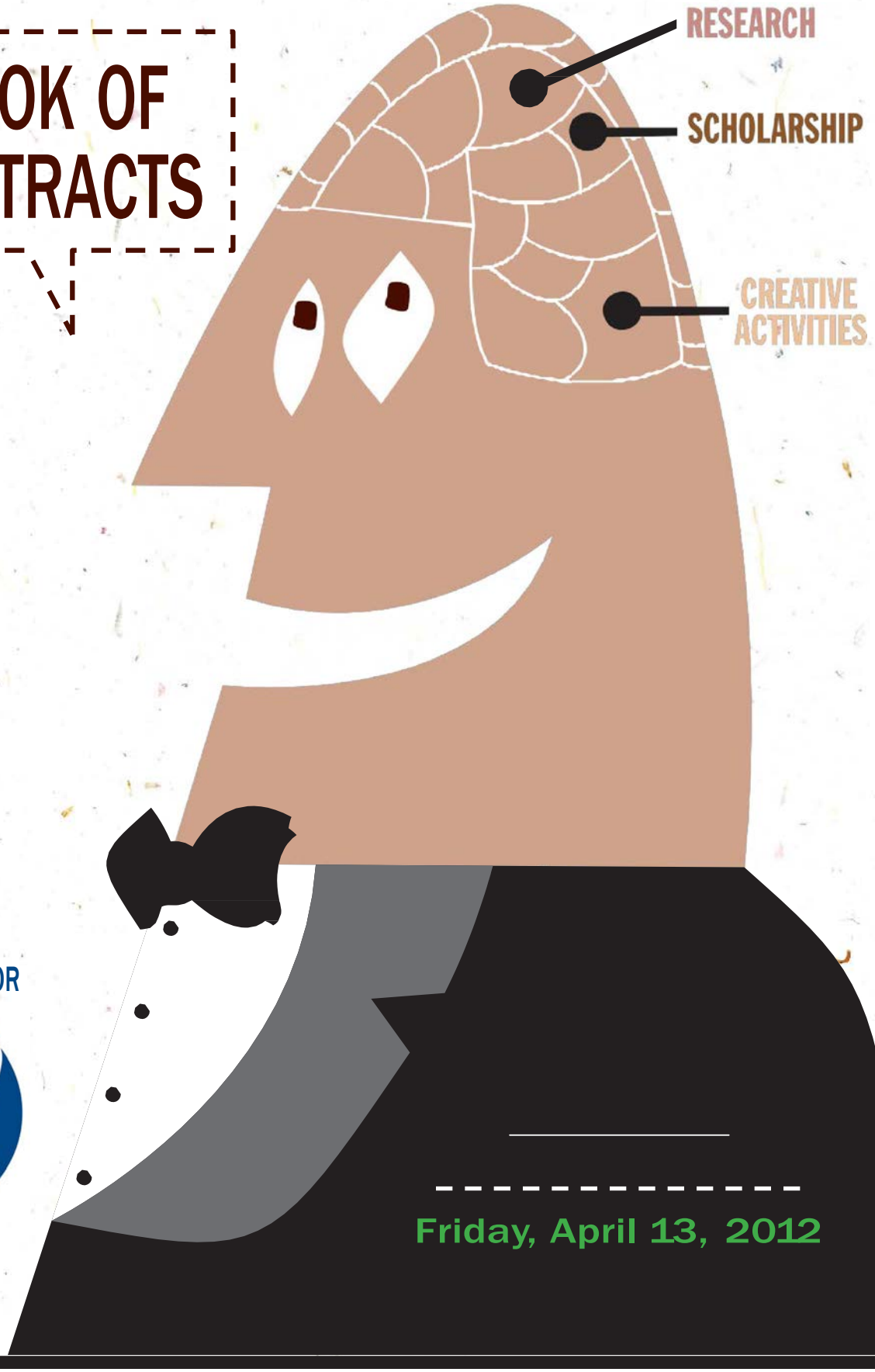
4-13-2012

Wright State University Celebration of Research, Scholarship and Creative Activities Book of Abstracts Friday, April 13, 2012

Wright State University Office of Undergraduate Research and STEMM Activities

CELEBRATION OF RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITIES

BOOK OF ABSTRACTS



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Friday, April 13, 2012

Wright State University's

Third Annual

Celebration of Research, Scholarship and Creative Activities

April 13, 2012

Student Abstract Booklet

A Compilation of Abstracts from Students' Oral and Poster Presentations

Office of Undergraduate Research and STEMM Activities
Wright State University
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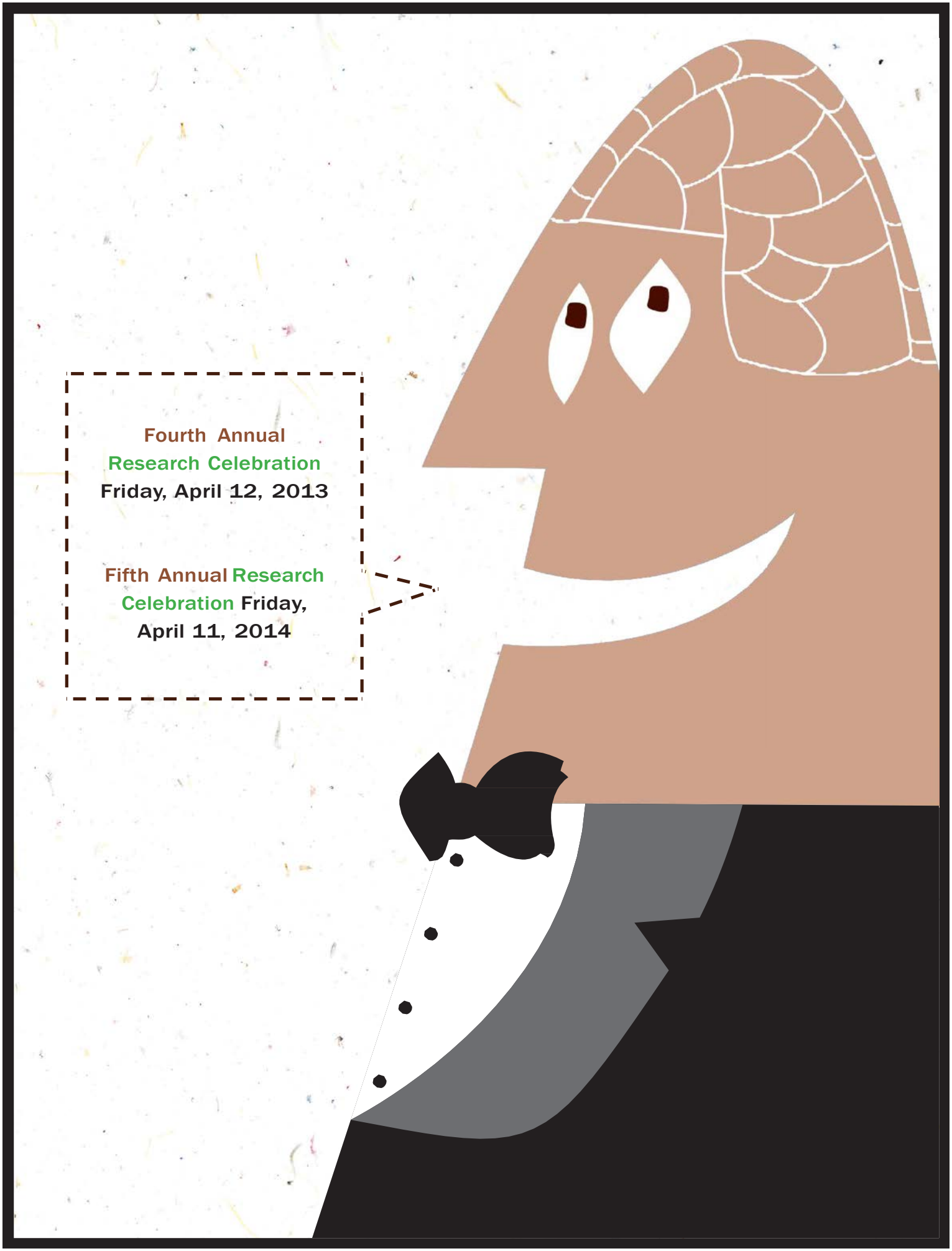
Table of Contents

Fourth Annual
Research Celebration
Friday, April 12, 2013

Fifth Annual Research
Celebration Friday,
April 11, 2014



Schedule of Events

Conference Check-In and Registration: Student Union, E156, E157, E163	7: 30 am - 11:30 am
Oral Presentation, Session I Student Union, E156, E157, E163	9 am – 11:20 am
COLA Dean's Colloquium	9 am – 11:20 am
Poster Presentations and Lunch: Apollo Room, Student Union	11:40 am – 1:30 pm
Oral Presentations, Session II: Student Union	1:45 – 3:45pm

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Applied Behavioral Science

Parent-Child Relationships as a Motivation for Improved Behavior Among Prison Inmates

Student Presenter(s): Carin Benning
Graduate student
Faculty Mentor: Karen Lahm
Department: Applied Behavioral Science

There are currently a combined total of 1,613,740 men and women incarcerated in the United States correctional system (Bureau of Justice Statistics, 2009). Because men and women experience social conditions differently, the needs of both male and female inmates require particular investigation. The purpose of this study was to examine how the amount of contact male and female prison inmates have with their children affects their behavior while they are incarcerated. Results from a sample of 9,706 state and federal prison inmates reflect that the higher the frequency of visitations male and female prison inmates have with their children, the less likely they are to be written up or found guilty of any rule violations while incarcerated. Implications of differential treatment for male and female inmates and the creation of parent-child based programs are discussed.

Athletic Training

The Etiology and Management of Achilles Tendon Ruptures

Student Presenter(s): Allison Church
Undergraduate student in Athletic Training
Faculty Mentor: Tony Ortiz
Department: Athletic Training

Injuries to the Achilles tendon are becoming more prevalent in today's society due to a variety of risk factors which include training errors and gait abnormalities. Achilles tendon ruptures, most commonly occurring in the 3rd-5th decade of life, are one of the most debilitating injuries, preventing weight bearing and ambulation on the injured side. The anatomy, physiology and biomechanics of the lower leg have been examined in order to recognize the pathology of Achilles tendon ruptures and determine the best preventive measures to reduce the risk of tendon rupture. Through clinical and surgical observation, and research using 18 scholarly journal articles, the most innovative and advanced management techniques have been analyzed to optimize patient recovery and prompt return to athletic participation. A comparison of injury treatment options, including conservative care and a variety of surgical techniques, are described to determine the best plan of care for diverse patient scenarios. A post-surgical protocol and rehabilitation plan have been designed to advance patients through the various stages of recovery, which include immobilization, therapeutic modalities, stretching, strengthening, proprioception and functional activities.

