entities have in our social structure? How will ethics evolve as these beings become increasingly intelligent? How can humans and robots share an experience? These questions form the basis of a new project in Drexel University's Design Futures Lab which seeks to shift the perception of robotic agency in order to explore a social and ecological frontier vastly different from our own.

This project envisions a habitat for non-humanity. *Synthetic Ecologies: Autonomous Botanists* explores the poetic potentials of a new artificial species by giving them the means to create their own environment. We have developed a synthetic landscape of engineered crystals, where nature is derived from data, and nurturing robot gardeners cultivate their own environment. A colony of robots networked to each other and their habitat will seed and grow the delicate crystal structures that make up the landscape. The robots and terrain encompassed in this project put forward a novel approach to autonomous systems and aesthetics; posing questions about ethics, empathy and the creative usage of robots and artificial intelligence in the future.

Binaural Beats: Brainwave Entrainment for Relaxation, Meditation & Creativity

CA-12

Victoria Powell

Advisor(s): Michelle Manghise

Undergraduate Student

Westphal College of Media Arts & Design

Music Industry

Binaural beats are known for effective brainwave entrainment of human brains. Many people do not have the desire or attention span to listen to a pure sine wave tone for 10 minutes. There are a few existing musical tracks that are composed with binaural beats, but many of these tracks are made with New Age healing music that many people prefer not to listen to. Binaural beats could be very effective if they are automatically interlayered into contemporary music of the user's choice.

As a music industry major, I have many music loving friends. I plan to do a qualitative research experiment using my peers as research participants. I will gain information by conducting short listening sessions with the participants' song of choice interlayered with binaural beats. I will record their first-person experiences through open ended interviews, surveys and observation.

Binaural beats occur when one pure tone is presented to one ear, and a different pure tone is presented to the other ear. When the difference between the frequencies of the two tones equates to a frequency between roughly 1.0 Hz and 40.0 Hz, there will be a new sound perceived by the brain. If the listener concentrates on the new sound, the brainwaves will slowly match the frequency of the tone. Different brainwave frequencies are associated with different states of consciousness. Humans can use these frequencies to entrain their brainwaves that lead to a different state of mind that may be more conducive to concentrating on a hard task (Beta), or improvising a live concert (Theta).

Although the binaural beat phenomenon was discovered in 1839, there are still many unverified claims and some skepticism regarding the effects of binaural beats on the brain. I will explore the research done on any negative affects from overuse of binaural beats.

In conclusion, I would like to bring binaural beats to the greater public in a safe, effective and contemporary manner.

Epi(c)genetics: Representing the Aesthetics of Oral Tolerance and Children's Immunity in Textiles and Garments

CA-13

Nancy Volpe-Beringer

Co-Author(s): Ulf Gehrman

Advisor(s): Roberta Gruber, Alphonso McClendon

Graduate Student

Westphal College of Media Arts & Design

Department of Design/Fashion Design

In collaboration with Ulf Gehrman, a scientist that studies epigenetics, this technical and creative textile research explored methods to aesthetically communicate the method of oral tolerance and the manner in which newborn children educate their immune system. The design challenge was to visualize and manufacture an innovative garment that reflects Gehrman's research, while also possessing a sophisticated silhouette and exciting aesthetic value. Visual analysis was conducted on numerous images that represented the important role of the gut in distinguishing possible dangerous substances from harmless ones. Gehrman detailed how epigenetics might contribute to this process by changing the patterns of genes that are turned on or off in immune cells in response to a physiological stimulus. The images and patterns served as an inspiration to explore textiles and design options to meet our team's scientific and design goals to create a fashion-forward, creative, and epic look. Textile experimentations included creating two- and three-dimensional structural surfaces made from machine and hand stitching, felting, and mixed media, as well as sculptural manipulation of fabrics that represented the important role of the gut and changing patterns of genes. Team Epic created a shapeshifting fashion garment that is inspired by the crucial function of the gut during oral tolerance and in regulating the immune system and the epigenetic mechanisms underlying it.

Responsive audio feedback for hand gesture interaction to enhance immersion in audio-only games

CA-14

Wenjie Wu

Advisor(s): Stefan Rank, Jervis Thompson, John Avarese

Graduate Student

Westphal College of Media Arts & Design
Digital Media

This project investigates hand gesture interaction in audio-only environments. An interactive audio experience responsive to hand gestures was designed as an approach to both encourage user participation and enhance immersion in audio-only games.

As motion tracking technologies, such as Kinect and Leap Motion, developed and have been applied in achieving immersion in video games, audio-only game designers can now consider studying gesture interaction as main game mechanics to enhance immersion in audio-only environments. However, due to the lack of visual cues, conveying messages regarding gesture interaction to the player through auditory cues without interrupting the immersive experience in audio-only environments becomes an interesting problem that should be tackled. Our approach is to test out useful designs of audio feedback that is responsive to hand gestures to both encourage user participation and maintain immersion. In particular, we test the hypothesis that replacing explicit audio instructions for hand positions and movements with responsive audio feedback for suggesting interaction methods using environmental story-related audio cues leads to higher immersion. We expect that the result of this study can enhance our understandings of game immersion and evoke new ideas for gesture interaction design in audio-only games. Our study investigates principles for designing immersive audio feedback responsive to hand gesture interaction in a 3-dimensional space. Our design can serve as a reference for audio feedback in hand gesture interaction in virtual reality. In addition, this project has implications for the blind community's access to motion-control games.

A Biofeedback-based Approach to Horror Game Design

CA-15

Cathy Lu

Advisor(s): Stefan Rank, Michael Wagner, Erin Solovey

Graduate Student

Westphal College of Media Arts & Design

Digital Media

Digital games featuring the use of wearable sensor technology have become more prevalent in the recent years as designers seek new and improved ways of reading inputs from a player. These new input methods provide game systems a multitude of additional outlets through which they can monitor, analyze, and react to a player's actions and emotions. Affective computing encompasses these methods, and is the study and development of systems and devices that can recognize, interpret, process, and simulate human affects. Our goal is to create a digital horror game that helps to explore whether the use of physiological sensors in computer games can improve players' engagement and what the relationship between biofeedback data and levels of emotion in digital games are. Biofeedback is typically the use of electronic monitoring of an automatic bodily function in order to train someone to acquire voluntary control of that function. We apply biofeedback methods to the horror game genre for the potential of customizing the horror experience for the player via dynamic game balancing techniques. This can lead to more intense and/or more appropriately paced feelings for the players. The key feature of the game is the integration of biofeedback devices which can measure the player's own heart rate (HR) and skin conductivity level (SCL) in order to change game elements in real time. Direct effects on the game environment range from atmospheric changes, such as frequency of appearance of disturbing images, to gameplay changes, such as faster enemy movement speed. Indirect effects affect the dramatic pacing of the game, e.g. in terms of progress through different stages.

A Review on Music-Evoked Emotional Processing in the Brain: Bridging Neuroscience Perspectives to Music Therapy in Children with ASD

CA-16

Fang-Yu Liu

Advisor(s): Paul Nolan

Graduate Student

College of Nursing and Health Professions

Creative Arts Therapies

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder. Children with ASD are known for having deficits in social communication and interaction, and having restricted, repetitive patterns of behavior, interests, or activities. The purpose of this project is to review relevant literature related to music-evoked emotional processing in the brain and to investigate how to utilize music to connect with children with ASD socially and emotionally through the neuroscience perspective. The literature review includes articles related to brain structures pertaining to functions involved in both emotional and music-evoked emotional processing.

From the literature review, it was found that the music-evoked emotional processing in the brain contains three steps. First, pertaining to arousal from the music, including the activation of the auditory nervous system, the diencephalon (thalamus and hypothalamus), and the brainstem. Second, focusing on the appraisal of the music, including the activation of the limbic system, such as the amygdala, hippocampus, nucleus accumbens, as well as the anterior and posterior cingulate cortices. Third, exploring the emotional expression toward the music. Depending on the type of expression, it can activate various regions of the brain, including the motor and premotor cortices, basal ganglia, insula, or the inferior frontal gyrus.

The finding of this literature review suggests specific recommendations for music therapists who are working with children with ASD, including the music elements chosen in music therapy sessions, and the music therapy methods/ techniques for evoking the emotional processing in children with ASD.

Representation, Dramatization, and Relationships: A Film Case Study as it Pertains to Common Themes in Documentary Filmmaking

CA-17

Kaila Taylor

Advisor(s): Lydia Timmins

Graduate Student

Westphal College of Media Arts & Design

TV Management

This thesis focuses on three major themes in documentary filmmaking: ethical representation, dramatization, and filmmaker-participant relationships. Each one of these themes is heavily influential in the outcome of a documentary. Ethical representation refers to the portrayal of participants on film. This first theme embodies the core of documentary films. How participants are portrayed on film determines the message an audience will receive. Dramatization is the creative aspect of documentary film. The incorporation of reenactments gives filmmakers the ability to capture the past and future. Finally, the filmmaker-participant relationship is the interaction that takes place behind the camera. Through a thorough analysis, these themes are dissected and explored, giving readers a clear perspective on the importance of these themes in filmmaking.

In order to put these themes into a real world application, the researcher traveled to Quito, Ecuador to produce a documentary. This trip served as the basis of the case study this thesis is centered on. Throughout her journey, the researcher was exposed to all three themes simultaneously during the production process. The researcher recorded the details of the production process, from both her memory, and some documented notes. Also, in order to add depth to her study, the researcher measured audience opinion as well as the input from her former film crew using survey analysis.

Through research and the case study, the researcher determined that, aside from thorough research, the best way to begin to understand the complexities of documentary filmmaking is to apply the practices through real world experience.

CA

Reinvigorating the Art Museum Visitor Experience

CA-18

Stephanie Kovacs

Advisor(s): Mike Glaser

Undergraduate Student

Westphal College of Media Arts & Design

Product Design

This project explores how visitors interact with art in traditional museum settings and synthesizes findings into an appropriate design solution. Through an intensive research process, current barriers to art interpretation are analyzed and new ways to promote active visitor engagement are investigated. Significant barriers include uncurated collections, limited access to artwork, and a lack of interactive tools within museums. Market research of museums and their education programs, services, and devices is conducted, with specific focus on the Philadelphia Museum of Art and the Cooper Hewitt Design Museum in NYC. Expert interviews with museum educators, professionals, and art historians in addition to targeted observation studies at the Philadelphia Museum of Art provide insight about visitor behaviors, ease of navigation, and obvious challenges that hinder active engagement. Thorough analysis of user-types, concept exploration, and high-level synthesis of data leads to the discovery of a novel solution. The solution, Keepsake, is a system that celebrates and aids the physical process of viewing art while integrating digital tools for more in-depth discovery. A physical guide helps users to find their way while a digital platform enables visitors to capture art beyond museum walls.

High School Student Engagement Tools and Practices Regarding Experiential Learning

CA-19

Sean Preston

Advisor(s): Verena Paepcke-Hjeltness

Undergraduate Student

Westphal College of Media Arts & Design

Product Design

High school students are largely on their own when having to make decisions about their futures. They use various college prep tools to prepare them for college but may have no idea what major they would like to choose. High school students are encouraged to choose a career path early on but know little about how to identify their own strengths and passions from a professional and future-oriented perspective. The current tools that exist to aid students are either unhelpful, too expensive (such as the Myers-Briggs Type Indicator) or are too abstract for students to use in an actionable manner. The focus of this research is on what tools exist currently that aim to help high school students plan for their futures and how and why they are or are not successful. A large part of the research was conducted through surveys, high school workshops at Drexel and research activities concerning students' ability to self-analyze, their communication between different types of people and the methods of connectedness used to establish and maintain communication. Through an understanding of high school students and the nature of the difficulties they face, insights about possible solutions began to emerge which informed the development of my senior Product Design thesis.

The Role of the Art Therapist in Community-Based Arts Practices: A Critical Review of the Literature

CA-20

Dylan Ottemiller

Co-Author(s): Yasmine Awais

Advisor(s): Yasmine Awais

Graduate Student

College of Nursing and Health Professions

Creative Arts Therapies- Art Therapy

The purpose of this critical review of the literature is to examine and evaluate the relationships between community-based theories, community-based arts practices and art therapy. Trauma and mental health challenges are widely prevalent among a diverse variety of communities in the United States. Yet, due to stigmatized views of mental health treatment and/or limited access and resources, many members of these communities do not receive the services they may need. Many art therapists have argued that the field needs to expand its scope of practice beyond the traditional mental health/medical model in order to serve those in need, reduce stigma around mental health, and promote social inclusion and empowerment. Through a review of the literature, it was found that art therapists have much to contribute to community-based arts programs, including a knowledge of group dynamics, the effects of trauma, effective interventions for those experiencing difficult emotions and effective conflict resolution techniques. Furthermore, art therapists are particularly adept at balancing structure and flexibility while fulfilling multiple roles, as well as balancing power dynamics through helping clients to discover individual strengths and artist identities. Despite the great possibilities for art therapists to be more involved in community-based arts practices, art therapists wishing to do this work may benefit from additional training in diversity and multiculturalism, systemic issues in specific communities and their effects on social, emotional and mental health, and multidisciplinary learning in related fields such as community psychology, social work, disability studies and social justice. Recommendations for a framework of practice will be made to inform art therapists on how to effectively utilize their art therapy knowledge and skills as a vehicle for healing, reducing stigma and promoting social inclusion, resilience and empowerment within a community.

HUMANITIES & SOCIAL SCIENCES

Online Religion? A Survey of the Information Landscapes of Roman Catholicism and Zen Buddhism

HM-01

Tim Gorichanaz

Advisor(s): Deborah Turner

Graduate Student

College of Computing and Informatics

Advances in technology allow for new modes of access to both secular and religious information. Historically, some religious groups seem to have been eager to acknowledge technological developments, while others have done so reluctantly. Nevertheless, the sustainability of a religious tradition depends on the ability of its practitioners to continually access information in an evolving world. Modern technology has occasioned broader religious information landscapes than ever before, to the extent that religion can seemingly be practiced using entirely online tools. Is this possibility borne out in reality? Through an analysis of the nature and historical development of Zen Buddhism and Roman Catholicism, this study identifies some aspects inherent in each tradition that have influenced each one's religious information landscape. It then explores the extent to which each religion can be practiced without an in-person faith community. These findings suggest an opportunity for further investigation into the information behavior of technology-enabled believers as a means of better understanding the future of religious experience.

The Effects of Self-Book© Art Therapy on Emotional Distress in Female Cancer Patients: A Randomized Controlled Trial

HM-02

Donna Radl

Co-Author(s): Dr. Nancy Gerber, Dr. Lydia Komarnicky, Dr. Tom Hardie, Dr. Mark Moore

Advisor(s): Dr. Joke Bradt

Graduate Student

College of Nursing and Health Professions

Creative Arts Therapies

The purpose of this study was to evaluate the effects of the Self-Book© art therapy intervention on emotional distress and psychological well-being in female cancer patients during active oncology treatment (radiation and chemotherapy). Assessing and treating patients' unmet emotional needs is a national focus in oncology care today. The intervention provided patients with an opportunity to portray their feelings and identify coping skills artistically through a creative process.

Art therapy is based on the theory that the human mind tends to experience intrusive and avoidant stress response symptoms when faced with adverse events, such as a life-threatening illness. Creative expression can help patients reintegrate their sense of self and strengthen personal attributes.

To evaluate the intervention, a repeated measures randomized controlled trial design was employed. Sixty consenting women from Hahnemann University Hospital were enrolled and randomly assigned to either the six-session Self-Book© art therapy intervention group or the standard care control group. Data were collected at four time points: baseline, week 3, week 6, and 1-to-2 month post-intervention follow-up. Forty complete sets of data were included in the final analysis.

Results suggest that Self-Book© art therapy may help decrease emotional distress and enhance spiritual well-being in female cancer patients during active oncology treatment. Positive trends in the data were present, but there were no statistically significant differences between the groups for the two main variables. Small treatment effects were found for Self-Book© art therapy on participants' psychological well-being. However, one subscale measure revealed statistically significant greater improvements in Self-Book© art therapy participants' spiritual well-being compared to the standard care control participants. Additionally, 30% of art therapy participants reported post-intervention emotional distress scores that were below the clinical range for emotional distress, compared with only 5% of standard care control participants, suggesting that Self-Book© art therapy has clinical significance. Analysis of limited narrative data from exit interviews contributed to positive trends in emotional distress, suggesting that emotional needs were met for the majority of Self-Book© art therapy participants.

Tweets, Likes, and Click-Throughs: Assessing the Return on Investment of Higher Education Social Media Marketing Initiatives

HM-03

Christina Crovetto

Advisor(s): Gregory Naylor

Graduate Student

School of Education

Higher Education

Although higher education institutions have gradually adopted and integrated social media technologies into their marketing efforts, the efficacy of these initiatives has not been substantially measured. Higher education poses a different set of challenges for marketing professionals, who must navigate the constantly changing social media landscape in their attempts to promote their institutions' mission and image to students, parents, and alumni both within the United States and abroad. To this end, institutions must strategize and increase their marketing efforts in an increasingly competitive marketplace. This research study set out to examine the extent to which social media technologies are being utilized and measured by college and university marketing professionals to promote their institutions' mission and image. The purpose of this study was to measure the efficacy of university marketing initiatives distributed through social media vehicles including Facebook, Twitter and YouTube on promoting the mission and image of higher education institutions. For purposes of this study, an online survey instrument was e-mailed to marketing and communications professionals employed at public and private colleges and universities across the United States. Both multiple-choice and open-ended questions were included in the survey, as well as questions incorporating a five-point Likert scale. This research study is significant to the field of higher education marketing and communications as it demonstrates the extent to which professionals in the field are successfully utilizing social media to promote their institutions' image. The implications of this study can serve to identify deficiencies in the current technologies and measurement tools that will help to create newer, more effective tools to gauge the return on investment of these institutions' marketing initiatives.

Encoded Exposure and Social Norms in Entertainment-Education

HM-04

Amy Henderson Riley

Co-Author(s): Suruchi Sood, Paramita Dasgupta Mazumdar, B Narendra Nath Chowdary, Alka Malhotra

Advisor(s): Suruchi Sood

Graduate Student

School of Public Health

Department of Community Health and Prevention

Entertainment-education is an effective health communication strategy that combines or embeds educational messages into entertainment programs to bring about social and behavior change. For years, scholars have considered “how” entertainment-education works. Some contemporary theories posit that entertainment-education does not directly engender behavior change but does so through mediating variables. This study is one of the first to explore the direct relationship between exposure and social norms. Key to this study is encoded exposure, a unique measure of exposure, which includes recall, involvement, and dose in its operationalization. Using cross-sectional data from Kyunki... Jeena Issi Ka Naam Hai, an entertainment-education program in India, results from this exploratory analysis indicate a significant relationship. How can we apply this finding to future programs? Questions remain, but if social norms are not an intermediary but the true outcome itself, then our educational narratives may have a wider capacity for change than we ever imagined.

What Was Ours Is Now Theirs: A Textual Analysis of Punk Rock Press Coverage in Rolling Stone, 1994-2014

HM-05

Ellen Bernhard

Advisor(s): Jordan McClain

Graduate Student

College of Arts and Sciences
Culture & Communication

1994 was an important year for punk rock. It was the year that Green Day's third album, *Dookie*, reached mainstream success on the Billboard charts, garnering the band significant attention from music journalists and MTV. In the same year, the Offspring's *Smash* became one of the most successful records to be released on an independent label, with over 10 million sales worldwide since its release. Twenty years later, these punk bands, along with numerous others, still frequent the pages of music magazines across the country. They have acted as the poster-children for punk rock, allowing unfamiliar readers to become acquainted with the subculture through countless articles, album reviews, and interviews.

In order to gain a better understanding of this phenomenon, framing theory will be applied to the press coverage of pop punk from 1994 through 2014. Framing theory looks at the ways in which a phenomenon is presented to an audience under various circumstances, and will be a useful tool in understanding how music journalism's perception of pop punk has evolved over time. The purpose of this study will be to investigate how the media frame punk rock and how this frame has changed over the last twenty years. Using textual analysis and the online archives provided by Rolling Stone magazine, I will analyze the reoccurring themes within the press coverage that surround punk rock from 1994 through 2014, using specific keywords and terms to guide my data collection. The goal of this study is to help understand the press coverage and subsequent discourse that has surround punk rock for the past two decades. It will also help to determine how the mainstream discussion of the genre allows punk rock to be accessible to a wide audience.

Indemnity: An Activist Game Conveying Latino Immigration Motivations

HM-06

Caroline Guevara

Advisor(s): Jichen Zhu

Graduate Student

Westphal College of Media Arts & Design

Digital Media

The use of games for educational, advertising and activist purposes has been increasing in recent years to address social issues ranging from genocide to world hunger. One of the many social problems that needs to be addressed is the underlying causes that are forcing thousands of Latino immigrants, mostly children and teenagers from Central America, to seek asylum in the U.S. The reasons are often complex and interrelated and are misunderstood by many. Focusing on this issue by breaking down the various factors that contribute to it through an activist video game may clear up negative misconceptions and persuade audiences to become more empathetic for this underrepresented group. The creation of an activist video game following a persuasive game framework, often used to convey how a certain system works or should work, will be used to convey the motivations of forced Latino immigration to the U.S. The game will place emphasis on both game mechanics and story ensuring that they complement each other. This is done so in a way to highlight how teenage Latino immigrants cannot find peace in their current living situations, regardless if they leave their country or stay. This game will aim to educate audiences on the life threatening dangers young Central Americans face on a daily basis as well as measure how effective the game is on spreading social awareness.

A Pilot Study in HCI Evolution

HM-07

Houda El Mimouni

Co-Author(s): Zheng Chen

Advisor(s): Xia Lin, Erjia Yan

Graduate Student

College of Computing and Informatics

Information studies

Since humans have been interacting with computers, research has been conducted to make the interaction smoother and friendlier. Human computer interaction research has impacted our lives, as computers have become an integral part of it. It has shaped the way we create knowledge, learn, think, communicate, and collaborate. Thus understanding HCI history is understanding our history. However, the scarce research conducted on this topic cites only the prominent events of the history of HCI on timelines and thus documents the “what happened” but never the “how it happened”. A more comprehensive approach to writing the history of such a field of endeavor should include the way new related concepts emerged, how they developed and how they became popular. Our study aims at finding a new approach for understanding the history of HCI. It endeavors to connect the dots by capturing concepts’ birth through published research. The treatment of Web of Science records on HCI using a data mining and informetrics approaches yielded interesting results on the evolution of HCI.

You Are Not a Muslim: Minority Rights and Sharia Interpretation in Pakistan

HM-08

Wajeeha Choudhary

Advisor(s): Rachel R. Reynolds

Graduate Student

College of Arts and Sciences

Communication

This project explores the production of Sharia in Pakistan in relation to the treatment of religious minorities from the lens of speech acts theory. Specifically, this project investigates the status of the Ahmadiyya Muslim Community, a revivalist Islamic community deemed heretical and non-Muslim by the constitution of Pakistan. To investigate this issue, I conduct a discourse analysis of the Pakistan's second constitutional amendment declaring Ahmadis as non-Muslim and Ordinance XX of 1984, with special emphasis on the denial of self-identification for Ahmadis as Muslims. The discourse analysis indicates Pakistan's narrow, dogmatic and exclusionary interpretation of Sharia, and also a perversion of liberal systems (e.g., Pakistan's supreme court) to support orthodox Sunni agendas. This discourse analysis is supplemented with and supported by ethnographic accounts of first and second generation American Ahmadi Muslims of Pakistani origin. The primary purpose of the ethnographic accounts is to demonstrate some of the far-reaching and residual ramifications of Sharia interpretation in Pakistan as it continues to impact those outside of the borders of Pakistan. Therefore, this project also calls upon issues of transnational-immigrant perspectives.

Who Teaches Us What's Right - Can Virtue be Taught in a Classroom Setting?

HM-09

Sarah Margulis

Advisor(s): Peter Amato

Undergraduate Student

College of Arts and Sciences

Philosophy

Today, ethics courses are commonly taught at most universities. However, what it is that these ethics courses are actually teaching us, is a crucial question that is seldom examined.

The goal of this project was to examine whether or not ethics – in and of itself – could be taught in a classroom setting. Many ethics classes today focus strongly on ethical theory, and very little on what it means to be an ethical person. By conducting a meta-analysis of works of the ancient philosophers Plato and Aristotle, the modern philosopher Immanuel Kant, and the contemporary philosopher Gordin Marino, I attempted to determine whether or not an ethics course could train students to act virtuously.

I was able to conclude that the best way to teach virtue in a classroom is to design a course centered on personal development of the students. Ethics professors would need to serve as mentors to their students; encouraging them to delve into their own personal virtues – as opposed to teaching them ethical theory written by others.

This research project, completed as part of the 2013-2014 Humanities Fellowship Program, was completed with the goal of eventually introducing an ethics course of the above nature to the Philosophy Program at Drexel.

An Examination of Religious Coping and Depression Amongst Infertile Muslim Women

HM-10

Mona Elgohail

Co-Author(s): Pamela A. Geller

Advisor(s): Pamela A. Geller

Graduate Student

College of Arts and Sciences

Psychology/Clinical Psychology

Infertility is a deeply distressing experience that affects millions of women each year, with many also suffering from depression. Depression may increase the risk of experiencing infertility, and decrease the success rate of infertility treatment. Studies suggest that strong religious beliefs may be protective against depression, and lead to better infertility treatment outcomes; however, in the Western world these connections remain unexplored outside of Christian populations. Studies suggest that American Muslim women may experience higher levels of depression than the general population of women, and therefore may be particularly prone to infertility and unsuccessful infertility treatment. While it has been common practice to apply Christian conceptualizations of religiosity to Muslims, evidence suggests that this approach is inadequate in conceptualizing Muslim religiousness. This poster will provide an overview of an ongoing project that seeks to extend our understanding of the relationship between depression, religiosity, and infertility by investigating the role of religion in shaping the psychological well-being of infertile Muslim women living in a Western context. Muslim women residing in the US, Canada, the UK, or Australia with self-reported infertility are being recruited to complete an online survey consisting of a demographics questionnaire, CESD-R, Fertility Problem Inventory, and the Brief RCOPE. A positive relationship between depression and infertility-related distress is hypothesized. It is also hypothesized that religiosity will be inversely related to depression and infertility-related distress. This is the first study to address this gap in the literature in hopes of guiding the development of interventions that benefit infertile Muslim women physically and mentally, and increase their chances of successful pregnancy.

This made me very emotional: A mixed method study of digital game players and emotion

HM-11

Alexander Jenkins

Advisor(s): Ernest Hakanen

Graduate Student

College of Arts and Sciences

Communication, Culture, and Media

The digital game industry has been undergoing revolutionary changes. Included in this has been an increase in the number of game developers actively using games to evoke emotions from players. This research was a mixed methodology design. The qualitative method employed was a discourse analysis of 27 video game player journals collected from gamers. The quantitative portion of the study was an online questionnaire distributed to 400 users of Amazon Mechanical Turk (MTurk). This portion of the study used Hakanen's (2004) Emotional Recognition Inventory. A principle component analysis was conducted on the 11 emotions from the inventory and three groupings were retained -- positive emotions (excitement, delight, happiness, satisfaction, and passion), negative emotions (anger, grief, sadness, and frustration), and ego-centered emotions (pride and satisfaction). Findings suggest that age plays a part in how gamers experience emotion in digital games, with those 18-29, more likely to identify positive emotions, negative emotions, and ego-centered emotions than players age 50 and up. Players largely reported agreeing or strongly agreeing that they felt positive emotions and pride while playing digital games and disagreeing or strongly disagreeing that they felt anger, sadness, or grief when they played digital games. In the qualitative study players frequently discussed the presence of negative emotions while they played a digital game. Frustration and anger were frequent topics of discussion in the journals, as were feelings of sadness during certain moments of gameplay or in the narrative of the digital game. This discrepancy indicates that there are differences in how gamers experience emotion while playing a digital game and how they recall emotions.

A Scientometric Exploration of Creative Ideas in Economic Sciences: Nobel Prize Laureates (2000-2014)

HM-12

Meen Chul Kim

Co-Author(s): Yongjun Zhu, Qing Ping, Yuanyuan Feng, Chaomei Chen

Advisor(s): Chaomei Chen

Graduate Student

College of Computing and Informatics

PhD in Information Studies

In this study, we aim to keep track of how creative ideas in economic sciences have evolved and influenced successive research. Toward that end, we explore the intellectual landscape around the Nobel Prize awardees and identify thematic patterns, landmark articles and emerging trends and new developments in economics. Our investigation is based on two sets of bibliographic records retrieved from the Web of Science. The core dataset, obtained through an author search, contains 1,745 original research and review articles. The expanded dataset, consisting of 134,866 articles and reviews, was collected by citation expansion. We identified intellectual landscapes, landmark articles and bursting keywords of the domain in core and broader perspectives. We found that the dominant research themes that had influenced the laureates' research from 1980 till 1999 were macroeconomic tests and economic analysis in time series. Then, the creative ideas have diverged into a variety of issues such as labor market, economic governance, market design, asset pricing and cognitive aspect of economic decision making. We identified that these ideas have been diffused into successive research topics such as intertemporal general equilibrium model, reciprocity in economics, estimating profitable asset pricing and socio-ecological economics. Furthermore, it is argued that economic research around the laureates has become divergent over time. The significance of the present study lies in our motivation of comprehensively exploring the diffusion of creative ideas in science.

Understanding Available Spaces at a Boys and Girls Basketball Clinic in North Philadelphia

HM-13

Christopher Bonnaig

Advisor(s): Dr. Anthony Glascock

Undergraduate Student

College of Arts and Sciences

Department of Anthropology

As a part of my Ethnographic Methods class this winter, I conducted research at Strawberry Mansion High School in North Philadelphia. Every Saturday, between January 10 and February 28, I attended basketball clinics for 4-7 year olds conducted by “Basketball Builds Bridges”, a community based organization that uses basketball as a means of engaging both adults and children in activities that can lead to success. During the clinics, I used the method of participant observation to collect information on the interactions between: parents and children; children and coaches; parents and parents; and coaches and parents. My emphasis during the first three sessions was to establish rapport, as well as to create a role that allowed my presence at the clinics to be viewed as normal. Based upon the field notes that I took during these first three sessions, I was able to develop a topic—how do the parents at the clinics arrange themselves, during the clinics, within the available spaces in the gym?”—and a series of five working hypotheses. Over the next five sessions, I collected data through observation and interaction with all three groups to test these five hypotheses. Although the findings supported all five of my hypotheses, the most important thing I learned from the research was the difficulty of conducting research in an environment, which, on the surface appeared to be relatively confined, but turned out to be quite complex and challenging. My findings have also led to a larger research project on the role of personal networks in the success of community organizations in North Philadelphia which I will be pursuing during the Spring Term.

Effectiveness of Social Media on Higher Education Student Recruitment

HM-14

Alissa Totten

Advisor(s): Greg Naylor

Graduate Student

School of Education

Higher Education Administration and Leadership

In the past decade, social media has established a prominent role in communications, both in personal and business settings. From advertisements on billboards to magazine ads and commercials on television, social media presence has grown exponentially and continues to expand, even reaching into the realm of higher education, particularly in the arena of student recruitment. In efforts to comprehend the presence and impact of social media on higher education student enrollment, a study was completed with first-year students at Florida Southern College. Through this study, first-year student study participants completed an online survey that allowed the researcher to gather data on general participant social media use and exclusive use of Florida Southern social media prior to accepting their offers of admission. Additionally, participants were asked to share their opinions on the impact of Florida Southern social media on their decision to enroll. Mirroring the findings of past comprehensive studies that also examined particulars of social media and student recruitment, this study's findings suggest that while most prospective students are accessing Florida Southern social media, the majority of those individuals are not being specifically influenced by the social media profiles to enroll. Other factors, such as campus visits, the institution's website, and communication with college employees, such as admissions counselors, prove to be the most influential in students' making their decision to enroll at Florida Southern.

(Co-)Branding Multidimensionality: Questioning celebrity endorsement models through Uniqlo's myriad of relationships

HM-15

Myles Ethan Lascity

Advisor(s): Brent Luvaas

Graduate Student

College of Arts and Sciences

Communication, Culture and Media

Academic interest in branding has been slow to interrogate the use of celebrities and sponsorships. Studies and publications tend to be sparse and narrow in their scope. McCracken offers perhaps the most extensive discussion of celebrity endorsements where he argues that celebrity qualities must align with the product in order for the endorsement to be successful. In doing so, attributes assigned to a celebrity get transferred to brands in the minds of consumers through the endorsement process. However, clothing retailer Uniqlo seems to complicate McCracken's model by relying on dozens of celebrities to help create their brand image. The brand sponsors athletes, collaborates with fashion designers and uses celebrities in social media campaigns, all from seemingly different spheres and outlooks.

This paper seeks to question McCracken's model in light of a Uniqlo's myriad of brand relationships, and, in turn, offer a dialogic model of co-branding in its place. First, this paper will explore the multitude of celebrities that have been attached to Uniqlo, in order to understand what attributes would be provided through McCracken's model. Finding that the attributes are too numerous for the brand to be intelligibly understood, it will be suggested that celebrity endorsements should be understood as an intricate form of co-branding. The co-branding process is dialogic in that while the celebrity's image transfers to Uniqlo, the brand also provides attributes to the celebrities. Taking this discussion to brand literature, then, it will be suggested that multiple endorsements help to create a multidimensional brand image that can appeal to different segments of the population. In doing so, brands cannot be understood as a monolithic creation, but must be explored across various networks and subjective experiences.

Sexting and Sexual Satisfaction Among Adults: Results of an Online Investigation

HM-16

Emily Stasko

Co-Author(s): Pamela A. Geller, PhD

Advisor(s): Pamela Geller

Graduate Student

College of Arts and Sciences

Department of Psychology

Sexting, defined as “sending, receiving, or forwarding sexually explicit messages, images, or photos through electronic means”, has received growing attention as a risky activity, associated with numerous other risk taking behaviors (e.g., unprotected sex) and negative health sequelae (e.g., sexually transmitted infections). This research explored possible positive effects of sexting on sexual satisfaction. Leveraging a novel Internet platform (Amazon’s Mechanical Turk), this study recruited a large sample of English-speaking participants (N = 870), aged 18 and 82 (M = 35.30 years, SD = 10.02), who lived in the United States, had access to the Internet, and completed a survey assessing sexting behaviors and sexual satisfaction. The analyzed sample was mostly female (57.70%), white (80.60%) and reported being in a relationship (74.0%). The majority (87.80%) of the sample reported having sexted in their lifetime and 82.20% reported sexting within the last year. Lifetime sexting partners ranged from 0 to 100 (M = 3.52; SD = 6.83). ANCOVA analysis revealed a significant main effect for relationship status, $F(2, 734) = 7.18, p < .01, \eta^2p = .02$ (small) and for lifetime sexting behavior (M = 18.54; SD = 6.96), $F(1, 734) = 9.79, p < .01, \eta^2p = .01$ (small) on sexual satisfaction (M = 19.43; SD = 5.16). We found that sexting is prevalent among adults. Greater levels of sexting were associated with greater sexual satisfaction and participants who identified as single had significantly lower levels of sexual satisfaction than those casually dating or in a relationship. These findings indicate a robust relationship between sexting and sexual satisfaction. Given the possible implications, both positive and negative, for sexual health, it is important to continue investigating the role sexting plays in current sexual relationships.