Biochemistry and Molecular Biology

Isolation and Characterization of a Triple Histidine Mutation in the Proton-Collecting Antenna of Cytochrome c Oxidase in Rhodobacter Sphaeroides

Student Presenter(s): Khadijeh Alnajjar
Graduate student in Biological Sciences
Faculty Mentor: Lawrence Prochaska
Department: Biochemistry and Molecular Biology

Mitochondria are the metabolic powerhouses of the cell, taking energy released from foodstuffs and, in a series of oxidation-reduction reactions, conserving that energy into ATP, which is used to

drive most reactions in the cell. These oxidation-reduction reactions use molecular oxygen as the terminal electron acceptor. The energy released is coupled to the pumping of protons across the mitochondrial inner membrane, creating the proton motive force. Cytochrome c oxidase (COX) catalyzes the oxidation of ferrocytochrome c and the reduction of oxygen to water while concomitantly translocating protons across the inner mitochondrial membrane. The catalytic core of COX consists of three subunits. The N-terminus of subunit III (SUIII) contains three conserved histidine residues that are surface exposed and are in close proximity to the mouth of the D-channel, which takes up protons to the catalytic site, where oxygen is reduced. A triple histidine mutation in SIII of COX was created using Rhodobacter sphaeroides, a bacterial model of the mitochondrion. This mutation lacks the functional groups that could participate in the uptake of protons (H3A, H7A and H10A). The mutant COX was isolated and purified by using nickel affinity chromatography. The enzyme exhibits a similar visible absorbance spectrum as wild-type enzyme; however, SDS-PAGE shows that the isolated enzyme loses 50% of SUIII content. The mutant COX retains 35% of wild-type electron transfer activity and exhibits a phenomenon called suicide inactivation, where the enzyme slowly inactivates and denatures itself. Steady-state visible absorbance spectroscopic studies indicate that electrons accumulate at heme a in the mutant during enzymatic turnover. Though the mutation does not perturb the catalytic site; it slows electron transfer activity indirectly by slowing proton uptake through the D-channel. Taken together, these results show that the removal of the three histidine residues perturbs the entry point of protons to the D-channel.

Co-Authors/Collaborators: Jonathan Hosler, Lawrence Prochaska

Dose dependent effects of 1-alpha-25-dihydroxyvitamin D3 on keratinocyte proliferation and Delta-Np63alpha stabilization.

Student Presenter(s): Natasha Hill
Graduate student
Faculty Mentor: Madhavi Kadakia
Department: Biochemistry and Molecular Biology

Objective: 1-alpha-25-dihydroxyvitamin D3 (VD3), explored as an anti-cancer agent, has recently been shown to also promote cell survival. VD3 exerts its effects via its cognate receptor; the Vitamin D Receptor (VDR). delta-Np63alpha, a proto-oncogene up-regulated in non-melanoma skin cancers, positively regulates VDR expression and is critical for VDR mediated development. The objective of this study was to determine if VDR/VD3 signaling promotes keratinocyte proliferation via regulation of delta-Np63alpha. Results and Conclusions: Loss of VDR leads to decreased delta-Np63alpha expression indicating that VDR transcriptionally regulates delta-Np63alpha. Interestingly, while low dose of VD3 led to increased deltaNp63alpha protein expression and keratinocyte proliferation, high doses of VD3 decreased deltaNp63alpha and reduced keratinocyte proliferation. The stabilization of delta-Np63alpha by VD3 was shown to be at the protein level, and critical to the pro-proliferative effects of VD3. Loss of VDR led to a dramatic reduction in both basal as well as VD3 induced cell proliferation. Immunofluorescence staining of delta-Np63alpha and VDR after VD3 treatment further confirmed an increase in delta-Np63alpha expression with low dose VD3 and a decrease expression of delta-Np63alpha with high dose VD3. Significance: We have demonstrated a dose dependent effect of VD3 on delta-Np63alphalevels. The effects of VD3 on delta-Np63alpha were shown to be VDR dependent and critical for keratinocyte proliferation. This study provides mechanistic insight into how VD3 can exert both pro-proliferative and pro-apoptotic effects via

regulation of delta-Np63alpha levels. Delineation of the mechanisms by which VD3 exerts its effect on delta-Np63alpha will be critical for determining the future of VD3 in cancer therapies.
Co-Authors/Collaborators: Natasha Hill, Andrew Whitlatch and Madhavi P. Kadakia

PTEN impacts integrity and composition of mitotic centrosomes

Student Presenter(s): Mary Leonard
Graduate student in Biological Sciences
Faculty Mentor: Madhavi Kadakia
Department: Biochemistry and Molecular Biology

Loss of the tumor suppressor PTEN is observed in many human cancers, which display increased chromosome instability and aneuploidy. The subcellular fractions of PTEN are associated with different functions that regulate cell growth, invasion and chromosome stability. In this study we show a novel role for PTEN in regulating mitotic centrosomes. Localization of PTEN to mitotic centrosomes peaks between prophase and metaphase, paralleling the staining of gamma-tubulin and coinciding with the time frame of centrosome maturation. Knockdown of PTEN reduced gamma-tubulin at mitotic centrosomes and led to reduced global levels of gamma-tubulin during nocodazole-induced mitotic arrest. The reduction of gamma-tubulinmay contribute to the defects in centrosome number and chromosome segregation observed after knockdown of PTEN. The intensity and localization of PTEN at mitotic centrosomes was also impaired in more tumorigenic cell lines as compared to primary cells, indicating that recruitment of PTEN to mitotic centrosomes plays a role in chromosome stability and possibly cancer progression.
Co-Authors/Collaborators: Dr. Paula Bubulya, Dr. Madhavi Kadakia

Evaluation of Dietary Vitamin D on ΔNp63α and VDR Expression in UVB Induced Skin Cancers

Student Presenter(s): Gabriel Gracia Maldonado
Graduate student
Participant in GRAD-PREP
Faculty Mentor: Madhavi Kadakia
Department: Biochemistry and Molecular Biology

ΔNp63α, a proto-oncogene, has been shown to be upregulated in non-melanoma skin cancers while simultaneously inducing the expression of genes involved in inhibition of invasion. Vitamin D receptor (VDR), a target of ΔNp63α, and receptor of 1α25-(OH)2D3, vitamin D (VD3) inhibits cell invasion. The objective of this study was to determine if dietary VD3 modulates the expression of ΔNp63αand/or VDR in ultraviolet radiation induced tumors in SKH1 mice.
Effects of chronic ultraviolet exposure and/or increasing amounts of dietary VD3 on ΔNp63α and VDR expression was measured by immunofluorescence in formalin fixed, paraffin embedded tumor and normal skin samples from SKH1 mice. Mice were fed normal chow or increasing amounts of VD3 enriched chow in the presence or absence of UVB exposure, thrice weekly for 25 weeks. Statistical analysis of mean fluorescent intensities for ΔNp63α and VDR were used to correlate ΔNp63α and VDR expression with diet and tumor severity.
Chronic UVB exposure in SKH1 mice increased p63 expression while decreasing VDR expression in normal skin, independent of dietary VD3. Low-grade papillomas in mice exposed to UV and fed normal chow, displayed increased levels of ΔNp63α while more invasive tumors showed reduced expression of both ΔNp63α and VDR. Interestingly, mice fed high VD3 chow did not display elevated levels of ΔNp63α in locally invasive tumors but also had higher tumor burdens and size, suggesting that supra-physiologic levels of VD3 may impair tumor suppression by inhibiting the anti-invasive ΔNp63α during early tumor formation.

This study provides mechanistic insight into how the traditionally viewed "apoptotic" VD3 can affect skin cancer development and progression. The dose dependent effects of VD3 on ΔNp63α and VDR in chronically UVB exposed skin highlights the need for better understanding of how diet can affect tumor formation and/or progression. Clarifying the roles of ΔNp63α, VDR/VD3 in the mechanism and progression of non-melanoma skin cancer could lead to better methods of cancer prevention.
Co-Authors/Collaborators: Mary Leonard, Tatiana Oberyszyn and Madhavi P. Kadakia

miR-34a mediated post transcriptional regulation of MDM4

Student Presenter(s): Pooja Mandke
Graduate student in Biological Sciences
Faculty Mentor: Michael Markey
Department: Biochemistry & Molecular Biology

MDM4, also called MDMX or HDMX in humans, is an important negative regulator of the p53 tumor suppressor. MDM4 is overexpressed in about 17% of all cancers. MDM4 is known to be post-translationally regulated by MDM2-mediated ubiquitination to decrease its protein levels in response to genotoxic stress, resulting in accumulation and activation of p53. However, at the transcriptional level, MDM4 gene regulation has been less clearly understood. Through our work it is seen that MDM4 mRNA is a target of hsa-mir-34a (miR-34a). Micro-RNAs typically bind to their target genes in the 3' untranslated region. MDM4 mRNA contains a lengthy 3' untranslated region; however, it is a miR-34a site within the open reading frame (ORF) of the last exon that is responsible for the repression. Overexpression of miR-34a, but not a mutant miR-34a, is sufficient to decrease MDM4 mRNA levels to an extent identical to those of known miR-34a target genes. Likewise, MDM4 protein levels are decreased by miR-34a overexpression, and introduction of a miR-34a inhibitor can induce MDM4. A portion of MDM4 exon 11 containing this miR-34a site fused to a luciferase reporter gene is sufficient to confer responsiveness, being inhibited by additional expression of exogenous mir-34a and activated by inhibition of miR-34a. These data establish a mechanism for the observed negative regulation of MDM4 and potentially provide a means to manipulate MDM4 expression without introducing DNA damage.

Characterization of PLD2 GEF activity and its regulation

Student Presenter(s): Madhupriya Mahankali
Graduate student in Biological Sciences
Faculty Mentor: Julian Gomez-Cambronero
Department: Biochemistry and Molecular Biology

Phospholipase D2 (PLD2) is a lipase that catalyzes the breakdown of phopsphatidyl choline to phosphatidic acid (PA) which in turn is involved in variety of cell signaling pathways. PLD2 also interacts with many proteins like Grb2, Rac2 and actin etc. through which it regulates actin cytoskeleton. Therefore it is one of the key players in both physiological and pathological scenarios by mediating cell migration and cell invasion respectively. In addition to its lipase activity and its ability to interact with other proteins, surprisingly our lab for the first time discovered that it is a guanine nucleotide exchange factor (GEF). Since it is a newly identified GEF very little is known about its GEF activity. The objective of the present study is to identify the key aminoacids involved in the GEF activity of PLD2 and also the upstream regulators. With multiple sequence alignment of PLD2 and known GEFs, Dbs and Tiam1, conserved regions amongst the three proteins were manually derived. Candidate aminoacids in the conserved regions were selected to perform further mutational analysis to identify the aminoacids

involved in GEF activity. In addition, chemotaxis and phagocytosis assays were performed with macrophage cell lines to confirm the functional relevance of the mutants. We showed that the PX and PH domains are the GEF activity containing domains, PX being the important. Within the PX domain, we propose that the α-helix-3 has putative GEF activity site. The mutants that are deficient in GEF activity are also found to be defective in performing chemotaxis and phagocytosis. With respect to the regulation of GEF activity our preliminary data suggests that JAK3, a tyrosine kinase that is known to phosphorylate at tyrosine 415 of PLD2, inhibits GEF activity. In future we would like to investigate other upstream regulators and how lipase and GEF activities are differentially regulated

Co-Authors/Collaborators: Julian Gomez-Cambronero

Fatty acids and their thioester derivatives as ligands for human PPARα

Student Presenter(s): Dhawal Oswal
Graduate student in Biological Sciences
Faculty Mentor: Heather Hostetler
Department: Biochemistry and Molecular Biology

Peroxisome proliferator activated receptor alpha (PPARα) belongs to the family of the ligand dependant nuclear transcription factors that play key roles in regulating lipid homeostasis. Previous studies have suggested binding of mouse and xenopus recombinant PPARα to fatty acids (FA) and their thioester derivatives (fatty acyl coenzyme A; FA-CoA) however, no such studies have been done with full length human PPARα (hPPARα). Owing to differences in the physiological effects of PPARα activation across species (i.e. peroxisome proliferation seen in rodents but not in humans), it is possible that binding affinities and specificities for such ligands may differ. Dysregulation of FA and FA-CoA may alter the transcriptional activity of PPARα and may contribute significantly to the pathogenesis of the metabolic syndrome. In the current study, we test the binding of various FA and FA-CoA to hPPARα. Data from both spectrofluorometry and circular dichroism spectroscopy suggest binding of both saturated and unsaturated FA and FA-CoA to the hPPARα at physiologically relevant concentrations found inside the cell. This is in contrast to murine PPARα which bound to only unsaturated FA but not saturated ones. Our data helps determine various endogenous ligands for hPPARα which will further help delineate the role of PPARα as a nutrient sensor in regulating energy homeostasis. This work is supported by USPHS NIH grant DK77573.

Biological Sciences

The phylogenetics of Tachinidae (Insecta: Diptera) with an emphasis on subfamily structure

Student Presenter(s): Daniel Davis
Graduate student in Biological Sciences
Faculty Mentor: John Stireman
Department: Biological Sciences

The 10,000 species of the Tachinidae family are a specialized group of parasitoid flies that are used in biological control. However, little is known about the relationships with the family and how their parasitoid lifestyle arose. Using genetic techniques, a base level phylogeny was constructed for the major subfamilies and their relationships. Superfamily structure was also analyzed to provide clues to the evolution of the parasitoid lifestyle within the Tachinidae flies.

How environmental conditions and changing landscapes influence the survival of a rare woodland butterfly, Pieris virginiensis.

Student Presenter(s): Samantha Davis
Graduate student in Biological Sciences
Faculty Mentor: Don Cipollini
Department: Biological Sciences

Background/Question/Methods Rare organisms are often strongly affected by chance, disease, invasive species, and other factors. Pieris virginiensis (Pieridae), a rare woodland butterfly, flies only in April and May, in often unsuitable weather, and uses native mustards as its primary larval hosts. P. virginiensis may be adversely affected by the introduction of the invasive garlic mustard and other biotic and abiotic stressors. A. petiolata, which contains feeding deterrents, has been observed as an oviposition site for P. virginiensis. We reexamined a population of P. virginiensis in Ohio that uses A. laevigata as its primary host. This population was last studied in the 1988, prior to the introduction of A. petiolata to the area. We sought to test the hypothesis that A. petiolata introduction has changed P. virginiensis oviposition behavior. On April 28, 2011, we marked 64 flowering stems of A. laevigata and 54 flowering stems of A. petiolata in the exact location where the previous study was performed and examined them weekly for eggs, larvae, herbivore damage, and other observations. We recovered no P. virginiensis eggs or caterpillars, observed no Pieris-specific damage on monitored plants, and we failed to observe any butterflies. To examine alternative stressors on the butterfly or host populations, we recorded general damage, deer browsing, and the presence of possible larval predators. Although the invasive A. petiolata is well established at this site, we believe that the primary cause of butterfly mortality for 2011 was weather, with Columbus, Ohio reaching a new record of 18.1 cm precipitation from April 1-28. From 4/1-5/12, only 33% of the days were marginally acceptable for adult flight (wind < 6.7 m/s, temp. > 10 o C). We conclude that despite pressures due to invasion, predation, and deer browsing, poor flying conditions were the primary stressor in 2011 and apparently prevented any successful reproduction of this butterfly in this area.
Co-Authors/Collaborators: Don Cipollini

Characterization of HIV Rev and Tubulin Interactions

Student Presenter(s): Nickellatt Edwards
Undergraduate student in Clinical Laboratory Science
Participant in Bio- Star **Faculty Mentor:** Mill Miller **Department:** Biological Sciences

The HIV Rev protein has the ability to bind tubulin heterodimers and depolymerize microtubules (MTs) in vitro producing bilayered rings called Rev-tubulin toroids (RTTs) (Watts et al. 2000. J. Cell Biol. 150: 349-360). These interactions may account for MT defects observed in HIV infected cells or cells that over-express Rev. Watts et al. hypothesize Rev interacts with MTs by a mechanism shared with Kinesin-13 (Kin13) proteins owing to the presence of a shared amino acid sequence. Kin13 proteins are potent MT depolymerizing agents affecting MT behavior during mitosis. To test this hypothesis, point mutations were introduced into Rev substituting amino acids shared with Kin13. My lab aims to compare the abilities of each mutant to the wild-type protein to bind tubulin, depolymerize microtubules and alter spindle function. My role in this project is to purify recombinant and wild-type and mutant Rev proteins expressed in bacteria using a two-column FPLC method. Briefly, bacterial cell lysates will be clarified by low speed centrifugation and applied to a MonoQ ion exchange column. Rev eluting from the column

will be applied to a heparin sepharose column where Rev is predicted to elute at salt concentrations greater than 1.5 M. The eluted protein will be denatured with 6 M urea and refolded by sequential dialysis in solutions such that Rev monomers will polymerize into 13 nm thick filaments. At this point, each protein will be analyzed using functional assays that measure Rev-tubulin interactions.

Testing optimal defense theory in *Solidago altissima*

Student Presenter(s): Jeremy Heath
Graduate student in Environmental Sciences PhD Program
Faculty Mentor: John Stireman III
Department: Biological Sciences

Optimal defense theory (OD) predicts that levels of plant defense should correlate with tissue value and risk of attack. That is, tissues of higher fitness value should be more heavily defended (Rhoades 1979). Other theories such as the growth-differentiation balance hypothesis (GDBH) predict that because of constraints and trade-offs associated with resource allocation, OD might not always hold (Herms & Mattson 1992). Depending on the type of defense measured neither theory may be supported (Barto & Cipollini 2005). We assessed the relative contribution of these two theories in a field common garden study of potted clones of the herbaceous perennial tall goldenrod, *Solidago altissima* (Asteraceae). We found that aspects of both theories accurately predicted defense levels, but that genotype described the most variation. These results may form the basis for a model of plant defense that focuses on life history traits.
Co-Authors/Collaborators: Don Cipollini, André Kessler, and John O. Stireman III

Moderate Exercise in Mice Provides Protection against Diet-Induced Diabetes

Student Presenter(s): Daniel Hyman
Undergraduate student in Biological Sciences
Faculty Mentor: Roberta Pohlman
Department: Biological Sciences

Diabetes, a major public health problem affecting up to 25.8 million people in the USA in 2010 (CDC), has been escalating in recent years. One important issue in the etiology of this disease is diet which is composed more and more of fat and fructose. Chronic exercise has been recommended for human diabetics as a way to attenuate metabolic changes and prevent obesity. This study was undertaken to determine the effects of moderate swim exercise on body fat and metabolic parameters in response to a high fat/high fructose diet in mice. Mice were assigned to one of three groups: Control (standard chow, without exercise, n=10); Sedentary (fat/fructose, without exercise, n=9); and Exercise (fat/fructose, with exercise, n=9). In the Exercise group, mice swam 1 hour/day, 3 days/week for 8 weeks. In humans this is equivalent to a low/moderate training program. The fat/fructose diet produced a syndrome similar to human diabetes. There was high blood sugar, insulin resistance, high body fat (up to 40 percent), and increased metabolic hormones (insulin and leptin). The exercise paradigm prevented the pathological effects for glucose, insulin, leptin, and glucose tolerance. Exercise did not improve body fat or fat cell size. Glycogen storage and tissue morphology were examined in the liver. The high fat/fructose diet depleted glycogen and caused tissue damage, effects which were partially corrected by the moderate exercise program. Results document the beneficial effects of even moderate exercise on diet-induced diabetes.

Regulation of Coxsackie and Adenovirus Receptor (CAR) by Cytokines

Student Presenter(s): Poornima Kotha Lakshmi Narayan
Graduate student in Biological Sciences
Faculty Mentor: Katherine Excoffon
Department: Biological Sciences

Airway epithelial cells pose a formidable barrier for the entry of pathogenic viruses. The epithelial tight junction proteins maintain the barrier integrity by sealing the space between the epithelial cells. Adenovirus, which commonly causes acute respiratory infections, uses CAR as its primary receptor for entry into the host cell. CAR is primarily expressed on the basolateral surface of the epithelial cell and thus is sequestered away from pathogen-exposed (apical) surface. However, despite the inaccessibility of CAR to invading adenoviruses, adenovirus infection is common. Many potential mechanisms have been proposed, for example: (A) A structural break in the epithelial barrier might expose the basolaterally expressed CAR to the invading pathogen. (B) The presence of CAREx8, an alternate splice form of CAR, at the apical surface of epithelial cells might serve as adenoviral receptor. Lutschg et al., 2011 demonstrated that apical treatment of airway epithelial cells with supernatant from activated macrophages, and more specifically interleukin-8 (IL-8), for 4h increased the apical localization of CAR and adenovirus infection. Thus, we hypothesized that additional cytokines released on the mucosal surface of the airway epithelial cells regulate the expression of CAR favoring adenoviral infection. To test this hypothesis, the apical surface of polarized Calu-3 cells was treated with 9 different cytokines for 4, 24 or 48h and analyzed for transduction with adenovirus carrying the β-galactosidase reporter gene. Amongst the cytokines tested, both IL-8 and MCP-1 (monocyte chemotactic protein-1) treated epithelia exhibited increased adenoviral infection at 4h and decreased adenoviral infection at 24 and 48h. Short time points (4h) correlated with increased apical CAR while longer time points (24 and 48h) did not. In summary, susceptibility to virus infection in the lung is modulated by the secreted molecules, and likely the cells, that are meant to protect it.
Co-Authors/Collaborators: Katherine Excoffon

Exotic Lonicera species both escape and resist specialist and generalist herbivores in the introduced range

Student Presenter(s): Deah Lieurance
Graduate student in Biological Sciences
Faculty Mentor: Don Cipollini
Department: Biological Sciences

The enemy release hypothesis predicts that invasive plant species may benefit from a top-down control by co-evolved herbivores, particularly specialists, in their new range. However, to benefit from enemy escape, invasive plants must also escape or resist specialist or generalist herbivores that attack related species in the introduced range. We compared damage on the exotic invasive Lonicera maackii with the native congener Lonicera reticulata, and the native confamilial Viburnum prunifolium growing in the field. We also tested the laboratory performance of a North American honeysuckle specialist sawfly and a widespread generalist caterpillar on two North American native and two Asian exotic Lonicera species. Lonicera maackii received significantly lower amounts of foliar herbivory as compared to L. reticulata and V. prunifolium. Native L. reticulata was heavily damaged by the specialist in the field, but was not detected on non-native L. maackii. In no-choice feeding assays, the specialist herbivore performed best on native L. reticulata, while the generalist herbivore performed best on non-native L. maackii. Exotic L. japonica experienced little herbivory in the field and was unpalatable

to the specialist, while the generalist had low overall survival, but high growth rates of the surviving larvae. Both exotic species experienced little herbivory in the field, but L. maackii appears to escape detection by the specialist, while L. japonica is highly resistant to it. These findings indicate that enemy escape contributes to the success of exotic Lonicera species.
Co-Authors/Collaborators: Don Cipollini