Teacher Learning of Mathematics in Online Spaces

HM-17

Anthony Matranga

Advisor(s): Jason Silverman

Graduate Student

School of Education

STEM education/Educational leadership development and learning technologies

This study investigates the ways in which in-service secondary mathematics teachers engage with mathematics content knowledge in an online master's course, with a particular focus on the role of technology in this learning process. Two research questions guide this investigation: (1) how do individual understandings of mathematics content and collective ways of reasoning emerge in online spaces? (2) How do normative ways of participation amongst participants reflect those that are central to an existing community of mathematics teacher educators? A central aspect of this study is the development of an emerging conceptual model designed to study mathematics learning in online spaces. The purpose of this conceptual framework is to capture the nuanced, reflexive relationship between the individual, collective and technology when engaging in the process of learning mathematics in online spaces. In particular, this model takes the concept that individual cognition is qualitatively different when engaging with technology and integrates it with a perspective that coordinates individual psychological and sociocultural theories of learning. In this way, the crux of the conceptual model is to account for how technology both changes the learning process and affords the development of norms and practices that are specific to an existing community. In this poster presentation, existing theoretical perspectives of learning are presented to provide the foundation for a discussion of the conceptual model that is being proposed for the study of mathematics learning in online spaces.

Depression, Stress, and Health Behaviors among Mothers in the Neonatal Intensive Care Unit

HM-18

Lauren DeRuyter

Co-Author(s): Alexa Bonacquisti, M.S., Victoria Grunberg, B.S., Pamela Geller, PhD, Chavis Patterson, PhD

Advisor(s): Pamela Geller

Graduate Student

College of Medicine

Master of Medical Science

Currently, in the United States, approximately 7-15% of infants born each year are treated in a neonatal intensive care unit (NICU). NICU admission often presents significant practical and emotional challenges for parents, including difficulty establishing parental identity, limitations on holding or feeding the infant, worries about the infant's health, stress regarding other family or occupational demands, and even coping with the possibility of neonatal death. Moreover, mothers in particular must simultaneously manage their own physical and psychological health in the postpartum period as they recover from childbirth and transition to this role. Mothers of infants in a NICU have reported higher levels of psychological distress compared to other postpartum mothers. Depressive and stress symptoms are among the most common mental health symptoms for postpartum women and may be especially relevant for NICU mothers; however, the psychological impact of parenting a NICU infant remains understudied. Additionally, health-promoting behaviors have been shown to predict postpartum depressive symptoms, although this construct has not been well-documented within this particular population. This ongoing study examines the relationships between depression, stress, and health-promoting behaviors in mothers of infants in a NICU. To date, mothers have been recruited from the NICUs at Hahnemann University Hospital (n = 14), Cooper University Hospital (n = 23), and from the N/IICU at The Children's Hospital of Philadelphia (n = 3). Mothers are assessed at two time points, once during their infant's NICU admission and then three months later. The present study is ongoing with the aim of recruiting 120 participants. Data on depressive and stress symptoms and the presence or absence of health behaviors among mothers will be presented and discussed. Clinical implications relevant for improving women's physical and mental health in the postpartum period will be addressed.

Quotas, Affirmative Action, and the Students they were created for: An Examination of Black Student Experiences in Brazilian Higher Education

HM-19

Jeaná Morrison

Advisor(s): Rebecca Clothey

Graduate Student

School of Education

Educational Leadership Development and Learning Technologies

The first policy to enforce the quota system in Brazilian Higher Education was initiated in 2003 to legalize the use of vagas, or reserved spaces for underrepresented students in universities. As a result, the number of state funded universities increased from 4 in 2003 to 84 in 2008. Since then, more Black students have been able to attend the universities of Brazil, however, at what expense? Race has been and continues to be a very complex issue in Brazil where more than half of Brazilians identify as multi-racial. As a result, this complicates understandings and perspectives of race in general and who should benefit from quotas in particular. Using an exploratory sequential design, this mixed methods study examines how self identified Black university students negotiate “race” under a policy mandated to ensure opportunity on one hand, within institutional environments that restrict opportunity on the other.

Insomnia and its Association to Depressed Mood in a Community Sample of Postpartum Women

HM-20

Amy Gencarelli

Co-Author(s): Steven Smith, Christina Nash, Jacqueline Kloss

Advisor(s): Jacqueline Kloss

Graduate Student

College of Arts and Sciences

Psychology

Introduction: Sleep disturbance during the postpartum confers risk for postpartum depression (PPD). Less well established are the types of sleep disturbance that contribute to PPD. The present study sought to examine the degree of insomnia severity among postpartum women (PPW) and to qualify for whom (based on demographics) and when (based on time post-delivery) insomnia was most pronounced.

Method: Data for the present analyses were extracted from a larger study on sleep disturbance, physical activity, and PPD. Using online data capture from a community sample of women ($n = 108$; 6 weeks to 6 months postpartum), demographic information (SES and financial status, age, race), insomnia severity (insomnia severity index; ISI), and time since delivery (less than or greater than 12 weeks postpartum) were examined in association with PPD (Edinburgh Postnatal Depression Scale).

Results: 19% of PPW had moderate to severe insomnia; 35% had subthreshold insomnia. Insomnia severity was higher in early PPW ($M = 9.9$, $SD = 5.6$) compared to later PPW ($M = 7.7$, $SD = 5.3$), $p = .04$. Racial differences emerged with ISI scores higher among Asian Indians compared to Caucasians ($M = 10.7$, $SD = 5.2$ vs. $M = 7.6$, $SD = 5.5$). While age and SES were not associated with insomnia severity, endorsement of financial difficulties was associated with insomnia severity. ISI scores accounted for PPD, even when controlling for demographics and time since delivery, r^2 change = .33, $p < .001$, $\beta = .61$.

Conclusions: Our findings are consistent with other studies that show an association between sleep disturbance and PPD, and further qualify that insomnia symptoms, in specific, warrant attention during this transition, particularly among early PPW. While the cross-sectional data preclude causal interpretation, prospective data that carefully assess insomnia throughout the postpartum in relation to depression are needed.

The Neurocognitive Effects of Anxiety, Depression, and Childhood Trauma in Young Adulthood

HM-21

Jennifer Mongiat

Co-Author(s): Mark D. McCurdy, Elise Turner, Elizabeth Nicholls, Aimee Hildenbrand, Brian Daly, PhD

Advisor(s): Dr. Brian Daly

Undergraduate Student

College of Arts and Sciences

Psychology

Individuals exposed to childhood trauma (CT) are at increased risk of experiencing depression and/or anxiety in adulthood. Both CT and depression/anxiety have been found to contribute to reduced neuropsychological outcomes in intellectual and executive functioning domains. The aim of the present study is to examine the relationship between CT and neurocognitive functioning in young adults with moderate to severe symptoms of depression and/or anxiety. It is hypothesized that, among individuals with significant mood disturbance, those with a history of CT will perform worse on measures of intellectual and executive functioning compared to those who have not experienced CT. Data were collected as part of a larger study examining the effects of CT on neurocognitive outcomes. Participants met criteria for the current study if they reported moderate to severe symptoms of depression and/or anxiety via the Beck Depression Inventory and Beck Anxiety Inventory. Forty-six participants met criteria, and were classified as either having experienced CT ($n = 32$) or not ($n = 14$) based on responses to the Childhood Trauma Questionnaire. Intellectual functioning was assessed via the Wechsler Abbreviated Scale of Intelligence and executive functions were measured with the Delis-Kaplan Executive Function System (verbal fluency, color-word interference, trail-making test), and self-reported Behavior Rating Inventory of Executive Function. Independent samples t-tests were used to examine group differences. Results showed that individuals that experienced CT performed significantly worse on measures of intelligence, verbal fluency, and color-word interference ($p < .05$). However, groups did not differ on the trail-making test or self-reported executive functioning ($p > .05$). Findings suggests that a history of childhood trauma, in correlation with moderate to severe depression and/or anxiety, may be an additional risk factor for neurocognitive dysfunction extending into young adulthood.

Effect of dieting history and food-related behaviors on comprehension of food-related words

HM-22

Elif Celikors

Co-Author(s): Allison Britt, Samantha Winter, Michael Lowe, Daniel Mirman

Advisor(s): Daniel Mirman

Undergraduate Student

College of Arts and Sciences

Department of Psychology

Cohorts, or words that share initial sounds, are activated as spoken words are processed (e.g., “camera” and “camel”). Eye-tracking reveals that listeners tend to fixate cohort competitors more than unrelated items when trying to find a picture that matches a spoken word. We examined how hedonic properties of the word and personality properties of the listener affect this basic aspect of spoken word comprehension. Specifically, the current investigation explores (1), the impact of dieting history on cohort competition when highly palatable food items were used as competitors (e.g., “chocolate” as a competitor for the target “chopsticks”), and (2), differences between dieters and non-dieters on self-reported measures involving food-related feelings and behaviors. Although it was hypothesized that dieters would be more distracted by palatable foods, they showed significantly less cohort competition with highly palatable competitors than non-dieters did. Survey results provided one potential explanation for this finding: dieters responses’ indicated higher levels of cognitive restraint. Experience with cognitively regulated eating might lead to more avoidance of palatable, generally unhealthy foods.

Behavioral and Neural Correlates of Fluency Deficits in Aphasia

HM-23

Amanda Kraft

Co-Author(s): Daniel Mirman

Advisor(s): Daniel Mirman

Undergraduate Student

Pennoni Honors College

Custom-Designed Major

Fluent language production requires coordination of all levels of language processing and is a distinctive impairment in aphasia following stroke. Measures of fluency in aphasia attempt to capture these processes in terms of semantic and syntactic content, grammatical form, and rate of speech. In this study, we examine the behavioral and neural correlates of fluency in aphasia by evaluating archival data from 31 individuals with chronic aphasia following left hemisphere stroke. Two approaches were utilized to assess fluency: Correct Information Unit (CIU) analysis and Quantitative Production Analysis (QPA), each of which provides multiple measures to objectively characterize the semantic and grammatical features of spontaneous speech in aphasia. The archival data also included measures of overall aphasia severity, word-level semantic and phonological recognition and production, sentence comprehension, and approximate location and size of lesion. The CIU measures were very highly correlated with one another and with the QPA measure of words per minute. Hence, subsequent analyses focused on the more distinctive QPA measures. These QPA fluency measures were highly correlated with word-level semantic production, but not with sentence comprehension, suggesting that there is some separation between language production and comprehension systems that spans these two levels. Further, QPA measures correlated with damage to left inferior frontal regions, particularly Brodmann area 45. Given this region's involvement in cognitive control functions, fluent language production seems to depend on cognitive control mechanisms. In particular, a common mechanism for rapidly selecting among alternative sentence structures and words to fill those structures appears to be a critical component of fluent language production.

A Place at the Window: Transforming the Catholic Church to Create Space for LGBT Advocacy

HM-24

Seth Jacobson

Advisor(s): Dr. Rajashi Ghosh, Dr. Jamie Callahan

Graduate Student

School of Education

PhD Program

Pope Francis seems to have signaled a dramatic shift in Church discourse surrounding its teachings on sexual diversity; specifically, homosexuality. In myriad statements and interviews since his 'inauguration,' Francis' language has been viewed as a break from a dominant and traditional script of condemnation. This script has been understood as (systematically and directly) reinforcing anti-gay attitudes and behaviors throughout the world. While doctrine has not changed, Francis' language has been recognized as a powerful source for positive social change in the lives of LGBT persons.

Although Pope Francis may play a significant role, a focus on him (and his Office) as bringing about change in the Church's teaching and norms surrounding homosexuality would be incomplete. Such emphasis too heavily focuses on change outcomes (instead of change processes) and on those actors in positions of power. It is along this vein that this paper problematizes the metaphor often employed by scholars to describe the process by which marginalized groups seek social change: 'claiming a place at the table.' Such a process legitimizes the 'table' as the best place through which meaningful social change occurs, and reinforces the power of those seated closest to the table.

Thus, this paper advances a sociologically-oriented critical framework that approaches the process of change through a critical lens by emphasizing the roles of all actors enacting change on the margins. This critical framework provides a theoretical lens through which researchers can come to understand and advocate effective change processes in the Roman Catholic Church with regard to LGBT issues. In seeking to understand change in regards to LGBT issues in the Church, this framework encourages researchers to look away from, and beyond, the table; and instead, to pay attention to spaces and actors closer to a place at the window.

The Relationship Between Shore Withdrawal and Community Economic Prosperity

HM-25

Victoria Durand

Advisor(s): Scott Knowles

Undergraduate Student

College of Arts and Sciences

History and Politics

This research sets out to compare the differences between communities that, after a devastating natural disaster, choose different paths of recovery. The initial comparison was between two communities in the Northeastern United States that chose to rebuild, or retreat entirely. Seaside Heights, a prosperous tourism community chose to rebuild not just once, but several times, whereas Staten Island's Graham Beach retreat, with its residents and businesses relocating to other communities. What differences in economic and social structure between the communities lead to such different courses of dealing with a natural disaster? The research seeks to find out, with the use of public community records, legal research, statements and interviews from residents and news coverage about the towns.

The second half of the research deals with the ways that specifically withdrawal can affect different communities differently. As climate change makes natural disasters, especially hurricanes more common and more dangerous, many experts believe that shore withdrawal will be a necessary inevitability. However, withdrawal will not be an easy process, and will differ for each community that must undergo it. The research seeks to examine how the process of shore withdrawal is different in various communities, depending on their economic structure, main source of income and relative prosperity. The goal of the research is to determine if shore withdrawal has a disproportionate effect on low income communities. If so, it then seeks to find potential ways in which this disproportionate impact could be minimized, and the burden on their citizens lessened.

Effect of Weight Satisfaction on Accuracy of Body Weight Estimation

HM-26

Rachel Bomysoad

Co-Author(s): Rachel Bomysoad, Hallie Espel, Mayra Perez, Brittany Bentley, Jena Shaw

Advisor(s): Jena Shaw

Undergraduate Student

College of Arts and Sciences

Psychology

Introduction: Knowledge of one's body weight is crucial to healthy weight maintenance. Many factors are associated with reduced accuracy of self-reported weight (e.g., high body mass index, infrequent self-weighing, and female gender). Satisfaction with weight and shape may also play a role, though few studies have examined this relationship. To expand on the current literature, we sought to test the hypothesis that individuals would differ on weight reporting accuracy according to level of body dissatisfaction.

Method: Participants (N = 81) were recruited as a part of a larger study aimed at reducing soda consumption among college students. Self-reported height and weight, level of satisfaction with current weight, and anthropometrically measured weight were obtained. Participants were classified according to level of weight satisfaction: dissatisfied, neutral, and satisfied.

Results: A one-way ANOVA revealed that weight satisfaction groups differed on weight reporting accuracy ($F(2, 62.43) = 2.95, p = .06$; approaching significance). Post-hoc Games-Howell comparisons indicated that weight-dissatisfied participants tended to underestimate their weights to a greater degree than participants who were satisfied with their current weight ($M_{diff} = 4.91; SE_{diff} = 2.12$; approached significance: $p = .07$), but did not differ from those who felt neutral about their weight ($M_{diff} = 4.63; SE_{diff} = 2.61; p = .19$).

Discussion: Results suggest that individuals dissatisfied with their weight tend to underestimate actual weight more than those who have positive feelings about their current weight. Individuals who are dissatisfied with their weight may avoid self-weighing and therefore be less aware of the actual number. Alternatively, those who are dissatisfied may tend to report a weight they consider more socially desirable than their actual weight. Future research should investigate the mechanisms by which weight dissatisfaction influences weight reporting accuracy.

Identifying Variables of Decreased Alertness in Railroad Workers

HM-27

Steven Smith

Co-Author(s): Jacqueline D. Kloss, Mary V. Spiers

Advisor(s): Mary V. Spiers, Jacqueline D. Kloss

Graduate Student

College of Arts and Sciences

Psychology

Railroad workers who report reduced alertness are more prone to human factors accidents. What is less well established is which factors, in addition to sleep length and quality, contribute to such accidents. We sought to identify factors that contribute to decreased alertness throughout the workday among railroad workers. Specifically, we aimed to determine the degree to which schedule type (split shift and straight shift) and hours worked per week contributed to decreased alertness throughout the workday, beyond sleep length and quality. The association between stress and alertness was also examined.

Participants were healthy adult males ($n=506$) who were among a public database provided by the U.S. Department of Transportation and Federal Railroad Association. Participants completed daily activity journals for fourteen consecutive days and self-reported on demographic factors as well as general health topics. We identified a decreased alertness group ($n=58$, one standard deviation above the mean) and a no change alertness group ($n=65$, no reported alertness change).

Beyond sleep length and quality ($R^2 = .14$, $p < .001$), split shift (working two separate times throughout the day) and average hours worked per week, accounted for variance in reported decreased alertness throughout the workday ($R^2 = .07$, $p < .001$), while covarying for age and alertness at the start of the day ($R^2 = .06$, $p < .001$). Split shift was associated with a greater decrease in alertness compared to straight shift ($F(1, 121) = 36.79$, $p < .001$), and accounted for 4% of the variance. Greater overall stress was associated with change in alertness ($F(1, 482) = 26.40$, $p < .001$, $R^2 = .05$).

Schedule type and work hours per week are more predictive of decreased alertness among railroad workers than sleep factors alone.

Future in the Past: Temporality in Faulkner's Absalom, Absalom!