Effects of Chronic Exercise on Diet-Induced Obesity in Developing Mice

Student Presenter(s): Arlene Maliekal
Undergraduate student in Biological Sciences
Faculty Mentor: Roberta Pohlman
Department: Biological Sciences

According to a 2011 Centers for Disease Control report, approximately 17% of children and adolescents are obese in the United States. There is great concern that children consume an excess of foods containing high fat and sugar. Purpose: This study was conducted to determine the effects of chronic swim exercise on diet-induced obesity in developing mice. Method: Beginning at 3 weeks of age, C57BL/6 male mice were given standard chow and water or high fat chow (60%) and fructose water (10%) and exposed to swim exercise. Mice were randomly assigned to one of four groups with siblings housed together: Control (CON, n=8, chow/water; CON-EX, n=9, exercise, chow/ water) and Diet (DIET, n=10, 60% fat chow, 10% fructose water; DIET-EX, n=11, exercise, 60% fat chow, 10% fructose water). Mice in the exercise groups (CON-EX, DIET-EX) swam 1 hour, three times/week. Body weight and fat were measured weekly. Oxygen consumption was assessed at the start and end of the study. Results: Body Weight: By week 8 the DIET-EX group had gained the most body weight. ($p<0.0001$) (DIET-EX: 33.21g, DIET: 28.33g, CON-EX: 24.41g, CON: 25.15g). Body Fat: At 8 weeks, body fat was highest in the DIET-EX (DIET-EX: 36.46%, DIET: 23.65%, CON-EX: 11.23%, CON: 9.86%). Kcal/d: At 8 weeks, mice in the CON group consumed more kcal/d than the DIET group ($p<0.01$). The CON-EX group consumed the most kcal/d (CON: 12.03 kcal/d; CON-EX: 12.62 kcal/d; DIET: 6.70 kcal/d; DIET-EX: 8.71 kcal/d). Oxygen consumption data validated the exercise paradigm showing that uptake values were greater in the exercised animals (VO2 Pre = 1.6 ml/min vs. VO2 Post = 4.5 ml/min). Conclusion: Early developmental exposure to high caloric diet in mice produced a marked increase in weight associated with increased fat. This was modulated by chronic exercise, seen as enhanced weight and fat levels.
Co-Authors/Collaborators: Daniel Hyman

MAGI-1 Mediated Degradation of Coxsackievirus and Adenovirus Receptor Exon 8 (CAREx8)

Student Presenter(s): Alexandra McCann
Undergraduate student in Biological Sciences
Faculty Mentor: Katherine Excoffon
Department: Biological Sciences

The Coxsackievirus and adenovirus receptor (CAR) is important for the binding and entry of adenoviruses into the cells of human lungs. This receptor has two transmembrane isoforms, CAREx7 and CAREx8. CAREx8 localizes to the apical surface of polarized human airway epithelial cells where it is accessible for viral infection, while CAREx7 localizes to the inaccessible basolateral surface. Co-expression of CAREx8 with a PDZ-domain containing protein named MAGI-1 (membrane associated guanylate kinase with inverted domain structure-1) results in the loss of CAREx8. This results in decreased viral receptor availability and decreased adenoviral infection. We have recently discovered that CAREx8 interacts with two different domains of MAGI-1, PDZ domain 1 and 3 (PDZ1, PDZ3). Co-expression of CAREx8 with PDZ3 decreases CAREx8 cell surface protein levels

and hence, availability for viral infection, while PDZ1 protects CAREx8 from MAGI-1 mediated loss and sustains viral infection. Endoplasmic reticulum associated degradation (ERAD) is a pathway to degrade newly synthesized proteins. When protein chaperones in the endoplasmic reticulum (ER) detect a misfolded or mutated protein, the deformed protein is transported out of the ER and polyubiquinated for targeted destruction by the proteasome. I hypothesize that MAGI-1, and more specifically the PDZ3 domain of MAGI-1, causes newly synthesized CAREx8 to be identified as abnormal and shuttled into the ERAD pathway for destruction. Adenovirus entry, and thus apical CAREx8 expression, will be evaluated via beta galactosidase assay. I have shown that treating CHO or MDCK cells with an ERAD inhibitor, Eeyarestatin, can increase the apical adenovirus infection. This suggests that inhibiting the ERAD pathway allows more CAREx8 to be available for apical infection. Given these data, ERAD is a likely pathway for CAREx8 degradation. Potentially, ERAD inhibitors could be used to increase adenoviral infection for gene therapy.
Co-Authors/Collaborators: Abimbola Kolawole, Ran Yan, Priyanka Sharma, and Katherine Excoffon

The Influence of depth, rugosity, food quality and primary productivity on abundances of algivorous fishes in Lake Tanganyika

Student Presenter(s): Renalda Munubi
Graduate student in Biological Sciences
Faculty Mentor: Yvonne Vedeboncoeur
Department: Biological Sciences

Many tropical lakes have a diversity of fishes supported in part by algal productivity on rocks. We quantified densities and depth distribution of the two dominant algivorous cichlids by snorkeling along transect line 5m wide from 0-8m depth, at 10 rocky littoral sites in lake Tanganyika, East Africa. We measured rugosity, algal phosphorus (P) content, and primary productivity at each site. Fish densities were highest at 0.5 to 3m depth (1.5 fish/m2) and decreased exponentially with depth within sites. Among sites, fish density and algal P-content were significantly correlated, but fish densities were only weakly correlated with among sites variation in rugosity and primary productivity. At all sites, algivores inhabit the shallowest water where primary productivity is highest, suggesting a strong effect of food availability on algivore distribution. However, the more modest among-site variation in periphyton productivity was not a good predictor of algivore densities, reflecting the complex interactions between resource availability and consumer density. Similarly, the positive correlation between algal P-content and fish density may reflect spatial variation in P input or be driven by fish excretion.
Co-Authors/Collaborators: Ryan Satchell, Yvonne Vadeboncoeur and Peter B. McIntyre

Identification of novel proteins that interact with the Coxsackievirus and adenovirus receptor exon 8 (CAR^Ex8))

Student Presenter(s): James Readler
Undergraduate student in Biological Sciences
Faculty Mentor: Katherine Excoffon
Department: Biological Sciences

The Coxsackievirus and adenovirus receptor (CAR) has two membrane encoding isoforms. The seven exon isoform of CAR (CAR^Ex7) is localized at the basolateral surface of polarized epithelia where it behaves as a homophilic adhesion protein and is inaccessible for adenoviral infection. The eight exon isoform (CAR^Ex8) can be found on the apical surface where it may mediate apical viral infection. The two isoforms differ only in the last 26 (CAR^Ex7) or 13 (CAR^Ex8) amino acids of the cytoplasmic domain. Although both isoforms contain the

same AP-1b signal, which is involved in basolateral sorting, CAR^Ex8 is not localized on the basolateral surface which suggests that the CAR^Ex8-specific 13 amino acid sequence may be dominant over AP-1b-mediated basolateral trafficking. We hypothesized that novel proteins interact specifically with CAREx8. The C-terminus of each isoform of CAR was cloned into the pHH2 plasmid, which included glutathione S-transferase (GST) and 6x-His tags, and transformed into competent Rosetta E. Coli cells. GST-CAR^Ex7, GST-CAR^Ex8 or GST alone were synthesized and purified on GST-sepharose columns. Lysates from Calu-3 cells were pre-cleared and incubated with the GST-fusion proteins or GST (as control) and complexes were isolated with GST-sepharose beads. Proteins were separated by SDS-PAGE and stained with Coommasie blue. GST-CAR^Ex7 and GST-CAR^Ex8 bands were compared and a band, unique to CAR^Ex8, resulting from the Calu-3 cell lysate was sent to MS Bioworks for protein identification by mass spectrophotometry. 94 different proteins were detected in the band. The most prominent types of proteins identified were: actin associated (14/94), chaperone associated (14/94), ubiquitin associated (5/94), clathrin associated (5/94) and DNA/RNA/protein catalytic enzymes (15/94). In summary, CAREx8 interacts with a large number of proteins that will be investigated on a candidate basis.
Co-Authors/Collaborators: Ran Yan and Katherine J.D.A Excoffon

Btf colocalizes with pre-mRNA splicing and mRNA export factors at transcription sites and affects the cellular distribution of mRNAs

Student Presenter(s): Sapna Varia
Graduate student in Biological Sciences
Faculty Mentor: Paula Bubulya
Department: Biological Sciences

Transcription of protein-coding genes is coordinated with pre-mRNA processing as well as mRNP assembly and export in mammalian cell nuclei. Btf (Bcl-2 associated transcription factor) and TRAP150 (Thyroid Hormone Receptor Associated Protein of 150 kDa or THRAP3) are serine-arginine-rich (SR) proteins that have 39% sequence identity and 66% sequence similarity; however it is not clear if the functions of these two proteins completely overlap. Btf and TRAP150 were previously reported to associate with synthetic affinity-purified in vitro spliced mRNPs, and also as a part of the spliceosome complex, suggesting they are involved in pre-mRNA processing. We used an in situ approach to show that both Btf and TRAP150 are recruited to a constitutively active beta-tropomyosin reporter minigene locus in HeLa cells as well as to the U2OS 2-6-3 inducible reporter gene locus in its transcriptionally active but not inactive state. Upon inhibition of RNA polymerase II, Btf and TRAP150 were absent from the locus, indicating their presence at the locus requires transcription. At the activated locus, both Btf and TRAP150 showed some overlap with reporter RNA and other pre-mRNA processing factors, but showed the most extensive overlap with the exon junction complex protein Magoh. Intriguingly, RNA-FISH with fluorescently tagged oligo-dT probes showed an increase in cytoplasmic polyadenylated RNA in HeLa cells specifically following Btf depletion but not TRAP150 depletion. qRT-PCR revealed an increase of beta-tropomyosin minigene reporter transcripts in the cytoplasm in Btf depleted cells. Our data suggests that modulation of Btf and TRAP150 at transcription sites affects processing and nuclear/cytoplasmic distribution of mRNAs.
Co-Authors/Collaborators: Divya Potabathula, Zhihui Deng, Athanasios Bubulya and Paula A. Bubulya

Effects of salicylic acid and jasmonic acid on defensive chemistry of garlic mustard

Student Presenter(s): Alexandria Woodward
Undergraduate student in Biological Sciences
Faculty Mentor: Don Cipollini
Department: Biological Sciences