HM-28

Scott Olsen

Advisor(s): Dr. Thury

Undergraduate Student

College of Arts and Sciences

English

This project aims to examine strictly Faulkner's handling of temporality in Absalom, Absalom!, and what sort of effects temporal relationships might have on the narrative as a whole. This research on the novel has hit upon a general temporal quality, based on the character's narratives, of an inverse relationship between intimacy with the narrative and the degree of spatial and temporal distance between the events narrated and the character narrating them. An investigation of Faulkner's use of temporality as a narrative device clarifies and augments existing observations about the novel, examining his use of temporality, and considering the effect of temporal relationships on the narrative. It is this element of temporal difference and its effects within on Faulkner's his poetics that I shall focus on. The very fact or implication of temporal distance serves as an implied closure — or at the very least spurns seeking of reasoning behind a temporal shift or change in what was once of a different quality. The study examines Faulkner's use of the temporal structures, such as the "future in the past" tense as well as other related structures and considers how these structures function within the novel.

The subject of study shall be chapter 8 of the novel. Chapter 8 contains, for the most part, narratives delivered by a 3rd person narrator, and the character Shreve, most of which involve embedded narratives (the 3rd person narrator narrates Shreve's narrative), and plenty of interesting material to consider when examining the relevance of the temporal thread presented in the novel. The analysis of Chapter 8 may provide the basis of a future study of the novel in its entirety. We shall see what sort of qualities related to narrative and fiction that can be discerned through Faulkner's use of time in the chapter.

Mapping Perceptions of Environmental Health Risk

HM-29

Brittany Salen

Co-Author(s): Bhavika Patel, Matthew Lesser, Gregory Kunkel, Shreya Patel, Danielle Bartolanzo, Eman Addish, Hined Rafeh, Alexis Carlsson

Advisor(s): Alison Kenner

Graduate Student

College of Arts and Sciences
Science, Technology, and Society

Philadelphia's River Wards are characterized by industrial legacies that have left material and cultural imprints on neighborhoods along the Delaware. Philadelphia's 2035 sustainability initiative, however, is designed to address these legacies through projects guided by community input. How will city and community-based initiatives address suspected environmental hazards, particularly risks from activities that anchor economic development, expand existing infrastructure or were long ago abandoned? Recent redevelopment proposals promise to bring social and economic improvements to the community, but these proposals have also been met with criticism from the community.

This past fall, Drexel researchers conducted a community survey that investigated how River Ward residents perceive environmental conditions in their neighborhood, including how residents obtain information about environmental hazards. The survey also investigated perceptions of civic projects, and what community members felt were priorities for the River Wards district. In addition to the questionnaire, the field team also collected material data for each block surveyed, which included an array of details pertaining to drainage, trash, gardens, businesses, construction sites, and proximity to major roadways. The study seeks to pair geospatial data of community perceptions with ethnographic analysis.

Understanding how communities perceive industrial legacies is critical for future policy and city planning, particularly so that civic and grassroots initiatives include historically marginalized communities and populations. The way in which communities perceive their environments is not only influenced by air quality and trash, for example, but also by an array of socioeconomic and political factors.

Identifying Women's Occupational Patterns in a Long-Term National Health Study

HM-30

Aimee Palumbo

Co-Author(s): Yvonne Michael, Robert Wallace, Anneclaire De Roos, Lucy Robinson, Jana Mossey, Carolyn Cannuscio

Advisor(s): Yvonne Michael

Graduate Student

School of Public Health
Epidemiology & Biostatistics

Studies have found full-time employment predicts better health while aging. However, women are more likely to have intermittent work force participation throughout the life course compared to men. Despite increased labor force participation rates of women in recent decades, comprehensive, longitudinal studies describing women's work patterns are limited. Women between the ages of 50 and 79 were enrolled in the Women's Health Initiative Observational Study between 1993 and 2005 (n=93,605). Women provided information about the 3 longest held jobs. Latent class analysis (LCA) was conducted to assign women into classes of work patterns based on available work history and timing of children. LCA revealed 4 classes of work patterns. The 4-class model had the highest entropy value (0.93) and sufficiently distinct class parameter estimates. Class 1 had the lowest membership, 8% of the study sample, and described women who reported jobs of short duration early in adulthood. Class 2 described 40% of the women. Their 3 jobs spanned most of their adult life, with little or no gap between jobs. Class 3 described women whose 3 jobs were spread out over many years, but with gaps between these longest held jobs. Class 4 described women whose longest 3 jobs were held well after childbearing years. The 4 classes had markedly different levels of socioeconomic indicators. Women in class 2 were younger at baseline, had the most education, were more likely to be never married and have fewer children. Women in class 1 were older and more likely to be married and have high family income, whereas women in class 4 were more likely to have low family income. These findings suggest that work patterns revealed by latent class analysis are meaningfully distinct in terms of job timing and are associated with important indicators of socioeconomic status. The identification of these patterns is an important step in understanding women's employment patterns and their potential impact on health.

Training NICU Nurses to Recognize and Respond to Emotional Distress in Families

HM-31

Cecilia Gaultney

Co-Author(s): Emily Stasko, Ruchika Bhatnagar, Chavis Patterson, Pamela Geller

Advisor(s): Chavis Patterson, Pamela Geller

Undergraduate Student

College of Arts and Sciences

Psychology

As many NICUs move towards family centered care, neonatal nurses face the difficult task of balancing providing intensive care for an infant and supporting the infant's family. This often occurs without much formal training in therapeutic communication and family-integrated care. The purpose of this study was to create, implement, and evaluate a training program for nurses in the NICU that was developed to further educate NICU nurses on two core topics: recognizing and understanding the emotional responses of families in the NICU and effective communication with families in crisis. As part of their ongoing training at the Children's Hospital of Philadelphia, over 350 NICU nurses participated in the training and were asked to fill out three questionnaires anonymously. One questionnaire was completed before participating in the training, one directly after the training, and one two weeks following the training. The questionnaire given immediately following the training included three open-ended questions requesting that the nurses record three things that they learned from the training. This presentation will examine the frequency of three categories of topics in these responses: recognizing/understanding family emotional responses, nurses understanding their own reactions, and tangible actions the nursing staff can take. This poster will also address the needs that staff identified by the training and future application of this training.

What Does Writing Really Look Like at Drexel?: An Exploration of Writing Intensive Courses

HM-32

Jen Jolles

Advisor(s): Scott Warnock, Dan Driscoll

Undergraduate Student

College of Arts and Sciences

English and Philosophy

University Reading and Writing Coordinator at California State University, Sacramento, Dan Melzer writes, “instructors’ writing assignments say a great deal about their goals and values, as well as the goals and values of their disciplines,” asserting that the assignments given in discipline-specific courses provide great insight into the goals and values that drive upper-level, discipline-specific teaching. In extending the research from the project I undertook as a CoAS Humanities Fellow, I am attempting to examine the types of writing assignments given in upper-level, discipline-specific, writing intensive (WI) in effort to give a clear and potentially cohesive picture of what writing really looks like at Drexel.

In examining writing in upper-level, discipline-specific classes, one is able to better understand the genres, challenges, and expectations students encounter across the university. Through this project, I hope to explore what academic really looks like at Drexel. Through the acquisition of this information, I will have a clearer, more cogent picture of writing at Drexel. Hopefully, this information could be utilized in future to help improve both the Writing Intensive program and writing as a practice within the university.

Reevaluating the American Dream: Dominican Immigrant Experiences in the United States

HM-33

Jason Ludwig

Advisor(s): Eva Thury

Undergraduate Student

College of Arts and Sciences

History

Why does the experience of Dominican immigrants often differ from their original expectations of life in the United States? A 2004 study, conducted by Jose Itzigsohn, collected data from surveys completed by 418 Dominican immigrants living in New York City and Providence, RI. Seventy percent of the immigrants surveyed responded that they were unhappy with their current occupations, which they said did not match their original aspirations. The current study aims to address the reasons for the incongruity between immigrant expectations and reality. It is a case study of four Dominican immigrants showing how their experiences in the United States have contrasted with their original expectations, and the cause(s) behind this disparity. The immigrants occupy different socio-economic positions, providing a fuller understanding of the challenges Dominican immigrants face. Participants in the study reported social alienation, discrimination and language barriers as some of the challenges they faced in the United States. As a result, some participants transferred their aspirations for personal achievement into hope for their children's success. These results point to the challenges Dominican immigrants face in realizing the "American Dream," and indicate new ways such immigrants view their place in American society.

Relationship between Psychosocial Maturity and Academic Achievement among Incarcerated Adults

HM-34

Madeline Barry

Co-Author(s): Toni Mascaro, Erinn Tobin, Elizabeth Gale-Bentz, Emily Haney-Caron, Leah Brogan, Sharon Kelley, Naomi E.S. Goldstein

Advisor(s): Naomi E.S. Goldstein

Undergraduate Student

College of Arts and Sciences

Psychology

Prior research has explored the impact of psychosocial maturity on legal decision making, antisocial behavior, and adolescents' academic achievement, but extant research has not examined the relationship between maturity and academic achievement among incarcerated adults, a population with established academic skills deficits. Using Cauffman and Steinberg's conceptualization of psychosocial maturity (i.e., responsibility, perspective, temperance), the current study examined the relationship between psychosocial maturity and academic achievement among 103 adults (56% female) in correctional facilities. Consistent with other studies revealing pronounced academic deficits among incarcerated adults, on average, participants demonstrated 5th grade reading and 6th grade listening comprehension levels on the Wechsler Individual Achievement Test – II. Multiple linear regression analyses revealed that psychosocial maturity significantly predicted both reading comprehension and listening comprehension, suggesting that developmentally-related characteristics—such as autonomy of judgment, consideration of future consequences, and thinking before acting—may play important roles in the acquisition of academic skills among those who eventually enter correctional facilities. Implications of these findings for education will be presented; study limitations (e.g., assumptions of directionality) and areas for future research (e.g., longitudinal and intervention studies) will be described.

Food Safety Knowledge of Older Adults

HM-35

Angelina Adeline

Co-Author(s): Alice Ko, Alexandria Wolz

Advisor(s): Dr. Jennifer Quinlan

Undergraduate Student

College of Nursing and Health Professions

Nutrition Sciences

Adults 60 years and older are one of the subpopulations at greater risk for foodborne illness and serious complications that may arise from it. This group is particularly susceptible to complications from infection by *Listeria monocytogenes*. *L. monocytogenes* is unique because it can grow at refrigerated temperatures. Important consumer behaviors to prevent infection by *L. monocytogenes* include maintaining proper refrigeration temperatures, adherence to use-by dates, and proper handling of leftovers and ready-to-eat (RTE) foods. There is limited research on food safety behaviors of older adults with respect to prevention of listeriosis. The objective of this research was to evaluate the food safety knowledge and handling of adults 60 years and older who prepare their own meals and caregivers responsible for food preparation for adults over 60. A 32-question survey was created using select questions from the 2006 FDA Food Safety Survey. The survey was administered through Qualtrics. Recruitment of the target population was conducted through online forums including Craigslist.com, backpack.com, and social media (Facebook) over a five week period. A chance to win a \$100 Visa gift card was used to incentivize participation. Forty-three individuals completed the survey. While 53% of the respondents reported that knowing that refrigerator temperature is important, 58% do not check the temperature of their refrigerator. Thirty-one percent reported holding leftovers for two weeks or more. With respect to risky food consumption, 60% ate food past its use-by date, 33% ate uncooked hotdogs and 41% ate deli meat which was over 7 days old. These results indicate that there may be a need to better understand mishandling of perishable foods by older adults that might put them at risk for listeriosis. If the results found in this pilot study are widespread among older adults there may be a need to provide targeted food safety education materials for this population.

Is Timing Everything: Verbal IQ Characteristics Across an Academic Term

HM-36

Jessica Madej

Co-Author(s): Jessica Madej, Khushboo Sadadiwala, Nora Koppelman, Stephanie Singer, Mark Houck, Siara Johnson, Naomi Goldstein

Advisor(s): Dr. Naomi Goldstein

Undergraduate Student

College of Arts and Sciences

Department of Psychology

Undergraduate psychology students frequently volunteer to serve as participants in research studies to earn extra credit towards their coursework. Although researchers typically assume that the sampling of students is consistent across the period of recruitment, students may differ in critical characteristics (e.g., motivation, academic achievement, intelligence) depending on when in the academic term they volunteer (i.e., beginning, middle, end). The current study examined data from differences in verbal IQ (VIQ) scores by timing of participation in a research study. Participants were 40 undergraduate students (29 females) between the ages of 18 and 28 ($M = 20.45$, $SD = 2.76$). A one-way analysis of variance revealed no significant differences in VIQ score by time of participation, with mean VIQ scores of 108.31 ($SD = 9.21$), 112.76 ($SD = 11.26$), and 115.50 ($SD = 16.33$) for those students volunteering in the beginning, middle, and end of the term, respectively. Results suggest that researchers' assumptions may be accurate that participants are equivalent across the recruitment period, at least in terms of intelligence. However, alternative explanations (e.g., Type II error) and targets for future research (e.g., differences in other participant characteristics, such as motivation and grades, by timing of study participation) will be presented.

Evaluating Parents in the Know: An innovative parent-focused child sexual abuse prevention program

HM-37

Leslie Reynolds

Co-Author(s): Maria Pajil Battle, Julie Evans, MSW, Delilah Rumburg, Suruchi Sood, PhD, Philip Massey, PhD, MPH, Alexa Livelsberger, LSW

Advisor(s): Philip Massey

Graduate Student

School of Public Health

MPH

Background: To date, efforts to prevent child sexual abuse (CSA) have focused on working with potential and current victims of abuse, with few programs teaching parents bystander intervention strategies. The Parents in the Know program builds upon these approaches by providing parents with skills and confidence to recognize inappropriate behavior and intervene when necessary.

Purpose: To evaluate a child sexual abuse prevention program administered to parents and caregivers.

Methodology: The 8-hour program was presented by trained facilitators at 7 community sites between September and November, 2014 in Southeastern Pennsylvania. Data were collected from participants through self-administered questionnaires completed at baseline and one-month follow. A 3-item CSA misconception scale and 6-item warning-signs scale are used in analysis.

Results: The majority of program participants (n=70) were women (87%) and Hispanic/Latino (52%), with an average age of 37. Findings demonstrate positive changes from baseline participants (n=58) to follow up (n=33). Correct knowledge about CSA misconceptions increased from 82% at baseline to 86% at follow up. Participant ability to identify warning-signs of individuals who may sexually abuse children increased from 62% at baseline to 73% at follow up. Additionally, parents who were confident in their ability to identify community resources on a 5-point Likert scale increased from 68% at baseline to 84% at follow up.

Conclusions: Our findings support the need for parent-focused CSA prevention programs. Strengthening parental skills and capacity to identify potential warning signs of sexual abuse empowers and equips the entire family to be proactive in family and community violence prevention.

Predominance of the mental health history questionnaire within the preparticipation physical examination at NCAA collegiate athletic programs

HM-38

Courtney Loftus

Advisor(s): Dr. Amy Giddings

Graduate Student

Center for Hospitality and Sport Management
Sport Management

According to the latest consensus statement published by the National Athletic Trainers Association regarding recognition and referral of mental illness in student athletes, emphasis is placed on the need to include a mental health history form in the Preparticipation Physical Examination (PPE). As the PPE can be an important tool in detecting red flags for injuries, a mental health history component could very well do the same for athletes experiencing mental illness. This study will (1) examine which NCAA colleges and universities at the Division I, II, and III level include a mental health history component as part of the PPE, (2) identify whether the college or university currently has a plan for referral as a result of “red flags” on the PPE (3) determine whether the PPE is a successful tool for team physicians and athletic trainers to recognize mental illness (4) to determine the number of colleges and universities who have a mental health care professional employed at their collegiate institution (7) and to identify how many of the surveyed colleges and universities have a mental health care professional experienced in caring for student-athletes. This study was conducted through a quantitative and qualitative survey using Qualtrics. This survey will be sent to a variety of NCAA colleges and universities at the Division I, II, and III level in hopes of obtaining at least 15 responses (five from each division). Athletic Trainers representing a variety of NCAA colleges and universities from all division levels who volunteer their time to complete a brief survey on the PPE.

EDUCATION & OUTREACH

Solar Powered Autonomous Vehicle for Education in Sustainable Design

ED-01

Aurel Mathews

Co-Author(s): Kingston Lee

Advisor(s): Richard Y. Chiou, Yalcin Ertekin

Undergraduate Student

College of Engineering

Engineering Technology

This is a multidisciplinary project that integrates advanced technologies through the use of stackable Arduino 'shields' and can be used to teach students about emerging and sustainable practices. This project aims to design, build, and test a solar powered autonomous ground vehicle. The vehicle will be based on a customized remote control car whose steering and acceleration will be controlled autonomously using an Arduino microcontroller. The vehicle will drive to preset destinations using a GPS receiver module and a compass to navigate to waypoints until the destination is reached. The vehicle will be powered using a lithium polymer (LiPo) battery that will be recharged using solar panels. A maximum power point tracking (MPPT) solar charger will be used in between the panels and battery in order to provide the maximum charging current to the battery. A bluetooth module will be used to allow for wireless communication between the vehicle and an Android smartphone.

Korach's Fall: A Game Based Learning Environment for Informal Jewish Education

ED-02

Benjamin Goldberg

Advisor(s): Dr. Michael Wagner

Graduate Student

Westphal College of Media Arts & Design

DIGM

Like many other areas of education, informal Jewish education is now looking to 21st century influences for help in restructuring the manner by which educational material is delivered. Similar to many other religions, ritualistic practices within Judaism are connected to elements of play and games. In addition to this, researchers note the potential of game based learning to afford twenty-first century skills as well as provide a relevant educational methodology for the current generation of students. Thus, we believe that a game based learning environment would help make informal Jewish educational programs more meaningful to contemporary students. Subsequently, we propose the project, "Korach's Fall," a game based learning environment for informal Jewish education.

Collaborative Solar Canopy Design for the McMichael School STEAM Curriculum

ED-03

Sophia Frelke

Co-Author(s): Katherine Walker, Reginald Pharaud, Joshua Stoner, Sofia Mendez, Kathleen Vaccaro

Advisor(s): Dr. Kevin Scoles, Debra Ruben

Undergraduate Student

College of Engineering

Electrical and Computer Engineering, Mechanical Engineering and Mechanics

This presentation describes project goals, design process, and current results of a Solar Cafe designed to be integrated with a new school yard for the McMichael Elementary and Middle School, located in Mantua Philadelphia. The school is currently undergoing major renovations to improve its image and enhance the learning and play environment for students. It is being designed as a sustainable site that promotes learning and play; encouraging the physical health of the students.

As part of this schoolyard project, Drexel's Electrical and Computer Engineering, Mechanical Engineering, and Architecture & Interiors Departments have collaborated in the design of a Solar Cafe, with a Solar Canopy system that will produce 4 kW of peak DC power as well as provide a shaded space for students and faculty to relax and continue the learning process. The Solar Cafe will improve the environment of the neighborhood, while integrating the science, technology, engineering, art, and mathematics (STEAM) curriculum. Power generated can be used to power playground amenities, used by the school, or fed into the grid, which allows for federal and state incentives.

The Solar Canopy will have a south-facing solar array, integrated with digitally fabricated perforated panels that depict student artwork, will provide shade for tables and seating and will involve the students of the McMichael school in the design process. Electrical modeling and analysis was performed using Solmetric iSV application software and System Advisor Model (SAM) from National Renewable Energy Laboratory (NREL).

The architectural design was created with Revit by Autodesk. A solid model was developed in PTC Creo 2.0 from the architectural design, and used to print a scaled 3D model. The design has been verified to be structurally sound with the use of Ram Elements v8i by Bentley. The Solar Canopy's electrical, architectural, and structural goals, constraints, and final designs will be displayed on the poster.

Can STOP Sports Injuries Campaign Prevent Trauma and Overuse Injuries in Youth Athletes?

ED-04

Sarah Egreczky

Advisor(s): Masaru Teramoto

Undergraduate Student

College of Nursing and Health Professions

Health Sciences

The number of youth athletes participating in sports is increasing each year. Consequently, sports-related injuries among youth athletes are a growing concern. In the United States it is estimated that over 3.5 million visits to the emergency department each year are by youth athletes due to sports-related injuries. In 2007, the board members of the American Orthopedic Society for Sports Medicine created a campaign termed STOP (Sports Trauma and Overuse Prevention) Sports Injuries to fundamentally reduce the number of injuries by youth athletes. The STOP Sports Injuries campaign provides a detailed list of preventative guidelines for each sport that coaches, parents, and athletes can employ. This major campaign has been active for about eight years; meanwhile, there are no known data as to whether the campaign is effective in decreasing the number of sports-related injuries in youth athletes. The purpose of this study is to examine if the STOP Sports Injuries campaign has successfully reduced the sports-related injuries among youth athletes. Young athletes are in constant competition with their peers and are put under pressure to become the best in their sports. Their bodies are not fully developed yet, and they are often pushing themselves too hard, which can result in adverse health consequences or even life-long injuries. If the number of injuries has not significantly decreased since the installation of the STOP Sports Injuries campaign, then the goal of the campaign, which is to keep youth athletes playing in their sport for life, is not fully achieved, and a new idea on how to guide youth athletes may need to be designed. If research shows that youth athletes who were following the STOP Sports Injuries guidelines had a reduction in injuries, then the program would be the effective preventative guidelines for youth athletes to follow, so that they can continue to play their sports that they love all throughout their life.

Integrating Smoking Cessation with Substance Abuse Treatment

ED-05

Charlotte Smith

Co-Author(s): Jillian Arthur, MD

Advisor(s): Annette Gadegbeku, MD

Resident/Fellow (MD)

College of Medicine

Family Medicine Residency

Smoking is the leading cause of preventable death in the United States. This public health problem is of particular concern among individuals with substance use disorders in that they smoke at a greater rate than the general public. Smoking-related illness represents a major source of preventable death in persons with drug dependencies. Substance abuse treatment programs harbor a high percentage of smokers however nicotine dependence has historically not been treated as intently as other drug dependencies.. As a result, many persons in these treatment program settings do not receive opportunities to address their smoking.

The aim of this study was to evaluate the effectiveness of the implementation of a group smoking cessation program among residents currently enrolled in a substance abuse rehabilitation program. Participants were all residents of a Salvation Army drug and alcohol rehabilitation facility that was not currently offering any other form of formal smoking cessation counseling. Bi-monthly didactic and interactive sessions were held using a 4-session repeating syllabus and participation in the sessions was strictly voluntary. In addition to the group sessions, nicotine patches were also made available to participants. Records were kept to document the amount the participants smoked and feelings towards smoking, such as cravings, were numerically scaled. These results were pooled among all participants and trended over the length of the program. Results showed that smoking rates decreased, that some participants were even able to quit smoking all together and that 100% of participants would recommend the smoking cessation program to their friends and peers.

Collaborative School Leadership: An Exploration of Teacher Activity Systems in a Progressive High School

ED-06

Mollie Davis

Advisor(s): Kristy Kelly

Graduate Student

School of Education

PhD in Educational Leadership Development and Learning Technologies

This in-progress research proposal aims to explore teacher learning and leadership through involvement in activity systems and communities of inquiry. Communities of inquiry emerge organically to accommodate the learning needs of individuals within an organization, while activity systems provide a theoretical framework for examining the learning that takes place. Observing how members in these communities interact among themselves, in the context of the school, and in the broader context of the school's accrediting agencies offers insight into the relational negotiation between the historical, cultural nature of the school, the social milieu of the communities of inquiry, and the knowledge, skills, and attitudes of the individual teachers. This study employs Institutional Ethnography to explore the leadership structures of the host school and its affiliations to understand how teacher communities mediate democratic, distributed leadership to promote learning shaped by individual and community agency. It is the researcher's belief that future work in this vein will connect to other communities of inquiry to highlight implications for collaboration and democratic leadership, training, and development. At the policy level, this work has implications for teacher training, accountability, and evaluation as it provides a lens for viewing teachers, not as siloed individuals, but as members of a community in constant negotiation with their environment.

Study of Primary Students' Calculation Ability in USA and China

ED-07

Junjing Zhang

Advisor(s): Eva Thury

Undergraduate Student

LeBow College of Business

Accounting

Chinese students rank in first place among 65 members and partners countries in PISA (Programme for International Student Assessment) tests. Besides, many researchers have found that Chinese students outperform USA students in calculation. The current research project aimed to find out the reasons for those differences between Chinese and American students. The project involved research into the effects of language, teachers' tutoring methods, parental influence and found that in-school factors including teachers' teaching methods and textbooks play a role in students' calculation skills. It examined the difference between first year Chinese and American textbooks through a content analysis. The results show 1) differences in the two textbooks including different representation forms for math concepts and different numbers of exercises for some topics and 2) similarities including some of the same topics covered and similar types of exercises given to students. The study shows Chinese teachers 1) have a better understanding of basic math concepts, 2) emphasize basic knowledge for building students' solid basis for future learning 3) enhance Chinese students' understanding of calculation and 4) provides students with a coherent learning process.

A Teaching Toolkit for Particle Physics in High School

ED-08

Nicholas Sfiroudis

Advisor(s): Christina Love

Undergraduate Student

College of Arts and Sciences

Physics

In the last part of the 20th century, physicists have developed the Standard Model of Particle Physics. Although this is our best “theory of everything”, the Standard Model is rarely mentioned in a high school physics curriculum. The goal of this work is to introduce the Standard Model, as well as its current known limitations, to high school students in order to increase their level of interest in science and their level of learning. This will be done through diverse teaching methods consisting of teaching slides, interactive group activities, and a custom made computer application. A teaching toolkit is being developed to combine and distribute these activities. The toolkit will be tested in high school classrooms with pre and post surveys to gauge the success of our work. At the conclusion of this work, we hope to have a complete open source teaching toolkit that other high school teachers around the world can use and adapt.

Land Science: Learning as Identity Exploration

ED-09

Healthy Moeung

Co-Author(s): Sally Im, Heena Rameshkumar, Cali Chesterman, Mamta Shah

Advisor(s): Dr. Aroutis Foster

Undergraduate Student

Westphal College of Media Arts & Design

Animation and Visual Effects

As part of a larger NSF CAREER focused on game design and use for identity change in STEM, this poster presentation examines how one epistemic game supports learning and identity exploration in urban science. In Winter 2014-2015, Land Science, an epistemic game that introduces players to Urban Science, was examined to answer the following questions: (1) "What are the processes of identity change in Land Science?" and (2) "What features of Land Science facilitate desirable identity change, motivation, and learning for students?" First, the design features of Land Science were examined to understand how the game promotes players' motivation and interest to learn Urban Science. The game was also examined to identify the opportunities it afforded players for engaging in an intentional identity exploration process. Second, discourse analysis was used to examine qualitative data from sixteen students in the form of chat archives, notebook entries, and interview responses for what they know about urban science, motivation to learn, and identity exploration. Findings revealed that Land Science facilitated students in constructing knowledge about Urban Science (e.g. rezoning a city). However, the game did not afford many opportunities in aiding players to intentionally reflect on their motivation, values and interests for what it means to be an urban scientist. To date our findings indicate that Land Science did not offer many opportunities for intentional identity change in students. The game offered opportunities for situational interest in urban science and with additional design, motivation, and identity exploration elements could scaffold student interests and eventually nurture identity change. Implications from the analysis of Land Science will be shared on how the game could be incorporated in classrooms, such that students might develop interest in the content and be motivated to learn about Urban Science in relation to their future goals.

The Effect of Peer Review Introduction Messages On Online Writing Center Student Engagement

ED-10

Diana Gasiewski

Advisor(s): Dr. Eva Thury

Undergraduate Student

School of Education

Teacher Education

As higher education progresses into the technologically filled future, educational practices formerly reserved for face-to-face interactions are adapted to an online format. Writing centers—the university student’s resource for strengthening writing practices and developing projects—are part of this technological evolution as they transition face-to-face peer review sessions to synchronous online appointments. Because of the early state of this development, students are often unsure of what to expect as they log onto an unfamiliar online peer review space, and consequently fail to engage fully in the session. In order to improve student dialogue and involvement in an online peer review session, this study tests the effect of introductory messages briefly explaining the peer review process. The hypothesis tested was that if students have an understanding of the peer review process, including their role as well as the tutor’s, perhaps dialogue and involvement will improve. To investigate this hypothesis, I’ve created a research-supported Peer Review Introduction Message (PRIM) to use universally in Drexel University’s online writing center appointments. Drexel’s writing center receives a range of university students in a variety of majors, forming a sufficient participant group for this case study. The study compared 15 online appointments in which the PRIM was administered with 15 online appointments without any sort of introductory. It measured the effect the PRIM had on student engagement, recording the following results in both the PRIM and non-PRIM groups: 1. student word count 2. student to tutor word count ratio 3. quality of discussion via a word frequency analysis and 4. degree of independent revision by the student. It also surveyed all 30 of the students on their perception and comprehension of the peer review process prior to, during, and after the session. After data analysis, results should indicate the PRIM’s effect on student engagement, dialogue and understanding. This research should help writing centers decide whether PRIMs increase student engagement and satisfaction with the peer review process.

Remotely accessible laser scanner prototype to study solar cells defects

ED-11

Pranav Ram Kamarajugadda

Co-Author(s): Chetana Bayas

Advisor(s): Dr. Richard Chiou, Dr. Micheal G Mauk

Graduate Student

College of Engineering

Engineering Technology

A portable, low-cost laser scanner prototype that can be used for multiple research and learning purposes has been developed. One such application is studying defects in solar cells. When a laser is pointed at a spot on a solar cell, the cell gives out a certain amount of current. This current is constant for a monocrystalline solar cell while a polycrystalline solar cell gives out lesser current at points of structural defects caused by grain boundaries. By rastering a polycrystalline solar cell, one can determine the location of these grain boundaries and its degree of granularity. This module can be used as a learning tool that can supplement classroom learning for the Manufacturing Materials course that presents samples of solar cells at various stages of manufacturing to the students. The module has been developed with an intention of being remotely operated to enhance and empower the online-classroom learning experience and help the students better understand solar cell defects.

Raspberry HadoopPI: A Low-Cost, Hands-On Laboratory in Big Data and Analytics

ED-12

Kenneth Fox

Co-Author(s): William M. Mongan, Jeffrey L. Popyack

Advisor(s): William M. Mongan, Jeffrey L. Popyack

Undergraduate Student

College of Computing and Informatics

Computer Science

Educating STEM students in the techniques of massively parallel computing anticipates a growing current and future need for scientists, engineers, and analysts who are facile with Big Data. Using very low cost hardware (Raspberry Pi) and free software (Hadoop) we are exposing students to distributed computing while limiting expense. We anticipate that micro-cluster labs and projects will give students hands on experience necessary so they can be prepared to use these methods in real world applications. A series of lessons and projects were developed to teach Hadoop and MapReduce, and were extended into STAR summer competitive research projects.

Integrating Health Education

ED-13

Evan Goberman

Co-Author(s): Alexander Kregel

Advisor(s): Dr. Leland Rockstraw, Dr. Kathleen Ryan

Graduate Student

School of Public Health

Health Management and Policy/MPH

A simulation workshop involving public health, medical, nursing, therapy, business, informatics, law and other students is planned for April 9, 2015. The goal is to enhance collaborative capacity-building of future health professionals aligned with competencies highlighted by the Interprofessional Education Collaborative (IPEC) (2011). Up to 80 students will be involved in this simulation from various fields (all at the graduate level). The simulation will put students through three clinical—with simulated patients and actors—and non-clinical—scenarios that involve deep analysis and planning in various aspects of health services (i.e. closure of a safety-net hospital, infectious disease outbreak in a mall, pharmaceutical marketing strategy). The four major IPEC competencies targeted are: values & ethics, roles & responsibilities, communication and teamwork. Findings from pre and post surveys during the pilot program (Oct. 2014) found significant attitudinal change in competency & knowledge ($p < 0.001$), roles & responsibilities ($p < 0.001$), communication ($p = 0.0146$) and teamwork ($p < 0.001$) ($n = 15$). Establishing networks, understanding the roles of and having the capacity to work effectively with other professionals are all extremely important skills. Pilot findings suggested that our model for interprofessional health education presents a promising opportunity to improve systems-thinking, collaborative capital, and key competencies in future professionals. To prepare students for excellence in a dynamic and unpredictable environment, we suggest that all professional degree programs relating to health should offer co-curricular interprofessional development opportunities. Our poster will present new data from the planned simulation and a detailed explanation of our methods.

Planitia Hellas Human Advanced Martian Environment (PHHAME)

PS-01

Tirthak Saha

Co-Author(s): Kat Johnston, Frederick Wachter, Matthew Wiese, Matthew Meisberger, Chaitali Vyas, Dipika Sharma, Joe Masgai, Ronnie Joshi, Rishiraj Mathur, Nidhi Kumar

Advisor(s): Dr. Ajmal Yousuff, Amanda Ireland

Undergraduate Student

College of Engineering
Electrical Engineering

Project PHHAME, primarily intended to be Drexel University's entry in NASA's 2015 RASC-AL (Revolutionary Aerospace Systems Concept - Academic Linkage), proposes the human colonization of Mars through the use of innovative technologies and ideas that will provide a stepping stone for future missions, reduce costs of living, and minimize risk to humans.

Project PHHAME, in accordance to NASA's guidelines for the 2024 Mars mission, aims to support a fully self-sustainable colony of 24 astronauts by 2054 on the surface of Mars. Additionally, the colony can also serve as a forward base for other missions exploring the outer regions of the solar system.

This project leads the way through the various advantages PHHAME's habitat would provide to the group of pioneering colonizers on Mars. Firstly, looking through the logistics of the mission itself, it communicates the features of Hellas Planitia -the site of the habitat on Mars, the design of the habitat itself, and describes the precautions set for the health and security of the colonizers. The project then moves on to the designs for the generation of electricity and fuel using Origami-based solar panels, Vertical Axis Wind Turbines (VAWT), and bio-mass decomposition that will sustain the habitat. Furthermore, it covers the hydroponics that are proposed for purposes of food generation and research. The project also shines light upon In-Situ Resource Utilization (ISRU) of the mineral rich ores and subterranean reservoirs using Piezoelectric drills among other on-site custom built equipment.

Thus, this project aims at comprehensively assisting NASA scientists achieve the long standing aim of humanity to colonize out nearest neighbor in the Solar System.

Supporting Research and Education for a More Accurate Tool than the Body Mass Index Scale to Better Identify Health Risks

PS-02

Tara Cooke

Co-Author(s): Anne Woolley, Katerina Raiser, Addison McInnes, Erin McNamara, Christina Gyarmati, Olivia Dalrymple

Advisor(s): Jane Greene Ryan

Undergraduate Student

College of Nursing and Health Professions
Nursing

Using the Body Mass Index (BMI) scale as a marker of obesity, we misclassify 50% of patients with excess body fat as being normal or just overweight. We then miss the valuable opportunities to intervene and reduce health risk in such individuals [32]. The BMI scale shows a good correlation of percent body fat for individuals but fails to discriminate between body fat percentage and lean mass percentage [27]. Recent estimates from NHANES, a nationally representative health examination survey, project that approximately 34% of adult Americans are overweight (defined as a BMI between 25– 30 kg/m²) and an additional 34% are obese (BMI >30 kg/m²) [9]. In contrast, the CDC estimates rates of obesity over 20% in all 50 states with estimated rates over 30% in 12 states [<http://www.cdc.gov/obesity>]. These estimates are fundamental to United States policy addressing the epidemic of obesity and are central to designing interventions aimed at curbing its growth, yet they may be flawed because they are based on the BMI scale [8]. As health care providers, the public entrusts that we use evidence based practice in our clinical approach. The BMI scale is outdated, inaccurate, and lacks supportive evidence of its efficacy. It is up to us as future leaders of health care to promote research of a more accurate tool to detect health risks associated with people's percent body fat.