The biennial plant garlic mustard or Alliaria petiolata is a European native that is invasive in North America. The objective is to examine the effects of the defense hormones salicylic acid and jasmonic acid on defensive chemistry and insect performance on two populations of garlic mustard. The treatments included an independent treatment of each hormone, a control, and a combined treatment of both hormones to see if they acted synergistically or antagonistically. The effects of the hormones on the plants were measured by performance of a chewing herbivore, aphids, insect growth as well as biochemical changes of the plant. Results have indicated Pieres repae larvae tend to have a higher survival rate on the combined treatment of jasmonic acid and salicylic acid when compared to all the other hormone treatments for both populations. The jasmonic acid treatment had the lowest survival rates compared to the other treatments in both populations. Aphid damage results indicate that the combined treatment again had the most aphid damage in both populations. Therefore, the combined treatment could make the plant more palatable for the Pieres repae larvae. The growth rate for the combined treatment was smaller compared to the other treatments for both populations. The growth rates are not only caused by the hormone treatment, but the aphid damage to the plant. Cyanide assay results indicate that the salicylic acid treatment and the combined treatment had the highest concentrations of cyanide. The higher concentration of cyanide might suggest a better defense mechanism needed for these groups of plants. Other defense chemistry assays will be performed on the plants.
Co-Authors/Collaborators: Don Cipollini

The C-terminus of the Coxsackievirus and adenovirus receptor directly interacts with the PDZ1 and PDZ3 domains of MAGI-1 with high affinity

Student Presenter(s): Ran Yan
Graduate student in Biological Sciences
Faculty Mentor: Katherine Excoffon
Department: Biological Sciences

In most epithelia, a seven exon isoform of the coxsackievirus and adenovirus receptor (CAREx7) is localized at the basolateral surface where it behaves as a homophilic adhesion protein and is inaccessible for viral infection. However, we have recently discovered an alternatively spliced, low abundance isoform of CAR (CAREx8) that is present at the apical surface of well-differentiated human airway epithelia. The two isoforms differ only in the last 26 (CAREx7) or 13 (CAREx8) amino acids of the cytoplasmic domain. MAGI-1 is an essential PDZ domain containing protein known to be involved in cell polarization and cancer. We have previously demonstrated the interaction of both CAR isoforms with the third PDZ domain of MAGI-1 (PDZ3), and additionally, CAREx8 with PDZ1. We hypothesized that CAREx8 binds PDZ1 and PDZ3 directly with high affinity. To test this, the CAR C-termini and individual PDZ1, PDZ3, and PDZ2 (as control) domains were cloned into a prokaryotic expression plasmid and transformed into competent E. coli cells. Each of the proteins were synthesized, purified, and labeled with Cy3 or Cy5 fluorophores. Direct fluorescent binding assay and fluorescence resonance energy transfer (FRET) were used to detect the affinities between Cy3 labeled PDZ domains and Cy5 labeled CAR C-terminus proteins. Ligand binding curves indicated a high affinity binding for PDZ1-CAREx8,

PDZ3-CAREx8 and PDZ3-CAREx7 with Kd values less than 10nM. In transfected CHO-K1 cells, PDZ3 was able to decrease the cell surface expression of CAREx8 and adenovirus infection, without causing a decrease in total CAREx8 protein levels. In contrast, PDZ1 was able to rescue CAREx8 from MAGI-1 mediated degradation and thus allow adenovirus infection. These data suggest that the PDZ1 and PDZ3 domains represent potential druggable small molecules that are able to regulate the levels of CAREx8 and hence adenovirus infection.
Co-Authors/Collaborators: Abimbola O. Kolawole, Priyanka Sharma, Heather A. Hostetler, Katherine J.D.A. Excoffon

Positive feedback does not occur between garlic mustard (Alliaria petiolata) and Eurasian earthworms

Student Presenter(s): Alexandra Zelles
Graduate student in Biological Sciences
Faculty Mentor: Tom Rooney
Department: Biological Sciences

Eurasian earthworms are a growing concern to forests in northern regions of the United States and Canada. Earthworm invasion alters nutrient retention and uptake in ecosystems and reorganizes plant and animal community structure and composition. Likewise, garlic mustard (Alliaria petiolata) invasion alters native plant communities. Many studies have examined the positive relationship that may exist between invasive shrubs and Eurasian earthworms; however, very few have examined the interactions between garlic mustard and Eurasian earthworms. Our goal is to characterize the relationship between garlic mustard and Eurasian earthworm species in southwest Ohio forest understories. Earthworms were sampled by liquid mustard extraction. Earthworm community composition, abundance and biomass were compared between 0.1 m2 plots consisting of garlic mustard, cut-leaved toothwort (Cardamine concatenate), or wild ginger (Asarum canadense). One-way ANOVA did not indicate a difference in average abundance of Eurasian earthworms among plots with the three plant species. We did find a greater abundance of juvenile earthworms than adults in the spring than the fall sampling period. One-way ANOVA indicated a greater mean Eurasian earthworm dry weight biomass in garlic mustard and ginger plots than in cut-leaved toothwort plots in the spring, and a slightly greater mean Eurasian earthworm biomass in ginger plots than garlic mustard plots in the fall. Nightcrawlers (Lumbricus spp.) have a greater mean biomass than all other worm species sampled in all sampling periods. Linear regression does not show a correlation between aboveground % cover of plants and earthworm abundance or biomass. Analysis of similarity did not identify distinct worm communities beneath garlic mustard, cut-leaved toothwort, or ginger. Our results do not support strong feedbacks between garlic mustard and Eurasian earthworms.
Co-Authors/Collaborators: Thomas P Rooney

Biomedical, Industrial, and Human Factors Engineering

Neck and Head Injury Criteria and How It Relates to Pilot Ejection

Student Presenter(s): Kevin Hatcher
Undergraduate student in Biomedical Engineering
Faculty Mentor: Tarun Goswami
Department: Biomedical Engineering

In this research the criteria of neck and head injuries are examined to see if the forces experienced in car crashes can relate to the forces that fighter jet pilots experience. The data that the National Highway Traffic Administration (NHTSA) has presented on injury data and the

Abbreviated Injury Scale (AIS) will be used in classifying the types of injuries that pilots could experience during ejection. With the NHTSA data and the AIS the research should show that pilot will experience AIS values that affect the lower cervical spine of C7-T1 rather than the upper C1-C4.

Analysis of NFL Concussions

Student Presenter(s): Isiah Kendall
Undergraduate student in Biomedical Engineering
Faculty Mentor: Tarun Goswami
Department: Biomedical, Industrial and Human Factors Engineering

Concussions due to athletic activities is something that is persistently growing, specifically in the field of football. When two players run towards each other in opposed directions and collide they experience conservation of momentum. When the momentum is transferred, a force is also applied to the head based on a series of mechanical events. This process evokes a certain amount of G-force on the skull, which may lead to indications of a concussion. The objective of this research project is to not only understand the full expansion of an impact leading to a concussion (specifically occurring in the NFL), but also what is currently being done to moderate them. Data will be obtained by analyzing different collision scenarios and how much G-force is accumulated. The investigation of different types of football helmets will be examined in the event of seeing which brand provides the best protection from the G-force threshold leading to a concussion.

Imperfect Situation Awareness: Representing the Role of Error and Uncertainty in Modeling, Simulation & Analysis

Student Presenter(s): Victor Middleton
Graduate student Engineering
Faculty Mentor: Frank Ciarallo
Department: Biomedical, Industrial and Human Factors Engineering

Representation of Situation Awareness/Situation Understanding (SA/SU) is now an acknowledged need in computer simulations of military operations. An important aspect of such representation is decision-making with SA/SU that may be incomplete and/or erroneous. The goal of this research is to apply engineering methods to improve representation of SA/SU in such simulations, which at present rely too heavily on model "omniscience" in the data used to support decision-making and its effects.The approach employed uses agent-based modeling and simulation to represent military operations. Geo-spatially "lost" intelligent agents are simulated as trying to navigate in a virtual world. Each agent has a unique dynamic "mental map" - its idiosyncratic view of its geo-spatial environment. Its decisions are based on this idiosyncratic view, but behavior outcomes are based on ground truth. The rate and degree to which an agent's expectations diverge from ground truth provide measures of how good its SA/SU is, and simulation outcomes provide measures of the operational effects of different levels of SA/SU. Being "lost" can be studied as a concrete geo-spatial condition. It can also serve as a metaphor for uncertainty and/or inaccuracy providing a foundation for exploring the more metaphorical aspects of decision-making under uncertainty.

Supplier Decisions in a Two-Retailer, One Supplier Transshipment System with Quantity Discounts

Student Presenter(s): Gregory Noble
Graduate student Engineering
Faculty Mentor: Frank Ciarallo

Department: Biomedical, Industrial, and Human Factors Engineering

Transshipment allows for inventory sharing of a product between locations when there is sufficient demand for that product. The most common advantage identified in the literature from a transshipment system is that it allows for lower stock levels to be held at all locations, thus reducing inventory holding costs. The interaction of incentives between quantity discounts and transshipment agreements has not been studied in the past and leads to significant new insights into the behavior of suppliers and retailers. Using the two-block tariff quantity discount price structure in a transshipment model results in the two retailers having four potential equilibrium quantity combinations to consider, rather than just one when the supplier does not offer a pricing contract with a quantity discount. Two of the potential retailer equilibrium combinations have symmetric retailer ordering quantities, while the other two potential retailer equilibrium combinations have non-symmetric ordering quantities. This is in spite of otherwise symmetric cost and demand parameters. The quantity discount cost parameters chosen by the supplier are the base unit price, the discounted unit price and the discount triggering quantity. Strategically, the supplier should choose the pricing parameters within a range so that the retailers have a non-symmetric equilibrium to consider, since this can lead to the highest profits for the supplier. Also, the supplier must carefully choose the triggering quantity within the range that contains the non-symmetric equilibrium so that the retailers have equal profits, allowing the equilibrium to exist. We find that the supplier's profit will increase when the value of base price is as large as is feasible and the value of the discounted price is as small as is feasible. Decreasing the value of the discounted price also increases each retailer's profit, while increasing the value of the base price decreases each retailer's profit.

Co-Authors/Collaborators: Dr. Frank Ciarallo

Chemistry

"Green" size-selection and concentration of unfunctionalized silver nanoparticles for SERS-based sensing applications

Student Presenter(s): Joshua Baker
Graduate student in Chemistry
Faculty Mentor: Ioana Pavel-Sizemore
Department: Chemistry

Today, silver nanoparticles (AgNPs) are being widely used in consumer products, water disinfectants, therapeutics, biomedical devices and surface-enhanced Raman spectroscopy (SERS)-based sensing. AgNP size and aggregation state greatly influence these applications. However, many challenges arise from the toxicity of reagents, high costs or reduced efficiency of the AgNP synthesis or isolation methods (e.g., centrifugation, size-dependent solubility, etc.). Tangential flow ultrafiltration (TFU) is a recirculation method that passes a liquid sample through a series of hollow fiber membranes with pore size ranging from 1,000 kD to 10 kD in order to isolate proteins or cells according to their weight. In this study, TFU was modified to size-select and significantly concentrate a large volume of polydisperse colloidal AgNPs. The well-established Creighton method was utilized to synthesize unfuctionalized AgNPs (4 L, 14.7 µg/mL) by the reduction of AgNO3 with NaBH4. AgNP polydispersity was decreased through a 3-step TFU process using a 50 nm filter to remove AgNPs and AgNP-aggregates larger than 50 nm followed by two 30 kD filters to concentrate the AgNPs. TFU may be considered a "green" method as it neither damages the sample nor requires additional solvent to eliminate toxic excess reagents and byproducts. Representative TFU samples were characterized using TEM, UV-Vis

absorption spectrophotometry, Raman spectroscopy and ICP-OES. The final 30 kD retentate of AgNPs was highly concentrated (2 mL, 6.04 × 10^2 µg/mL of silver) but minimally aggregated and homogeneous (AgNPs of 1-20 nm diameter). The highly concentrated AgNPs were found to greatly enhance the SERS-based sensing capabilities of the Creighton colloid. SERS events were observed at 10^-9 M of R6G as compared to the original AgNP colloid detection limit of 10^-6 M of R6G. This was attributed to an increased number of SERS hot spots available for a target molecule within the minimal focal volume.
Co-Authors/Collaborators: Catherine B. Anders, Adam C. Stahler, Austin Williams, Ioana E. P. Sizemore

Halogenations of Aryl Substituted Sydnones

Student Presenter(s): Daniel Brown
Graduate student in Chemistry
Faculty Mentor: Kenneth Turnbull
Department: Chemistry

Recently, a novel avenue to the iodination of sydnones at the 4-position has been developed using N-iodosuccinimide in acetic acid (cf. 1 to 2). The scope of this concept will be enumerated using various activated and deactivated arylsydnones, and extended by means of other halogenating reagents, such as N-chlorosuccinimide and N-bromosuccinimide.
Co-Authors/Collaborators: Jennifer Benson, Ashley Clark, Kyle Liddy, Jeffrey Morehead, Kyle Oxman

Transport of Engineered Silver Nano Particles through Saturated Porous Media

Student Presenter(s): Jessica Dagher
Graduate student in Chemistry
Faculty Mentor: Ioana Pavel-Sizemore
Department: Chemistry

Silver nanomaterials are released into environmental receptors due to their increased application in consumer products and research. However, the interaction of silver nanoparticles (AgNPs) with soil and groundwater is not well understood. This study simulates bench-scale transport of Creighton colloidal AgNPs through a one-dimensional column packed with saturated porous media. The AgNPs were synthesized by reduction of silver nitrate with sodium borohydride, and characterized using ultraviolet-visible absorption spectroscopy (shape, size distribution, aggregation state, and surface plasmon resonance), Raman spectroscopy (purity), transmission electron microscopy (average size and size distribution), flame atomic absorption spectroscopy (concentration), dynamic light scattering (hydrodynamic size), and Zeta potential (surface charge). A glass column (5.0 cm length, 2.5 cm diameter) was packed with glass beads. AgNPs and a conservative tracer (chloride ion) were injected as a pulse into the column in an upward direction at fixed pH (~8) and ionic strength (0.01 mM of KCl). Aliquot samples were collected throughout the adsorption and desorption phases using a fraction collector. Breakthrough curves were constructed for the effluent to influent concentration ratio (C/C0) as a function of pore volume (PV). The breakthrough curve showed a mass loss in the effluent for the transport of AgNPs of 1-100 nm in diameter and no retardation compared to the tracer. This behavior may be attributed to the irreversible capture of the AgNPs by the glass beads. Our future experiments will target the transport of surface modified AgNPs in the presence of organic matter.
Co-Authors/Collaborators: Sushil R. Kanel, Allie Meyerhoefer, Mark N. Goltz, and Ioana E. Pavel Sizemore

Cyclopentadienone Dimers

Student Presenter(s): Mark Duffy
Undergraduate student in Chemistry
Faculty Mentor: William Feld
Department: Chemistry

The exposure of solid, red 2,5-dicarboethoxy-3,4-di(4-methylphenyl)cyclopentadienone to visible light results in the formation of a colorless "dimer". The cyclopentadienone is synthesized from 4,4'-dimethylbenzil and diethyl 1,3-acetonedicarboxylate. The structure of the "dimer" includes a central eight membered ring with two bridging carbonyls that shows interesting characteristics in the solid and solution state. It appears to be photochemically unstable in solution and undergoes transesterification on recrystallization from 1-propanol. Further research is in progress on this ring system to understand what manipulations it can undergo and how these manipulations affect its reactivity.
Co-Authors/Collaborators: Mark R. Duffy, Dr. William A. Feld

Synthesis of Molybdenum Trinuclear Clusters

Student Presenter(s): Kelsi Eberst
Undergraduate student in Pre-Med/Pre-professional health
Faculty Mentor: Vladimir Katovic
Department: Chemistry

The proposed research was to create three types of trinuclear clusters; [Mo3O2(OAc)6(H2O)3]2+ , [Mo2WO2(OAc)6(H2O)3]2+, and [MoW2O2(OAc)6(H2O)3]2+. After these trinuclear clusters have been synthesized, the goal is to deposit the trinuclear cluster electrochemically onto the platinum electrode of an ethanol fuel cell. The trinuclear metal clusters are planned to be deposited in order to keep the platinum plate from "pitting" or being poisoned by the adsorbed CO produced from the ethanol. In reality, only the [Mo3O2(OAc)6(H2O)3]2+] was attempted to be synthesized due to time constraints.

Tailoring the Solubility and Thermal Characteristics of Poly(ether ether ketone)s

Student Presenter(s): Andria Fortney
Undergraduate student in Chemistry
Participant in UROP Summer Program 2011

Faculty Mentor: Eric Fossum
Department: Chemistry

The solubility and thermal properties of poly(ether ether ketone) (PEEK) have been modified by incorporating various ratios of a comonomers, 4,4'-difluorobenzophenone, 1, and its geometric isomer 3,5-difluorobenzophenone, 2. The resulting polymers have the same chemical composition, allowing for accurate structure-property relationships to be determined. The use of monomer 2 affords PEEK systems that carry pendant benzoyl groups, which provide a versatile site for the introduction of functional groups. The ratio of monomer (2:1) had a dramatic influence on the thermal properties and solubility characteristics of PEEK. At lower ratios, 50:50 and 75:25, the polymers were completely amorphous and soluble in N-methylpryrrolidinone, while at higher ratios, 80:20, 85:15, and 90:10, the materials became semi-crystalline and their solubility decreased. TGA analysis indicated excellent thermal stability as the materials 5 % weight loss temperatures (Td5%) in excess of 410°C.

Synthesis of Crown Ether-Lithium Phthalocyanine Complexes

Student Presenter(s): Daniel Greene
Undergraduate student in Chemistry

Faculty Mentor: William Feld
Department: Chemistry

Dilithium phthalocyanine has attracted recent attention for potential application as a conductive material for lithium ion batteries. It has been found that one of the lithium ions is easily exchangeable or removed via a metathesis reaction. A variety of tetraalkyl ammonium halides and imidazolium tetrafluoroborates have been reported as participants in these metathesis reactions and the corresponding lithium phthalocyanine complexes have been characterized. In an alternative approach, two crown ethers, 12-crown-4 and 18-crown-6, have been mixed with dilithium phthalocyanine to afford two new compounds; 12-crown-4 lithium phthalocyanine and 18-crown-6 lithium phthalocyanine. Characterization of these compounds by H1NMR and elemental analysis has shown that along with the crown ether-lithium phthalocyanine compound, acetone and water are present. This corresponds to what was observed in the crystal structure of dilithium phthalocyanine which contains six moles of acetone and six moles of water in the unit cell.
Co-Authors/Collaborators: W.A Feld

Nanoscale Modification and Functionalization of Carbon Electrodes for the Detection of Harmful Organic Chemicals in Water

Student Presenter(s): Miyong Hughes
Undergraduate student in Chemistry
Participant in UROP Summer Program 2011
Faculty Mentor: Suzanne Lunsford
Department: Chemistry

Novel nano materials with biosensing functions possess great potential in the development of a new generation of chemical sensors and actuators in the detection of organic pollutants such as phenol and phenol derivatives. There has been continued interest in the STEM research field to use nanostructured materials such as TiO_2 and ZrO_2 as film forming materials since they have high surface area, optical transparency, chemical inertness, robust mechanical strength, relatively good conductivity and long term mechanical stability. The goal of this project was to study the use of novel materials such as ZrO_2 and TiO_2 and mixture (TiO_2 + ZrO_2) nanoscale modified electrodes to optimize the detection limits for phenol compounds electrochemically utilizing cyclic voltammetry. The studies for this STEM research was directed towards the synthesis of nanostructured metal oxides such as TiO_2 and ZrO_2 and mixture that exhibited electrochemical activity towards the phenol and phenol derivatives of interest at optimized pH values. The results of this modified metal oxide electrodes will be discussed and the morphology of the novel modified metal oxide surfaces will be illustrated by studies such as AFM and SEM. These studies will help to understand the morphology better of the novel surface nanoscale modified electrodes developed for the detection of these harmful organic chemicals such as phenol and phenol derivatives.

Modeling Second-Order Chemical Reactions using Cellular Automata

Student Presenter(s): Nora Hunter
Graduate student in Chemistry
Faculty Mentor: Paul Seybold
Department: Chemistry

Cellular automata (CAs) are discrete, dynamic, agent-based mathematical models that can be used to describe complex environmental, biological and chemical systems. The present study involves creation of a 2-dimensional, probabilistic CA model of a second-order gas phase reaction of the form $A+B \rightarrow C$, using MATLAB. Beginning with a random distribution of reagents A and B the process of the formation of C emerges. The reaction rate can be varied based

on the probability of favorable collisions of the reagents A and B. This model was able to simulate second-order chemical reactions. The deterministic solutions of the reactions emerged as statistical averages in the limit of the large number of cells in the array.
Co-Authors/Collaborators: Paul G. Seybold, Ph.D.