Development of Self-Folding Auxetic Textiles Through Knit Stitch Architecture

PS-03

Chelsea Knittel

Advisor(s): Caroline Schauer, Genevieve Dion

Graduate Student

College of Engineering

Materials Science and Engineering

The purpose of this research is to discover viable methods of producing self-folding knitted textiles with auxetic characteristics, through the manipulation of geometry and stitch architecture. Due to their force absorbing abilities and unusual deformation mechanisms, textiles possessing auxetic characteristics have potential for applications in a number of fields, including medical, military and athletics. Our research began through the study of knit stitch geometry arrangements, and the observation of the similarities to the paper folding patterns of origami tessellation patterns. These patterns remained an integral part of the pattern development throughout, as research was conducted to find a recognizable relationship to convert from one medium to another. A number of variables were considered for the successful translation from paper to fabric prototypes, including material composition, stitch length, gauge, and tension.

Physics-based Computational Modelling of Knitted Textile Architectures

PS-04

Krzysztof Mazur

Co-Author(s): Daniel Christe, Chenyang Mo, Dani Liu, Aditi Ramadurgakar, Shane Esola

Advisor(s): Antonios Kontsos

Undergraduate Student

College of Engineering

Mechanical Engineering

Knitted fabrics are hierarchically structured materials exhibiting a complex set of structure-property-behavior relations driven by yarn-level interactions. Compared to other materials such as fiber-reinforced composites or metals, knitting gives the designer much finer control over the manufactured structure, fitting the broader “materials-by-design” framework. While manufacturing capability is sufficiently advanced to allow digital morphological design and production of elaborate knit structures from a diverse array of input materials, a lack of predictive simulation capability hinders progress in certification and deployment of smart garment devices, which are envisioned as tailorable material platforms for applications such as actuation or medical sensing.

A key objective of this work is to develop robust data-driven simulation tools to study mechanical/multi-physics behavior of smart textiles. To this aim, we implement an integrated computational materials engineering (ICME) strategy linking multiscale mechanical testing, numerical simulation, computational mechanics, and manufacturing. Specifically, mechanical testing of selected yarn grid level pattern(s) in parallel with full-field strain mapping via digital image correlation was conducted as part of a broader hierarchical characterization scheme from single fiber to fabric levels. The internal structure was imaged in two and three dimensions using a combination of optical, scanning electron microscopy, and microcomputed X-ray tomography. Simulation-wise, geometric representation of knit structures was accomplished with consideration of actual manufacturing process parameters. Computational mechanics methods were employed to investigate the role of structure and material properties in determining deformation behavior of knitted materials, with a goal to provide quantitative feedback to manufacturing.

Quasar Classification Using Color and Variability

PS-05

Christina Peters

Co-Author(s): Gordon Richards

Advisor(s): Gordon Richards

Graduate Student

College of Arts and Sciences

Physics

We use the Non-parametric Bayesian Classification Kernel Density Estimation (NBC KDE) quasar selection algorithm (Richards et al. 2004) to identify 36,569 type 1 quasar candidates in the Sloan Digital Sky Survey (SDSS) Stripe 82 field using the combination of optical photometry and variability. 5-band coadded optical photometry is taken from the SDSS-I/II to a depth of $r \sim 22.4$; from these data variability parameters are calculated by fitting the structure function of each object in each band with a power law using 10 to >100 observations for timescales from ~ 1 day to ~ 8 years. Selection was based on a training sample of 13,221 spectroscopically-confirmed type 1 quasars from SDSS-I/II and the Baryon Oscillation Spectroscopic Survey (BOSS). Using variability alone, colors alone, and combining variability and colors we achieve 91%, 93%, and 97% quasar completeness and 98%, 98%, and 97% efficiency respectively, with particular improvement in the selection of quasars at $2.7 < z < 3.5$ where quasars and stars have similar optical colors. The 23,043 quasar candidates that are not spectroscopically confirmed reach a depth of coadd $i \sim 22: 0$ and 21,380 (92.8%) are dimmer than coadded i -band magnitude of 20.2, the cut off for spectroscopic follow-up for SDSS DR7.

The Exposure and Effects of Particle Radiation on High Voltage Zener Diode

PS-06

Joseph Warsheski

Advisor(s): Dr. Charles Lane

Undergraduate Student

College of Arts and Sciences

Physics

Ionizing radiation produces a potential hazard to sensitive electronic equipment, thereby becoming a guaranteed problem for low voltage components. The issue is that, unless tested, one does not know how extensive that damage can be on high voltage electronic components, let alone how much radiation their lattice structure can absorb before rendering the components useless. This lattice structure damage can cripple the intrinsic functions of the individual components, causing them to inefficiently function, or even completely malfunction. Knowing the behavior of high voltage electronic components under radiation exposure changes the engineering of various instruments and machines, particularly in areas where intense amounts of particle radiation becomes a serious issue.

This research in particular focuses on a high voltage Zener diode, with a voltage divider build to accommodate the measurements taken. Zener diodes are known for their zener breakdown, which occurs when the diode hits a certain input voltage (in this case, 150V). Multiple circuits will be built, and tested with various doses under an electron beam. The goal is to further understand what damage occurs (specifically regarding the zener breakdown), and to what extent is the damage at the macroscopic scale.

A Novel Alternative Infrastructure for Efficient High Volume Computation

PS-07

Pouya Dianat

Co-Author(s): Zhihuan Want, Thinzar Aung, Marina Utesheva, Mark Hempstead, Ioannis Savidis, Baris Taskin, Bahram Nabet

Advisor(s): Bahram Nabet

Graduate Student

College of Engineering

Electrical and Computer Engineering

Recently, the analysis of big data has become the engine for societal, financial, scientific, and technological endeavors. This demands an infrastructure that is capable of fast and reliable high volume data processing. Here a monolithic nano system is proposed for low energy computations. It functions based on optically connected one dimensional solid state devices. This design circumvents the electron-transport limitations of conventional technologies, offers innate integration of optics and electronics, and applies novel physics of one dimensional nano structures and many-electron systems. Overall, this alternative technology can reduce the energy cost per unit of computation and increase the rate of reliable data transfer.

A Real-Time Liquid Xenon Purity Monitor

PS-08

Dylan Temples

Advisor(s): Michelle Dolinski

Undergraduate Student

College of Arts and Sciences

Physics

The Enriched Xenon Observatory collaboration is currently searching for a neutrinoless double beta decay of the xenon-136 atom. Observation of this decay would confirm the Majorana nature of neutrinos, and represents physics beyond the Standard Model. The current detector, EXO-200, is a liquid xenon time projection chamber that uses 200 kg of liquid xenon enriched to 80% in the isotope xenon-136. This detector is capable of achieving low background measurements, in order to adequately resolve the signal of the neutrinoless double beta decay from that of standard double beta decay. The resolution of the detector is very sensitive to the purity of the liquid xenon currently in the chamber due to attenuation of the ionization signal. This effect can be compensated for by measuring accurate electron lifetimes in the xenon while the detector remains operational.

The next generation, ton-scale, detector, nEXO, plans to incorporate an electron lifetime detector to maintain energy resolution during xenon purity fluctuations. This paper presents a design for an apparatus to measure electron lifetimes in a specific range in real time, but can be easily modified for various lifetimes. A strong ultraviolet LED will be used to liberate photoelectrons from a photocathode and their lifetimes will be calculated using their attenuation over a known drift region. This apparatus will be capable of measuring the electronegative impurity levels of liquid xenon, but is not sensitive to other sources of contamination.

On the Asymptotic Distribution of Parameters in Random Weighted Staircase Tableaux

PS-09

Amanda Lohss

Co-Author(s): Pawel Hitczenko

Advisor(s): Dr. Pawel Hitczenko

Graduate Student

College of Arts and Sciences

Mathematics

Staircase tableaux are combinatorial objects that were introduced due to their connections with the asymmetric exclusion process (ASEP) and Askey-Wilson polynomials. Due to their interesting connections, staircase tableaux have been the object of study in many recent papers. More specifically, the distribution of various parameters in random staircase tableaux has been studied. There have been interesting results on parameters along the main diagonal, however, no such results have appeared for other diagonals. It was conjectured that the distribution of the number of symbols along the k th diagonal is asymptotically Poisson as k and the size of the tableau tend to infinity. We have partially proven this conjecture; more specifically we have proven it for the second and the third main diagonal.

Colloidal Deposition on Porous Substrates: Competition among Diffusive, Evaporation and Infiltration Time Scales

PS-10

Min Pack

Co-Author(s): Han Hu, Dong-Ook Kim, Xin Yang

Advisor(s): Dr. Ying Sun

Graduate Student

College of Engineering

Mechanical Engineering and Mechanics

Recent interests in printable electronics and in particular paper and textile-based electronics have fueled research in inkjet printing on porous substrates. On nonporous substrates, the diffusion of the particles and evaporation of the solvent are the two main mechanisms that drive the final deposition morphology. For porous substrates another factor, mainly infiltration, adds a layer of complexity to the deposition patterns that has not yet been elucidated in literature. In this study, a high-speed camera was used to capture the imbibition of picoliter-sized polystyrene nanoparticles in water droplets into nano-porous anodic aluminum oxide substrates of various porosities and wettabilities. For water, the infiltration rate is much faster than both evaporation and diffusion and thus when the substrate fully imbibes the droplet, the well-known “coffee ring” is suppressed. However, when the imbibed volume is less than the in-flight volume, or in other words, a residual droplet forms upon the termination of the infiltration regime t_I , the competing diffusion and evaporation regimes, t_D and t_E respectively, define the critical time scales for which the coffee ring will be formed ($t_D/t_E < 1$) or suppressed ($t_D/t_E > 1$). For large residual volumes, there is sufficient time for the particles to aggregate near the contact line to form the coffee ring whereas for small residual volumes, there is insufficient time for the particles to assemble, thus suppressing the coffee ring effect.

Tuning the Selectivity of MALDI Imaging MS through Control of the Sample Preparation Parameters Using Alternative Matrix Deposition Techniques

PS-11

Brian Malys

Co-Author(s): Elsa Gorre, Kevin Owens

Advisor(s): Kevin Owens

Graduate Student

College of Arts and Sciences

Chemistry

Mass spectrometry is a powerful qualitative and quantitative analysis technique. In recent years, imaging MS (IMS) has coupled the mass spectral data with the spatial coordinate of the sampling location, allowing the distribution of analytes to be visualized. In matrix-assisted laser desorption ionization (MALDI) IMS, a laser is used to create analyte ions from a small area (1000 μm^2), allowing for spatial selectivity. MALDI IMS has been applied to a variety of systems, including cancer biomarker detection in concert with histology, drug localization in pharmaceutical studies, and fingerprint analysis in forensic research. Prior to analysis by MALDI, a matrix, which absorbs the laser light and promotes the desorption and ionization of analyte, must be applied to the sample. The parameters of this application include the choice of deposition method, matrix identity and amount, and solvent composition. Many of the sampling parameters used in the experiment affect the resulting data.

In a MALDI imaging experiment, there can be hundreds of analytes belonging to different classes of compounds present. The biases introduced during sample preparation can result in a number of analytes of interest not being detected or their spatial distribution being distorted. In order to evaluate this, samples are created consisting of multiple analytes applied in a particular pattern. Sample preparation parameters are then varied and the fidelity of the resulting image is evaluated much easier than by the use of a complex and unpredictable biological sample. Electrospray deposition will be used to apply the matrix since it allows for more reproducible application of the matrix compared to conventional deposition methods. A fundamental understanding of how the sample preparation parameters affect the selectivity of a particular experiment is of great interest, as the ability to tune and predict the selectivity of an experiment enhances the utility of MALDI IMS for a variety of fields.

Mechanical Behavior of Compacts Made of Binary Mixtures of Starch and Sodium Chloride: A Study of Factors that Affect the Tensile Strength

PS-12

Jovana Radojevic

Advisor(s): Dr. Antonios Zavaliangos

Graduate Student

College of Engineering

Materials Science and Engineering

The purpose of this work was to try to understand the behavior of a two component system in the case of two pharmaceutical excipients – sodium chloride and starch, and examine the effects of different factors on the mechanical behavior of compacts made of these mixtures. Two different mixing methods were compared. The milling time with zirconia balls affected the particle size of powders. The presence of a soft phase during milling appears to have enhanced the reduction of particle size in the brittle component of the mixture. In both cases the tensile strengths of mixtures deviated from the rule of mixtures between the individual components. The experiments were performed at different times throughout the year and the results suggest that the storage of powders over time can have an effect on mechanical behavior of compacts. Moisture pick-up may have affected properties of powders. The conclusion is that sodium chloride and starch form interacting mixtures and that a mixture of fixed composition can have a range of properties depending on the particle size and the degree of powder evolution during storage. Percolation theory and microcracking can offer some explanations of the peculiar behavior of these mixtures.

Phosphorus Dynamics in the Barnegat Bay

PS-13

George Keighton

Co-Author(s): Dr. David Velinsky, Dr. Nathaniel Weston, Dr. Bhanu Paudel

Advisor(s): Dr. David Velinsky, Dr. Daniel King

Undergraduate Student

College of Arts and Sciences

Chemistry

Phosphorus (P) loadings from tributaries are significantly higher in the northern sections of the Barnegat Bay, while dissolved phosphorus concentration is higher in the southern Barnegat Bay. In this project, we seek to determine what mechanisms are causing this anomaly. It has been hypothesized that bay sediment is acting as a phosphorus reservoir, and the conditions present in the southern sections of the bay are causing phosphorus to be released more readily. Water and sediment samples were collected from 20 different stations throughout the bay and its tributaries. The water samples were analyzed for dissolved and particulate phosphorus. Sequential sediment extraction was performed to analyze phosphorus speciation in the collected sediment samples. Benthic phosphorus exchange and water column P production was identified by purging sediment cores of the six main bay stations with water collected from each station to measure benthic fluxes under oxic and anoxic conditions. Concentrations of phosphorus in the surface water and the sediment samples along the north-south gradient confirmed the initial observations that became the impetus of the project. Preliminary findings from the sediment extractions show that the bulk of sedimentary phosphorus is bound up in the inorganic form, and high inorganic P in the Southern bay. The P concentration gradient along the two sections of the bay was not evident in the benthic flux experiment, and no difference was apparent between oxic and anoxic conditions. Summer data suggested the water column, on the other hand, may be acting as a source of phosphate under anoxic conditions. Comparison of summer and fall data reveals a significant phosphorus uptake in the sediments during the fall at central and southern sites. The findings suggest that sediments are the sink of phosphorus.

Fabrication of Proximity Coupled Superconducting TiSe₂ Field Effect Devices

PS-14

Joseph Lambert

Co-Author(s): Sam Ciocys, James Curtis, David Lioi, Goran Karapetrov

Advisor(s): Goran Karapetrov

Graduate Student

College of Arts and Sciences

Physics

We have fabricated field effect devices based on the layered dichalcogenide titanium diselenide (TiSe₂). This material is a member of the transition metal dichalcogenides exhibiting a unique chiral charge density wave (CDW) state. This state has an onset at a temperature of $T \approx 200\text{K}$. Small amounts of copper or palladium dopants induce a superconducting state with superconducting critical temperature of $T_c = 4.15\text{K}$ and 2K , respectively, which competes with the CDW state. By using field effect doping on single and few-unit-cell-thick layers we explore the interplay between superconducting and CDW states in proximity coupled superconducting devices. We have fabricated multi-terminal devices by mechanically exfoliating TiSe₂ flakes from single crystals of TiSe₂ onto SiO₂ substrates, and defining Nb and Al contacts using optical and electron beam lithography techniques. We have confirmed that the CDW state persists in these devices when scaled to few-unit-cell thick layers. Future efforts include transport measurements of sub-micron devices down to milliKelvin temperatures.

Acknowledgement: This work is sponsored by the US Army Research Office under contract W911NF-14-1-0567

Consumption and Conversion of Nitrogen Species by a Mixed Photosynthetic Community within a High Density Bioreactor

PS-15

Jacob Price

Co-Author(s): Wen K. Shieh

Advisor(s): Christopher M. Sales

Graduate Student

College of Engineering

CAEE

The performance of a continuous upflow photobioreactor (PBR) containing a mixture of algae and bacteria was investigated for the removal of ammonia and nitrate from a synthetic influent stream with no organic carbon. The use of an upflow reactor enables culturing algae at high densities (1.5–2.8 g SS L⁻¹). Several ranges of ammonia and nitrate feed combinations were tested to determine the effect of NH₄-N:NO₃-N feed ratio on N removal and conversions by the mixed community. The PBR was found to remove an average of 14.7% of total nitrogen species from the feed. N removal was found to be significantly and positively related to feed NO₃⁻ (n=71, p=0.007) suggesting denitrification is occurring or algae are assimilating NO₃⁻. N removal was highest when NO₃⁻ feed concentrations were twice that of NH₄⁺. The removal of NH₄⁺ combined with accumulation of NO₃⁻ suggests that Ammonia and Nitrite Oxidizing Bacteria were present and active within the community. Increases in feed NO₃⁻ led to significant increases in the removal of NO₃⁻ (n=72, p=0.000) suggesting that denitrification and NO₃⁻ assimilation collectively became more significant than nitrification when NO₃⁻ becomes dominant in the feed. Increases in feed NH₄⁺ resulted in significant decreases in the removal of NO₃⁻ (n= 72, p=0.000) possibly the result of nitrification exceeding the reactor's denitrification capabilities. Reactor studies of this type provide a valuable source of information about nutrient cycling, competition, and feedback within mixed communities. Understanding these dynamics will assist in the optimization of reactor design and their subsequent use in the treatment of high N content waste streams.

In Situ Microstructure-Sensitive Investigation of Fracture by Coupling Acoustic Emission with Scanning Electron Microscopy

PS-16

Brian Wisner

Co-Author(s): Michael Cabal, Prashanth Vanniamparambil, Jacob Hochhalter, William P. Leser, Antonios Kontsos

Advisor(s): Antonios Kontsos

Graduate Student

College of Engineering

Mechanical Engineering and Mechanics

Damage is a multiscale process particularly when considering incubation and initiation. Therefore, understanding fracture at the microscale is important to determining a materials state and thus, the remaining useful life of a material. A novel technique using Scanning Electron Microscopy (SEM) combined with Acoustic Emission (AE) monitoring is used to investigate microstructure-sensitive fracture of metals. The coupling between quasi in situ microscopy with actual in situ nondestructive evaluation falls into the ICME framework and the idea of quantitative data-driven characterization of material behavior. To validate the use of AE monitoring inside the SEM vacuum chamber, aluminum 2024-T3 sharp notch specimens were tested both inside and outside the microscope using a small scale mechanical testing device and compared to previous work conducted at the mesoscale. Load data were paired with both AE information and microscopic observation of microcracks, precipitate fracture and slip.

Polymerized Ionic Liquid Diblock Copolymers for Lithium-Polymer Batteries

PS-17

Jacob Nykaza

Advisor(s): Prof Elabd

Graduate Student

College of Engineering

Chemical and Biological Engineering

A polymerized ionic liquid (PIL) diblock copolymer was synthesized, poly(MMA-b-MUBIm-TFSI), comprised of an IL component (1-[(2-methacryloyloxy)undecyl]-3-butylimidazolium bis(trifluoromethane)sulfonimide) (MUBIm-TFSI) and a non-ionic component (MMA). This polymer was synthesized via postfunctionalization from its precursor PIL diblock copolymer, poly(MMA-b-BrUMA) (BrUMA = 11-bromoundecylmethacrylate), which was synthesized via RAFT and ion exchanged from the bromide-conducting PIL, poly(MMA-b-MUBIm-Br) (MUBIm-Br = 1-[(2-methacryloyloxy)undecyl]-3-butylimidazolium bromide). The effect of 1 M ILMix (LiTFSI (lithium bis(trifluoromethanesulfonyl)imide) in EMIm-TFSI (1-ethyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide)) on the PIL diblock copolymer was studied. The mole ratio of imidazolium cations in the 1 M ILMix to imidazolium cations in the PIL diblock copolymer was varied from 0.0 to 0.5.

Interestingly, the PIL diblock copolymer exhibits no microphase separation for any ratio studied. Differential scanning calorimetry shows only one broad glass transition temperature (T_g) which decreased with the addition of ILMix from 39 °C to 10 °C (Ratio = 0.0 to 0.5). Small angle X-ray scattering displayed no microphase separation (Ratio = 0.0 to 0.5) which is consistent with the observation of only one T_g . However, the conductivities of the samples increases over 3 orders of magnitude by the addition of the ILMix (Ratio = 0.5) compared to the neat PIL diblock copolymer (Ratio = 0.0). These results suggest that the addition of ILMix accelerates ion transport without changing morphology and could have an impact on the design of block copolymers as polymer electrolytes in lithium-polymer batteries.

A Wirelessly Powered System with Charge Recovery Logic

PS-18

Leo Filippini

Co-Author(s): Emre Salman, Baris Taskin

Advisor(s): Baris Taskin

Graduate Student

College of Engineering

ECE/PhD

In this paper, charge recovery logic is proposed as an alternative to traditional or near-threshold CMOS logic for high-performance systems where the power is wirelessly delivered, e.g. bio-implantable devices. This approach has two primary, complementary advantages in i) providing a wirelessly transmitted sine-wave as the power clock source to the charge recovery logic and ii) eliminating the AC/DC power stage required to provide a stable supply voltage needed in CMOS circuits. The paper presents solutions to the main obstacles of this method and shows simulation results of a 64-stage inverter chain designed in Efficient Charge Recovery Logic (ECRL) as part of a wireless powered system. The designed wirelessly powered ECRL (coined WP-ECRL) system i) consumes 15.2X less power than full-swing CMOS and ii) operates at higher frequencies than near-threshold CMOS. These comparative trends in power dissipation are for the computing circuit only, and do not include the bulky AC/DC stage that would be necessary for CMOS implementations. In terms of resilience, it is shown that logic functionality is preserved even when the coupling coefficient of the wireless link is decreased by 60% from the nominal value or when coils with very poor quality factor (down to $Q = 0.1$) are used.

Automated Green Energy Solar Heating

PS-19

Zachary Heino

Co-Author(s): Zachary Heino, Keith Hess, Mohammed Said

Advisor(s): Dr. Richard Y. Chiou, Dr. Irina N. Ciobanescu Husanu

Undergraduate Student

College of Engineering

Engineering Technology

The overall objective of this design project is to modify a previously constructed heat exchanging solar collector system for implementation in the effective heating of a farming greenhouse. This process consists of two phases: initial modification and final implementation. The first stage of this process includes troubleshooting the previously built heat exchanging solar collector system. This system is comprised of an evacuated tube and a flat panel solar collector both attached to a hot water tank heat exchanger for maximum efficiency. Having two different solar collectors present with varying ideal operating conditions enables the unit to operate effectively under changing environmental conditions in the North Eastern Region of the United States. A control system is designed to actively monitor the thermal energy transferred to the fluid from both solar collectors and allows the fluid to flow through the most effective heat exchanger using electronically activated pumps. The second stage is the solar collector system connection to the greenhouse for ideal effective heating. The control system is specifically designed to actively monitor soil temperatures with the use of a thermocouple sensor all the while maintaining ideal greenhouse conditions by pumping heated fluid through coils underneath the soil surface. The addition of this active negative feedback control system is to maximize the energy transfer from each panel with minimal energy losses. The intention of this project is the replacement of expensive energy costs for heating a greenhouse with an alternative sustainable solar heating design. The expected outcome of this undertaking is the successfully incorporation of the heat exchanging solar collectors as the exclusive energy input required to heat the greenhouse system in order to decrease farming costs, expand the profitability of fruit and vegetable harvests, and decrease the environmental impact of greenhouse heating.

Formulation of Ionic Liquid Electrolyte to Expand the Voltage Window of Supercapacitors

PS-20

Katherine Van Aken

Co-Author(s): Majid Beidaghi, Yury Gogotsi

Advisor(s): Yury Gogotsi

Graduate Student

College of Engineering

Materials Science and Engineering

While their high-power performance exceeds that of batteries, supercapacitors lack the energy density capability for some energy storage applications. Since the energy density of the device is proportional to the square of operating potential window (OPW), an effective way to increase the energy density of the device is by increasing the potential window. Ionic liquid electrolytes are beneficial for this reason since they can theoretically operate at up to 6 V, though experimentally, this value is between 3-4 V depending on the properties of electrode materials. By employing a novel electrochemical technique to analyze symmetric supercapacitors of carbon electrodes and ionic liquid electrolytes, we have found one of the possible reasons for smaller OPWs of ionic liquids in practical applications. We observed that for a symmetric device with electrodes equal in size and weight, the different properties of cations and anions in the electrolyte results in an asymmetric performance of the two similar electrodes. By performing a systematic study with ionic liquid electrolytes and model electrode materials, we show that a symmetric behavior of the electrodes can be achieved by formulating an ionic liquid mixture containing different cations and anions. In our model electrochemical device, onion like carbon (OLC) was used to fabricate the device electrodes and two ionic liquids, EMI-TFSI and EMI-BF₄, and their mixtures were used as electrolytes. This electrolyte mixing results in an extended OPW of the device and a higher energy density.

Modeling Massive Cluster Formation with Stellar Feedback using FLASH and AMUSE

PS-21

Joshua Wall

Co-Author(s): Stephen McMillan, Kevin Olson, Mordecai Mac Low, Simon Portegies Zwart

Advisor(s): Stephen McMillan

Graduate Student

College of Arts and Sciences

Physics Department

We are developing a simulation of massive star cluster formation using FLASH magnetohydrodynamics code and the AMUSE astrophysical software environment. FLASH handles the hydrodynamics of the gas and star creation through cloud collapse, and then the stellar dynamics are integrated with a fourth order Hermite scheme in AMUSE. Further stellar evolution is computed in AMUSE, and then radiative and supernovae feedback information is computed in FLASH based on the stellar evolution. Gravitational interaction between the gas and the stars is handled via a symplectic gravity bridge between the Hermite integration code and Flash in AMUSE.

Continuous Wave Cavity Enhanced Magneto-Optic Rotation Spectroscopy for Small Combustion Radicals

PS-22

Michael Stichter

Co-Author(s): David L. Miller

Advisor(s): Nicholas Cernansky

Graduate Student

College of Engineering

Mechanical Engineering

The transportation sector contributes nearly a third of green house gas emissions and consumes two thirds of the liquid petroleum used today. Advanced engine technologies that are more efficient and cleaner burning promise a reduction in fuel usage and decreased green house gas emissions. Low temperature combustion (LTC) engines are an advanced technology under development. Small combustion radicals (e.g. OH and HO₂) play an important role in LTC chemistry. The objective of this investigation is to further develop the Cavity Enhanced Magneto-Optic Rotation (CEMOR) laser spectroscopy technique for measuring the small peroxy radicals in combustion systems. CEMOR combines the sensitivity of Cavity Ringdown Spectroscopy (CRDS) with the selectivity of Magneto-Optic Rotation (MOR) to allow sensitive and selective measurements of paramagnetic species (e.g., OH and HO₂) in spectral regions with interferences from stable diamagnetic species (e.g., CO₂ and H₂O). Previous work in our laboratory utilized CEMOR for selective detection of OH in the A₂Σ⁻-X₂Π (0,0) vibronic band near 308 nm, demonstrating an improvement in sensitivity of the MOR technique to detect weakly absorbing paramagnetic molecules in a region congested by diamagnetic molecules. In our flash photolysis cell facility, we have also generated and measured HO₂ using a pulsed Nd:YAG/OPO laser. The present work represents the next step in development of the CEMOR diagnostic. Specifically, this experimental study explores the increase in resolution by application of a narrow bandwidth DFB telecom laser near 1430 nm to measurement of HO₂ in our flash photolysis facility using continuous wave CRDS and continuous wave CEMOR. Following this effort, the photolysis cell will be used to provide HO₂ and RO₂ calibration of the diagnostics including high resolution spectroscopy for these species, and then application of CEMOR to quantification of OH, HO₂ and RO₂ in combustion systems.

Neutrino Analysis of Extended Cosmic Ray Hotspots

PS-23

Elizabeth Wills

Advisor(s): Naoko Kurahashi-Neilson

Graduate Student

College of Arts and Sciences

Physics/PhD

Icecube is a kilometer-cubed Cherenkov detector buried a kilometer under the ice at the South Pole. Ice is used as the target medium for the detector as it allows for propagation of light the charged particles emit as they lose energy passing through the ice, or Cherenkov radiation. Strings of light detectors, or digital optical modules (DOM), track this light through the ice allowing for reconstruction of the particle's path, giving us a pointer to where it came from in the sky. This allows us to study the universe around us in more detail in addition to optical telescopes.

Icecube reconstructs the tracks of different particles, such as neutrinos and cosmic rays. Cosmic rays are charged, consisting mainly of protons. They produce high-energy neutrinos when they interact with matter. Doing astronomy with cosmic rays is challenging as their charge causes them to be deflected by inter-galactic magnetic fields, hiding their source locations. Neutrinos, on the other hand, are neutral and point straight back to their sources, and can travel through denser space than light, specifically gamma rays, can. This makes them excellent candidates for high energy astroparticle physics, allowing us to see even more of the universe.

Several large hot-spot regions of cosmic rays have been discovered by gamma ray telescopes. As they are not completely scrambled by the many magnetic fields in space, they are believed to be fairly near to our own galaxy. Thus far, no one knows what has caused them, nor has any one looked to discover them in related particles, such as gamma rays or neutrinos. I am carrying out a neutrino analysis of these regions, using Icecube's data, that will help to help determine their cause.

Analysis of the Oligosaccharide and Protein Content of Beer Using Matrix-Assisted Laser Desorption Ionization Time-Of-Flight Mass Spectrometry

PS-24

Elsa Gorre

Co-Author(s): Jon Soffer, Kevin Owens

Advisor(s): Kevin Owens

Graduate Student

College of Arts and Sciences

Chemistry Department

Matrix-Assisted Laser Desorption Ionization (MALDI) is a soft ionization technique most commonly used for analyzing large biological molecules due to its high sensitivity. Recently, MALDI Time-of-Flight Mass Spectrometry (TOFMS) has been found to generate unique spectral fingerprints of proteins found in microorganisms, such as bacterial and fungal species. Most recently, MALDI TOF-MS has found an application in the brewing industry where the analysis of beer samples show oligosaccharide and protein patterns that are characteristic of the materials used in the brewing process. In a MALDI experiment, the sample is prepared by combining a “matrix” with the analyte. Most commonly used matrices include 2, 5-dihydroxybenzoic acid (2,5-DHB), α -cyano-4-hydroxy-cinnamic acid (CHCA), and sinapinic acid (SA). In this work, multiple beer samples are analyzed using four MALDI matrices, including 2,5-DHB, CHCA, SA and dithranol, and the protein patterns observed with each are compared. The effect of solvent and matrix used in sample preparation will be studied in correlation to the proteins that are seen in the mass spectra. It is believed that the proteins observed in the MALDI spectrum are related to matrix and solvent polarity and the solubility of the proteins in the matrix solution; this is further investigated here. Preliminary results show that dithranol is more effective in observing protonated proteins while matrices such as CHCA and 2, 5-DHB ionize glycosylated proteins. No interpretation regarding whether the glycosylated proteins are Na^+ or K^+ cationized is known at the moment. MALDI TOF-MS spectra obtained using different matrices will be combined to effectively determine the correct mass of the proteins observed.

Synthesis and Characterization of AMn7O12 Quadruple Perovskite Films

PS-25

Amanda Huon

Advisor(s): Steve May

Graduate Student

College of Engineering

Materials Science & Engineering

AMn7O12 quadruple perovskites exhibit many interesting phenomena including multiferroicity and charge ordering transitions. In these compounds, the transition metal resides on both the A- and B-site of the perovskite structure yielding the formula $(AA'3)B4O12$, where both A' and B are Mn. Previous reports have studied the bulk synthesis of quadruple manganites, but there remains little known about their thin film counterparts. Herein, we describe the thin film synthesis of two compositions of AMn7O12 (A= Ca, Sr) quadruple perovskites grown by molecular beam epitaxy on SrLaAlO4 and YAlO3 substrates. We use x-ray diffraction, transmission electron microscopy, atomic force microscopy, magnetization, Raman spectroscopy, and temperature dependent resistivity measurements to characterize as-grown films and films that are treated with high temperature post-growth anneals. The structural and electronic results are compared to density functional theory calculations to provide further insights into the physical behavior of the films.

This work is supported by the Office of Naval Research (N00014-11-1-0664).

Microstructurally-driven investigation of twinning & strain localization in magnesium alloys via in situ testing

PS-26

Michael Cabal

Co-Author(s): Brian Wisner, Kostantinos Baxevanakis, Jake Hochhalter, Antonios Kontsos

Advisor(s): Antonios Kontsos

Graduate Student

College of Engineering

Mechanical Engineering and Mechanics

Despite frequent observations of shear banding, the formation of shear bands, their development, and overall contribution to rolling and recrystallization textures is still not understood from both material and mechanics perspectives. To understand microstructure-specific mechanisms responsible for local (micro) plasticity, as well as shear band formation and development in magnesium alloys, multi-scale full field strain measurements provided by Digital Image Correlation (DIC), Acoustic Emission (AE) monitoring, and in situ mechanical testing were coupled with direct microstructure of two different rolling sheet textures before and after deformation. Controlled specimen geometry provided an a priori defined strain localization zone that assisted in minimizing the unknowns and to generate data also suitable for a modeling approach. Using electron back scattered diffraction (EBSD) and surface morphology quantification techniques, results on the role of twinning in shear band formation and associated strain measurements are reported. Such quantified information is currently being used to build a mathematical model for both phenomenological and crystal plasticity models.

Drexel Smart Campus Project

PS-27

Jonathan Berardino

Co-Author(s): Mohammed Muthalib, Jesse Hill, Tiffany Lakins, Chika Nwankpa

Advisor(s): Chika Nwankpa

Graduate Student

College of Engineering

Electrical and Computer Engineering

The “Smart-Campus Project” was a Sub-Award of DOE Smart Grid Investment Grant (SGIG) to PECO, where Drexel University partnered with Viridity Energy in order to create a “Smart-Campus” microgrid interoperability demonstration capable of providing lower electricity costs and lower demand across the Drexel campus. This project was directed at maximizing smart grid technology in the form of a campus-wide energy management system capable of controlling building demand in a way that balances building operational needs with grid operations and costs. This supported the project objectives of implementing a system to reduce energy costs, support network reliability, efficiency, and the potential for renewability, as well as offer a template system for replication in other markets.

This poster describes the evolution of the design and implementation of the Smart Campus project. Particular attention is placed on the physical realization of project goals for automated and remotely actuated control of building electrical loads. Ongoing research related to the project is also described.