Alkoxyammonium Lithium Phthalocyanines

Student Presenter(s): Michael Krol
Undergraduate student in Chemistry
Faculty Mentor: William Feld
Department: Chemistry

Dilithium phthalocyanine undergoes exchange reactions with tetralkylammonium halides or imidazolium tetrafluoroborates. The tetraalkylammonium lithium phthalocyanines are soluble in dichloromethane and have melting points that range from 118o to 160o. Solubility and melting points are dependent on the size of pendent ammonium or imidazolium substituents. To extend our understanding of influence of cation structure on physical properties of cation-lithium-phthalocyanine complexes, a series of alkoxyalkylammonium halides were synthesized and used in metathesis reactions with dilithium phthalocyanine. Characterization data for the exchange products will be presented.
Co-Authors/Collaborators: Andrew M. Beauchamp and W. A. Feld

Main Chain Alkoxy Substituted PPV

Student Presenter(s): Jeremy Lear
Undergraduate student in Chemistry
Faculty Mentor: William Feld
Department: Department of Chemistry

In the interest of the synthesis of polymers that have the potential to possess inherent light emitting properties (LEDs) the synthesis of diethyl 5-benzyloxy-2,3-diphenylbenzenecarboxylate was conducted to produce an intermediate in the synthetic pathway for a novel 1,4-bis(chloromethyl)benzene monomer. The synthesis began with production of diethyl 5-([N-methyliminodiacetato-O,O',N]borane)-2,3-diphenylterephthalate, via a Diels-Alder reaction, using 2,5-dicarboethoxy-3,4-diphenylcyclopentadienone and ethynylboronic acid MIDA ester as starting reagents. The diester was de-boronated and oxidized to diethyl 5-hydroxy-2,3-diphenylterephthalate through a reaction with sodium carbonate and 30% hydrogen peroxide. Synthesis of diethyl 5-benzyloxy-2,3-diphenylbenzenecarboxylate was achieved through a Williamson ether synthesis involving diethyl 5-hydroxy-2,3-diphenylterephthalate and benzyl chloride. The products of each synthetic step were analyzed by ^{1}H NMR.
Co-Authors/Collaborators: Dr. William Feld

A Study of the Transport of Different Size Silver Nanoparticles in Saturated Porous Media

Student Presenter(s): Allie Meyerhoefer
Undergraduate student in Chemistry
Participant in UROP Summer Program 2011
Faculty Mentor: Ioana Pavel-Sizemore
Department: Chemistry

Silver nanoparticles (AgNPs) have been increasingly applied in various nanotechnology areas due to their unique optical and antimicrobial properties that are absent in bulk form. With elevated release of AgNPs into the environment, their interaction with groundwater and soil needs to be examined. The goal of this study is to model the transport of colloidal AgNPs through water saturated porous media at low flow rates (1 mL/min), fixed pH (~8) and ionic strength (0.01 mM KCl), and for AgNP of diameters within the 1-100 nm range. The colloidal AgNPs were synthesized using a

Creighton method and were size-selected using a tangential flow ultrafiltration approach. The physical and chemical properties of AgNPs (purity, shelf life time, average size, size distribution, aggregation state, surface plasmon resonance, concentration, and surface charge) were then determined via Raman spectroscopy, ultraviolet-visible absorption spectroscopy, transmission electron microscopy, flame atomic absorption spectroscopy, and Zeta potential measurements. AgNPs (15 ppm of silver) and a conservative tracer (Cl- ions) were injected in upward direction through a one-dimensional column (2.5 cm diameter, 5.0 cm length) that was pre-packed with saturated glass beads. A 2 mL volume of effluent was collected every two minutes. The samples were chemically digested and diluted quantitatively with nitric acid. The concentration of silver in the colloids was determined using flame atomic absorption spectroscopy, and inductively coupled plasma optical emission spectroscopy. Breakthrough graphs were created by plotting the normalized concentration of total Ag versus the pore volume. The transport of AgNPs of 1-100 nm diameter size range showed no retardation with respect to the tracer, while a mass loss within the media pores was observed. More experiments will be performed in the future to verify the effect of colloidal AgNPs in heterogeneous porous media (sand and real soil).

Co-Authors/Collaborators: Jessica M. Dagher, Sushil R. Kanel, Mark N. Goltz, and Ioana E. Pavel Sizemore

Bis(alkoxyphenyl)cyclopentadienones

Student Presenter(s): Ryan Oostendorp
Undergraduate student in Chemistry
Faculty Mentor: William Feld
Department: Chemistry

Poly(p-phenylenevinylene) (PPV) has been used in a variety of applications particularly in electronic devices such as LED displays and related semi-conducting systems. Cyclopentadienones have been employed as PPV precursors specifically as carriers of various electron-donating and electron-withdrawing substituents. Alkoxy substituted PPV precursor cyclopentadienones are rare. Dimethoxybenzil could serve as a basis for synthesizing dialkoxysubstituted cyclopentadienones however, its solubility is low in sovents required for cyclopentadiene synthesis. Thus, 4,4'- dimethoxybenzil was demethylated and alkylated with appropriate solubilizing groups. The
reactions and characterization of alkylated benzyl will be presented.

Co-Authors/Collaborators: W. A. Feld

Effects of Substrate Temperature on the SERS-based Sensing Performance of Silver Nanorod Thin Films Fabricated Through Oblique Angle Deposition

Student Presenter(s): Adam Stahler
Graduate student in Chemistry
Faculty Mentor: Ioana Pavel Sizemore
Department: Chemistry

Surface-enhanced Raman spectroscopy (SERS) possesses the same molecular fingerprint capabilities of Raman spectroscopy but offers much higher sensitivity. However, the size, shape and spatial arrangement of SERS substrates greatly influence the SERS enhancement. As a result, reproducible, uniform SERS substrates are highly desired. In this study, many limitations on the fabrication of traditional SERS substrates were overcome by employing an inexpensive, fast, and fine-tunable oblique angle deposition (OAD) technique at two temperatures, 100 K and 300 K. SEM images showed that AgNRs fabricated at 100 K had a greater surface area (2.6×10-12 m2/×m2) than AgNRs produced at 300 K (1.7×10-12 m2/×m2). Therefore, it was hypothesized that the SERS-based sensing capabilities of 100 K

fabricated AgNRs would be significantly improved over those of AgNRs produced at 300 K. To validate the proposed hypothesis, AgNRs were emerged for 24 hours in aqueous solutions of rhodamine 6G (R6G, 2 mL of 10-6 M, 10-7 M, and 10-8 M) and micro-Raman maps were collected following ambient drying. All 100 K AgNR substrates exhibited larger, SERS-active areas with significant SERS signal enhancement than the 300 K AgNR substrates (1.5-fold and 3.7-fold signal enhancement at 10-6 M and10-7 M of R6G, respectively). R6G at 10-8 M was detected for both AgNR substrates, but poor signal to noise ratios made the quantification of the SERS enhancement difficult. The R6G (10-6 M) signal obtained on 100 K AgNRs was approximately 10-fold greater than the signal collected from a Creighton colloid (15.3 ppm Ag) at the same R6G concentration. SEM images of 100 K AgNRs obtained post R6G incubation showed greater polydispersity in size and shape than AgNRs fabricated at 300 K. This observation in combination with the larger areas available for analyte binding demonstrated the improved SERS-sensing capabilities of the 100 K AgNRs and confirmed the proposed hypothesis.
Co-Authors/Collaborators: Piyush Shah, Andrew Sarangan, Ioana Pavel Sizemore

Poly(arylene ether)s prepared from functionalized 3,5-difluorotriphenylphosphine oxide

Student Presenter(s): Courtney Sutherland
Graduate student in Chemistry
Faculty Mentor: Eric Fossum
Department: Chemistry

3,5-difluorotriphenylphosphine oxide (TPO) was functionalized via the reaction with n-iodosuccinimide, introducing two iodo groups to the system. A model reaction was performed with t-butyl phenol to verify that the carbon-iodine bonds are able to withstand the conditions of nucleophilic aromatic substitution (NAS). The iodinated TPO monomer allows for the introduction of pendant functional groups for modification of the TPO-based polymers, tailoring the solubility, and physical properties of the poly(arylene) ethers, PAEs. Using the iodinated monomer as a platform for pre- and post-polymerization will allow for the introduction of a multitude of functional groups, including Suzuki coupling reactions with boronic acids, the introduction of nitro groups as a precursor to amino based systems, the Heck reaction to form a substituted alkene, and Sonogashira coupling for the conversion to an alkyne.
Co-Authors/Collaborators: Eric Fossum

Facile Synthesis of Functionalized poly (arylene ether sulfone) s

Student Presenter(s): Mehmet Tatli
Graduate student in Chemistry
Faculty Mentor: Eric Fossum
Department: Chemistry

The synthesis of poly (arylene ether) s, with a pendant aryl iodide was achieved via nucleophilic aromatic substitution, NAS of 3-iodo-3',5'-difloro-diphenylsulfone, 1, with Bisphenol-A. Monomer 1 was prepared by the reaction of 3, 5-diflorodiphenylsulfone with N-Iodosuccinimide, NIS. Model reactions indicated that the iodo group was stable to NAS conditions. Both GC/MS analysis and NMR spectroscopy indicated quantitative displacement of the two fluorine atoms while the iodo group remained untouched. Furthermore, the introduction of the desired functional groups was achieved via the Pd (OAc) 2 catalyzed cross-coupling reaction with phenyl, naphthyl, and phenyl acetyl boronic acid. The thermal properties of the polymers were evaluated via GPC, DSC and TGA. The iodo polymer possessed a glass transition temperature, Tg, of 144 C while the corresponding phenyl derivative displayed a

slight decrease in Tg to 131 C. The much bulkier naphthyl derivative provided a higher Tg of 150 C. The more polar acetyl derivative showed a much higher Tg of 165 C. All the polymers exhibited high Td5% values between 400 C and 500 C.

Identifying new haplotypes and potential cryptic species for marine leeches (Ozobranchus spp.) from Hawaiian and Florida sea turtles based on molecular data

Student Presenter(s): Triet Truong
Graduate student in Chemistry
Faculty Mentor: Audrey McGowin
Department: Chemistry

The etiological agent of fibropapillomatosis (FP), a neoplastic disease originally identified only on green sea turtles (Chelonia mydas), is still unknown. The involvement of an environmental cofactor appears possible since many FP outbreaks occur at sites of poor water quality in Florida, Hawaii, Brazil, and other similar places around the world. Studies have shown an association between FP and the fibropapilloma-associated turtle herpesvirus (FPTHV), but not all turtles with FPTHV develop FP. Recently, high viral loads of FPTHV were detected in marine turtle leeches (Ozobranchus spp.) from a green sea turtle. However, the study failed to identify the species of marine leech. Leeches may transmit or activate FPTHV but are impossible to identify at all life stages using standard taxonomic practices. In this study, character-based DNA barcoding using mitochondrial cytochrome c oxidase I (COI) gene as a molecular marker was employed to identify both species of Ozobranchus spp. (Ozobranchus branchiatus and Ozobranchus margoi) at all stages of development from different sites in Florida and Hawaii. In addition, phylogenetic analysis of O. branchiatus at other genes (18S rDNA, 28S rDNA, and histone H3) is being used to establish whether specimens from Hawaii and Florida are distinct species. Genetic sequences for O. branchiatus and O. margoi were submitted to the National Center for Biotechnology Information GenBank. This is the first study to submit genetic data for O. branchiatus. The spread of FP to other species of turtles combined with the discovery of a new turtle host for the O. branchiatus leech suggests the vector organism involvement behind FP may be species specific. However, an extensive molecular data set must be assembled in order to confirm whether the separate haplotypes identified for O. branchiatus on a loggerhead are indeed haplotypes of the same species and not the discovery of cryptic specimens.

Co-Authors/Collaborators: Philip Lavretsky, Jeffrey L Peters, PhD, and Audrey E. McGowin, Ph.D.

Monitoring the health of Glen Helen Nature Preserve: Can I drink the water?