STM Investigation of the Vortex State of FeSe_{1-x}

PS-28

James Curtis

Co-Author(s): Goran Karapetrov, Steven Moore, Eric Lechner, Maria Iavarone, Olga Volkova, Alexander Vasiliev, Dmitriy Chareev

Advisor(s): Prof. Goran Karapetrov, Prof. Maria Iavarone

Undergraduate Student

College of Arts and Sciences

Physics

For the past thirty years, a complete picture of the underlying mechanism of high-temperature superconductivity has eluded researchers. The recent discovery of Fe-based superconductors has opened new avenues of exploration. The coexistence of ferromagnetic iron and superconductivity puts into question the long-held belief that magnetism and superconductivity are incompatible.

FeSe has a simple crystal structure, which may help shed light on the physics governing the more complicated Fe-based materials. In this work, ultra-high vacuum low-temperature scanning tunneling microscopy and spectroscopy has been used to investigate the superconducting properties of FeSe single crystals. Magnetic field dependent conductance maps in the superconducting state reveal elliptical cores of the superconducting vortices, which reflect an anisotropy of the superconducting coherence length in this material. Scanning tunneling spectroscopy in this material show a multi-gap behavior of the superconducting state.

G.K and A.N.V acknowledge the support by a grant from U.S. Civilian Research and Development Foundation CRDF OISE-14-60109-0.

S.M, E.L and M.I acknowledge the support by the U.S. Department of Energy, Office of Basic Energy Sciences, Division of Materials Sciences and Engineering under Award DE-SC0004556.

Improving 3D Electric Field Map for the EXO-200 Experiment

PS-29

Yi-Hsuan Lin

Advisor(s): Michelle Dolinski

Graduate Student

College of Arts and Sciences

Physics, PhD

Various experiments have observed that the neutrino, a neutral particle assumed to be virtually massless by the Standard Model, actually oscillates between its flavor states (e , μ , τ), which are combinations of neutrino mass states. A method to find an upper bound on the neutrino masses is through the half-life of neutrinoless double beta decay ($0\nu\beta\beta$), a rare nuclear process, which can only occur if neutrinos are their own anti-particle. The EXO-200 collaboration is searching for $0\nu\beta\beta$ using 200 kg of isotopically enriched liquid xenon, which resides in an ultra-low background single-phase time projection chamber (TPC) with scintillation and ionization readout capabilities. Energy and positions of the charge depositions inside the TPC are reconstructed from these readouts. In order to reduce the systematic errors of EXO-200's result, the fit for radial distribution must be improved at the edge of the TPC. One approach is to use a 3D field map instead of a 2D field map in the Monte Carlo simulation and take edge effect in the TPC into consideration. Several major improvements have been made to the 3D electric field model and new energy and position distributions from the simulation are compared to the low-background data.

Progressive Damage Monitoring and Quantification in 3D and 2D Woven Carbon Fiber Composites

PS-30

Nestor Castaneda

Co-Author(s): Nestor Castaneda, Alexander Michna, Jefferson Cuadra, Mike Cabal, Brian Wisner, Rajesh Kumar, Shahram Amini

Advisor(s): Antonios Kontsos

Undergraduate Student

College of Engineering
Mechanical Engineering & Mechanics

Currently the aerospace industry is focused on advanced composite materials such as 3D woven composites. This is mainly because of their high specific strength, thermal properties as well as “Out-of-Autoclave” manufacturing capabilities through Vacuum Assisted Resin Transfer Molding (VARTM). Of the advantages above, the high strength achieved by these woven composites is of most interest. This can vary depending on the fibers used in the weft and warp directions for 2D-type architectures, but in 3D types it is also influenced by the presence of through thickness “z-fiber” or “binder” yarns, which also become a toughening mechanism in the through-thickness direction, resulting in high delamination resistance. To investigate the potential benefits of these novel composite architectures, this work employs a multimodal nondestructive evaluation and characterization approach consisting of Digital Image Correlation (DIC), Infrared Thermography (IRT) and Acoustic Emission (AE) to identify the failure behavior under tensile, fatigue and compressive loading conditions. Complementary data acquired from X-ray micro computed tomography (μ CT), Scanning Electron Microscopy (SEM) and post-mortem fracture pattern analysis are used to investigate progressive damage behavior of these materials.

Photochemical treatment of flowback water for pentachlorophenol using UV-light and fructose

PS-31

Shaila Nayak

Co-Author(s): Sean-Erik O'Donnell, Saeed Keshani

Advisor(s): Dr. Christopher Sales, Dr. Rohan Tikekar, Dr. Juan Muniz

Graduate Student

Center for Hospitality and Sport Management

Food Science

Hydraulic fracturing process has provided access to previously inaccessible sources of energy reserves. However, this process generates large volumes of contaminated flowback and produced waters. Pentachlorophenol (PCP) is one of these contaminants present in the hypersaline flowback water which have been detected above their maximum contamination levels. Removal of contaminants, such as PCP, from flowback water is an important step in ensuring that hydraulic fracturing practices do not cause harm to humans or the environment. In this study, we investigate the use of UV-light and fructose for photochemical treatment of PCP. Fructose was chosen because it has shown to produce reactive oxidative species when exposed to UV light ($\lambda=254\text{nm}$). A comparative degradation study between photosensitizers fructose and titanium dioxide (TiO_2) to degrade pentachlorophenol photochemically using UV photoreactor was performed. The presence of 500 mM fructose and 10% saline solution of 500 mM fructose increased the rate of PCP degradation by 1.6 and 2.16 times respectively compared to the control (UV exposure only). High salt content of flowback water did not hinder the photocatalytic property of fructose. The conventional photosensitizer TiO_2 , did not affect the speed of PCP degradation compared to the control. Hence, fructose is effective as a photosensitizer in degrading pentachlorophenol in flowback water. Use of fructose as a photosensitizer to degrade pesticides and organic contaminants like PCP could provide a cheaper and greener alternative for treating water. The UV-light and fructose photochemical treatment method could also be extended to treatment of waste water from food industries, such as beverages, where effluents inherently contain fructose and hence can act as a self-cleanser degrading trace pesticides in these waters.

Large-scale environmental dependence of gas-phase metallicity in dwarf galaxies

PS-32

Kelly Douglass

Advisor(s): Michael Vogeley

Graduate Student

College of Arts and Sciences

Physics

We study how the cosmic environment affects galaxy evolution in the Universe by comparing the metallicities of dwarf galaxies in voids with dwarf galaxies in more dense regions. Ratios of the fluxes of emission lines, particularly those of the forbidden [O III] and [S II] transitions, provide estimates of a region's electron temperature and number density. From these two quantities and the emission line intensities, we estimate the abundance of oxygen with the Direct Te method. We estimate the metallicity of 37 void dwarf galaxies and 71 dwarf galaxies in more dense regions using data from SDSS via the MPA-JHU value-added catalog. We find very little difference between the two sets of galaxies, indicating little influence from the large-scale environment on stellar evolution. Of particular interest are a number of extremely metal-poor dwarf galaxies.

Todorokite Manganese Oxide as a Li-ion and Na-ion Battery Intercalation Host

PS-33

Bryan Byles

Co-Author(s): Patrick West, Ekaterina Pomerantseva

Advisor(s): Ekaterina Pomerantseva

Graduate Student

College of Engineering

Materials Science

Throughout the past two decades, Li-ion batteries have become a common choice to power portable electronics and electric vehicles. This has led to an increased demand for Li in order to supply the growing Li-ion battery market. However, Li is a finite resource, and as demand further increases with the growing popularity of electric devices and vehicles, prices are expected to increase for lithium compounds. Therefore, the focus of much research has shifted towards investigating alternative charge-carrying ions, such as Na⁺ and Mg²⁺. These elements are far more abundant and thus lower in price. Our work focuses on developing electrode materials to utilize these inexpensive charge-carrying ions in beyond-lithium energy storage systems.

In this work, we study a manganese oxide phase known as “todorokite” (Mg_{0.20}MnO₂). The structure of this material consists of MnO₆ octahedra arranged to form a large open tunnel structure around solvated Mg²⁺ ions. Hydrothermal synthesis methods are utilized to synthesize high aspect ratio nanowires of todorokite, and these nanowires are characterized in terms of their composition, morphology, and crystal structure using SEM/EDX and XRD. This material is then fabricated into a battery electrode and galvanostatically tested in Li-ion battery and Na-ion battery configurations. The performance of this material in these two metal-ion battery systems is compared side by side, revealing that the todorokite has a higher specific capacity for Na-ion charge storage. This work aids in developing an understanding of the differences between Li- and Na-ion intercalation in this todorokite host material, as well as in evaluating the relationship between charge-carrying ion size and host crystal structure.

Oscillator Phase Noise Reduction using Optical Feedback with Dual Drive Mach-Zehnder Modulator

PS-34

Tianchi Sun

Co-Author(s): Li Zhang, Kevin Receveur, Ajay K. Poddar, Ulrich L. Rohde, Afshin Daryoush

Advisor(s): Afshin Daryoush

Graduate Student

College of Engineering

Electrical Engineering

A reduced phase noise of stable microwave oscillators is designed by forced oscillation using Self-ILPLL (self-injection locking phase locking) technique fiber optical delayed feedback. Fiber optic links using single drive and dual drive MZM (Mach-Zehnder Modulator) have been used to implement the optical feedback path. A phase noise reduction of 22 dB at 300 Hz offset is measured for a commercially available DRO at 10 GHz using dual drive MZM in long fiber optic delay lines. The measured -127 dBc/Hz at 14 kHz offset has been demonstrated by employing 4km and 8km fiber optic delay lines.

Keywords: dielectric resonator oscillator, self-injection locked phase locked loop, dual drive Mach-Zehnder modulator

Identifying Affordable Rain Gauges for Green Stormwater Infrastructure Research

PS-35

Mehar Kalra

Co-Author(s): Alejandro Ochoa

Advisor(s): Franco Montalto, Walter Yerk

Undergraduate Student

College of Engineering

Environmental Engineering

There have been many studies on rainfall which have developed standards for measuring rain with rain gauges. Although these standards have been well documented and organized in the WMO Guidelines, when a researcher investigating certain aspects of Green Infrastructure, such as interception, requires a high density of small rain gauges, problems arise. Therefore, alternatives to standard gauges may be contemplated as an affordable option. The goal of our study was to identify adequate off-shelf surrogates for rain gauges.

To do so, we deployed a small randomly distributed array of household funnels: four with a diameter of 11cm and four with a diameter of 9cm. We compared them to two control rain gauges of standard design with a diameter of 16.5cm. After computing the average percent errors for all three types of gauges for fifteen distinct rain events, the difference in accuracy between the standard gauges and off-shelf gauges resulted in a substantial difference. The average percent error between both standard design gauges was 1.1%; in contrast, the average errors of the two types of the proposed gauges in relation to the standard design gauges were 6.1% and 7.8% for the 11cm and 9cm generic gauges correspondingly. In addition, both types of generic gauges had peaks in percent error on the same rain events ranging from 19% to 35% while the standard funnels did not.

These results suggest that – for certain research objectives – off-shelf gauges can be appropriate affordable surrogates for standard design gauges as they have an accuracy near the 5% recommended by common hydrological practices.

Fabrication of TiSe₂ Thin Films Using Chemical Vapor Transport

PS-36

John Rayer

Co-Author(s): Sam Ciocys, James Curtis, Jan Fedor, Olga Kzylova, Goran Karapetrov

Advisor(s): Goran Karapetrov PhD

Undergraduate Student

College of Arts and Sciences

Physics

TiSe₂ is a unique material that exhibits coexistence of chiral charge density wave and superconductivity. We have been successful in synthesizing single crystals of TiSe₂ and exploring its superconducting and charge density wave properties using a variety of experimental techniques. In order to exploit these unique material properties in device systems we intend to fabricate single crystalline thin films of TiSe₂. Here we design a plug-flow reactor apparatus utilizing chemical vapor transfer with iodine as a transport agent to grow dichalcogenide thin films. Chemical vapor transport method will be utilized to grow films with variable thickness down to single unit cell as well as enable us to dope the TiSe₂ with various substitution elements and intercalants. The flexibility in synthesis will allow us to explore the rich phase space of this strongly correlated electron system. Structural properties and surface morphology of the films will be measured using X-Ray Diffraction and Atomic Force Microscopy, respectively. Energy Dispersive Spectroscopy will be used to determine elemental composition. The availability of thin films of dichalcogenides will pave the way for fabrication of quantum devices such as Josephson junctions and enable us to explore the unique physical properties of this system in the extreme 2D limit.

This work has been supported by the NSF through a grant ECCS-1408151

Kepler AGN Data Reduction and Kalman Filter Analysis

PS-37

Jackeline Moreno

Co-Author(s): Vishal Kasliwal

Advisor(s): Michael Vogeley

Graduate Student

College of Arts and Sciences

Physics

Kepler provides excellently sampled (30 min. measurements) time series photometric data of Active Galactic Nuclei (AGN). However, the current data pipeline is optimized to extract transit sources that harbor exoplanets, not chaotic active supermassive black holes. Recent literature in the domain of Kepler AGN analysis utilizes either the data processed by the default Kepler pipeline or data processed by inconsistent reduction methods using the PyKE toolkit. In this work, we use the longest existing light curve, Zwicky 229.015 (totaling 3.4 yrs), and other well studied Kepler AGN to show the effects of pixel aperture extraction methods and cotrending basis vectors which mitigate thermally driven focus variations and instrumental aberrations. Statistical studies of AGN variability involve determining key timescales which are likely convolved with systematically driven variations. In particular, variability pertaining to longer timescales on the order of days to years are of high interest to AGN but are overly detrended by the default pipeline for the search of exoplanets. Optical/UV variability as measured by Kepler is theorized to arise from accretion disk instabilities, changes in accretion rate, or changes in the accretion disk's structure. Timescales calculated using a Kalman filter analysis will be indicative of real physical sizes and structure. Our results will also be compared against parameters obtained by reverberation mapping and power spectral studies for the same objects to determine the sensitivity and thus reliability of various time series analysis methods subject to systematic corrections.

Spatial Control of Condensate Droplets using Nanostructured Surfaces with Mixed Wettability

PS-38

Emre Olceroglu

Co-Author(s): Matthew McCarthy

Advisor(s): Matthew McCarthy

Graduate Student

College of Engineering

Mechanical Engineering and Mechanics

This work investigates condensation onto superhydrophobic nanostructured surfaces with engineered nucleation sites composed of superhydrophilic islands. These “super-bi-philic” surfaces are fabricated using a novel bio-templating technique based on the self-assembly of the Tobacco mosaic virus technique, combined with traditional photolithography and lift-off of conformal PTFE films. These surfaces promote the nucleation of rectangular arrays of droplets during condensation heat transfer and have been shown here to substantially affect both wetting dynamics as well as stability of the structured surfaces at increased supersaturations. Optical microscopy and environmental scanning electron microscopy are used not only to visualize the morphology of spatially ordered microscale condensate droplets, but also to quantify the performance of different designs.

The Effect of Length Scales during Pool Boiling on Hierarchical Copper Surfaces

PS-39

Md Mahamudur Rahman

Co-Author(s): Emre Olceroglu

Advisor(s): Matthew McCarthy

Graduate Student

College of Engineering

Mechanical Engineering and Mechanics

The enhancement of phase-change heat transfer processes is of critical importance due to their impact on energy, the environment, and water resources, as well as their potential in high-power thermal management systems. Recent studies have shown that micro/nanostructures can be used to substantially alter boiling heat transfer phenomena by influencing the nature and behavior of liquid, vapor, and solid interfaces. This work characterizes the role of both microscale and nanoscale surface structures on the enhancement of boiling heat transfer. Numerous copper oxide nanostructures have been grown onto copper substrates to investigate the effects of nanoscale coating morphology on boiling. Additionally, microstructured copper surfaces have been fabricated using traditional machining approaches. Combining these various nano- and micro-scale structures, hierarchical surfaces have also been fabricated and tested. Experimental results have shown that while nanostructures promote surface wicking to delay dry-out and enhance the maximum achievable heat flux, microscale structures are seen to increase nucleation at low superheat temperatures. Hierarchical surfaces have been shown to exhibit superior performance by exhibiting both surface wicking as well as high nucleation site densities.

Increased Intercalation of Conducting Ions in Vanadium Oxide Nanowires

PS-40

Mallory Clites

Co-Author(s): Bryan Byles

Advisor(s): Ekaterina Pomerantseval

Graduate Student

College of Engineering

Materials Science and Engineering

Lithium ion batteries have dominated the portable battery industry because of their long life and high energy density. As lithium's abundance is limited, there is a need to develop batteries based on the same intercalation mechanism but with other conducting ions such as sodium, potassium, and magnesium.

Vanadium oxides are researched because of their high theoretical capacities, low toxicity, affordability, and abundance. Due to their many possible structural phases, research in intercalation-based batteries is of particular interest. As vanadium can be stable in multiple oxidation states, many conducting ions can be intercalated into each unit of vanadium oxide, allowing for high capacity within a small area.

Wet chemical synthesis methods have been previously used to develop lithium-intercalated vanadium oxides. No syntheses have been used to intercalate ions beyond lithium. In this work, we have developed a mild synthesis of vanadium oxide intercalated with a range of conducting ions, including lithium, sodium, magnesium, and potassium. Post-synthesis hydrothermal treatment was also studied. The reaction of V₂O₅ powder and hydrogen peroxide in the presence of aqueous conducting-ion salt produced vanadium oxide gels. The use of a high temperature-mixing step proved vital to high intercalation of samples. Hydrothermal treatment increased extent of intercalation.

The extent of intercalation of lithium was determined through galvanostatic cycling, showing first capacities of up to 152 mAh/g. Energy-dispersive x-ray spectroscopy of sodium, magnesium, and potassium samples gave values of up to 0.84, 0.4, 0.35 ions per molecule of V₂O₅, respectively. In summary, chemical synthesis and hydrothermal treatment is shown as an efficient method to intercalate vanadium oxide with conducting ions. Current work is focused on the refinement of this method in Na-ion and Mg-ion batteries and the studying of additional post synthesis treatments.