Student Presenter(s): Triet Truong
Graduate student in Chemistry
Faculty Mentor: Audrey McGowin
Department: Chemistry

Glen Helen Nature Preserve is a 1,000-acre nature preserve of woods, waterways, prairies, and fields, all accessible daily from a 25-mile network of trails. Antioch College through the Glen Helen Ecology Institute manages the Glen, which serves as a valuable public resource for hiking, birding, and exploration and an important resource for the future development of the college curriculum. Students from Antioch College and Wright State University (graduates and undergraduates) participated in a joint collaboration to assess water quality at seven sites in the Glen. Water quality monitoring is essential to the Glen's preservation, because water quality reflects not only the health of the area's watershed but is also an indicator of the

Glen's ecosystem. The project's water quality assessment goals were successfully implemented into the student's curriculum and included analysis of four core areas: on site sampling data (temperature, dissolved oxygen, and pH), microbial data (biological oxygen demand and coliform and E. coli counts), ion chromatography anion analysis (Cl^-, NO_2^-, NO_3^-, Br^-, F^-, SO_4^{2-}, and PO_4^{3-}), and inductively-coupled plasma chromatography trace metal analysis (Ca, Mg, Na, Fe, Al, Cr, Co, Ni, Cu, Zn, As, and Pb). Antioch College provided access to the Glen during the 10-week project but data analysis took place in the WSU facilities for all three sampling events. WSU students gained teaching experience from the mentorship of Antioch students who benefited academically from access to WSU laboratory expertise. The service learning course also introduced WSU students the importance of documenting laboratory methods through the practice of writing standard operating procedures. The project's findings provided information on the chemical heath of the Glen and gave students the rare opportunity to disseminate scientific information to the public. The new sampling, instrumental, and teaching skills acquired will assist students in their future endeavors into academia and industrial chemistry.

Co-Authors/Collaborators: Audrey E. McGowin, Ph. d, Garret VanNess, and David Kammler, Ph.d

Exchange Reaction using 1, 3-bis(1-adamantyl)imidazolium tetrafluoroborate and dilithium phthalocyanine

Student Presenter(s): Kristy Wickman
Undergraduate student in Chemistry
Faculty Mentor: William Feld
Department: Chemistry

The synthesis 1, 3-bis(1-adamantyl)imidazolium lithium phthalocyanine employed 1,3-bis(1-adamantyl)imidazolium tetrafluoroborate as a cationic salt is an exchange reaction with the free lithium ion in dilithium phthalocyanine. Earlier synthetic schemes gave yields of 55%. An improved synthetic sequence was developed that gave reproducible yields of 85%. Elemental and ^{1}H NMR analysis were used to establish the purity of the product. The new procedure appears to be scalable.

Co-Authors/Collaborators: W A Feld

Synthesis, characterization and "green" manipulation of unfunctionalized silver nanoparticles for SERS-based sensing applications

Student Presenter(s): Austin Williams
Undergraduate student in Biological Sciences
Faculty Mentor: Ioana Pavel-Sizemore
Department: Chemistry

In this study, Creighton silver nanoparticles (AgNPs) were synthesized by the reaction of silver nitrate with sodium borohydride in water. These widely-used, unfunctionalized AgNPs were then characterized by UV-Vis absorption spectroscopy (size, shape, aggregation state, and surface plasmon resonance), Raman spectroscopy (purity), transmission electron microscopy (TEM - average size and size distribution) and inductively coupled plasma optical emission spectroscopy (ICP-OES - concentration). A modified tangential flow ultrafiltration (TFU) process was employed to size-select 4 L of AgNPs (14.7 μg mL-1 silver) and to concentrate it down to 2 mL of AgNPs (6.04 × 102 μg mL-1 silver). TFU is commonly used in biology for the weight-based separation of proteins and cells. In this study, TFU was adapted for the "green" manipulation of colloidal AgNPs. The polydispersity of the AgNPs was greatly reduced in a 3-step TFU process, while passing the colloid through a 50 nm and two 30 kD water-compatible filters. The 50 nm filter (460 cm2) was employed to remove AgNPs and AgNP-

aggregates larger than 50 nm, and was followed by two 30 kD filters (820 cm2 and 20 cm2) to concentrate AgNPs. Upon completion of the TFU process, a highly concentrated suspension of minimally aggregated and homogeneous AgNPs (1-20 nm in diameter) was obtained. The SERS-based sensing efficiency was greatly increased with detection of R6G at 10-9 M. The highly concentrated AgNPs exhibited a significant increase in detection in comparison with the original Creighton colloid (10-6 M R6G) due to the increased number of available SERS hot spots within the focal volume. TFU might be applied to other functionalized or unfunctionalized noble metal nanoparticles upon careful consideration of the interaction mechanism. Ultrafiltered NPs might find other research and industrial applications that will overcome the limitations of the current synthesis and size-selection methods (e.g., centrifugation, size-exclusion chromatography, size-dependent solubility, etc.).
Co-Authors/Collaborators: Joshua D. Baker, Catherine B. Anders, Adam C. Stahler, Ioana E. P. Sizemore

College of Nursing and Health

Project SMARTCare: Interdisciplinary Collaboration for Development of a Virtual Environment for Bleeding Disorder Education

Student Presenter(s): Laura Churchman, Stacey Sherman, Brittany Fouts
Undergraduate student in Nursing
Faculty Mentor: Detrice Barry
Department: College of Nursing and Health

There is a growing population of patients with a genetic recessive, chronic condition—hemophilia which is characterized by an insufficient amount of protein necessary for the blood to clot. Chronic conditions such as heart disease, obesity, hypertension and stroke account for 80% of the mortality rates in the United States and rates are significantly higher for African Americans. Estimated 2020 projections suggest that 157 billion residents in the United States will have at least one or more chronic conditions. The Institute of Medicine encourages interdisciplinary collaboration among care providers and scientists to meet the future learning needs of patients with chronic conditions. The purpose of this project was to develop a virtual environment as an educational tool about bleeding disorder education and chronic illness for nursing students, patients, families, community members and healthcare practitioners. A collaboration was formed with the Wright Patterson Air Force Base Research Lab (Tec^Edge). An interdisciplinary team of students in Nursing, Biomedical Engineering, Zoology, Computer Science and Mathematics were chosen to develop the virtual environment. An interactive virtual home was developed with an African American family with a history of hemophilia, diabetes and obesity. Cultural considerations were incorporated throughout the home. The virtual robots are programmed with responses to their respective chronic illness. The 3D tour of the blood via a ride on a red blood cell shows the normal clotting process and clotting process in person with hemophilia. In the virtual learning center, games and quizzes test the knowledge of learners. A resource room provides information for visitors and virtual meetings can be held in the meeting room where learners can connect from around the world. Future plans include expansion of the virtual environment to include other blood disorders and chronic illnesses. Empirical research is needed to test the design and effectiveness of the environment in addition to evaluate the learning outcomes and impact of the end users.
Co-Authors/Collaborators: Detrice Green Barry, PhD, RN & Sherrill Smith, PhD, CNL, CNE, RN Assistant Professor Wright State University College of Nursing and Health Dayton OH, USA Rob Williams, PhD Research Director Discovery

Childhood Obesity and Participation in a Health and Fitness Program

Student Presenter(s): Lindora Hubel
Graduate student in Nursing
Faculty Mentor: Yi-Hui Lee
Department: Nursing

Comparison of 4th, 5th and 6th grade student health status: Before and after participation in an afterschool Health and Fitness Project Tracy Cordonnier, BSN, RN, OCN, LSN, Lindora Hubel, BS, RN, Kimberly McIntyre, BSN, RN, EMT-P, & Elizabeth Obringer, BSN, RNC Obesity is quickly becoming a growing epidemic in the United States in both adult and pediatric populations. Studies have established a relationship between childhood obesity and adult obesity and the risk factors related to obesity (Eisenmann, et al., 2004). The incidence of significant health issues such as type II diabetes, hypertension, and high cholesterol are on the rise at an alarming rate within this group. Lack of participation in physical activities among American children aged 9 to 13 years old is well documented by the Center for Disease Control. Offering students the ability to participate in an afterschool program in which a variety of fun physical activities are provided at the school, free of charge, will allow students the opportunity to obtain the physical activity that is so important to health status. However, research provided information regarding effective programs on prevention of childhood obesity is limited. The purpose of this quasi-experimental study is to examine the effects of a wellness promoting exercise program among 4th, 5th, and 6th grade students of schools in rural western Ohio. One hundred and two students will be recruited for this study. Through the use of some of the Presidential Fitness Challenge exercises and active video games from WII and XBOX, the health status of the study participants is expected to be enhanced through the Health and Fitness Project in this study. In this study, participant's health status will be assessed before and after participation in the project by measuring body image, weight, and BMI. The results of this study will advance the nursing profession by adding to our knowledge of the effectiveness of the school and community based exercise program and information for the prevention of childhood obesity.

Co-Authors/Collaborators: Elizabeth Obringer, Tracy Cordonnier and Kimberly McIntyre

End-Of-Life Care Education for the Intensive Care Nurse

Student Presenter(s): Jennifer Schueler,
Graduate student in Nursing
Faculty Mentor: Yi-Hui Lee
Department: College of Nursing and Health

In the intensive care unit death is often complicated and unnatural due to technology, aggressive physician directed treatments prolonging death, lack of open communication between health care providers, patients and their families, and nurses' misperceptions of what a quality end-of-life care encompasses. Research has indicated that formal and continuing education regarding the aspects of quality end-of-life care (EOLC) is void for the critical care nurse and if provided, can enhance the quality EOLC the dying patient will receive. The purpose of this study is to explore the critical care nurse's personal perception of what quality EOLC involves and also evaluate the effects of how a formal, end-of-life continuing education curriculum will affect the critical care nurses' delivery of a quality of care to the dying patient. Sister Callista Roy's framework will be used to guide this study. Researchers will use a quasi-experimental one group pretest-posttest design that utilizes a historical comparison group and a post intervention group to survey impressions of the patient's next of kin (NOK). Data will be collected using the Quality of Death and Dying

questionnaire administered to families two to four weeks following the patient's death in the ICU. Comparison will be made between scores achieved on the QODD before the ICU nursing education intervention and post education. Results of this study will add on nurses and other health care providers' understanding about the effects of implementing an EOLC educational program on enhancing nurses' knowledge and confidence of providing quality EOLC to the dying patient.
Co-Authors/Collaborators: Amy DeToro, Laurie Schnipke

Community Health

Physical and demographic influences on health related quality of life

Student Presenter(s): Elizabeth Alvarez Paradise
Graduate student
Participant in GRAD-PREP
Faculty Mentor: Miryoung Lee, Stefan Czerwinski
Department: Community Health

Self-assessment through the application of well-constructed surveys is a diagnostic tool that can be used to identify high risk individuals within a population. The short form health survey (SF-36) is a multi-purpose assessment tool that measures health-related quality of life including mental and physical well-being and functionality. The objective of our analysis is to identify some of the physical characteristics that significantly influence both physical and mental well-being as assessed by vitality and physical functioning domains in the SF-36. Our study sample consists of 304 (121 males, 183 females) adult participants ranging in age from 20 to 86 years. Approximately 35.5 % are non-Hispanic blacks (n=108). We assessed participants' total body fat free mass (FFM) and leg fat free mass (LFFM) using dual X-ray absorptiometry (Lunar, GE Health Care) and quadriceps muscle thickness (QMT) using ultrasound. We used backward linear regression analyses to determine the significance of independent variables (age, sex, race, BMI, QMT or LFFM) on two domains of SF-36: vitality and physical functioning. Mean (standard deviations) vitality and physical functioning scores were 64.8 (18.8) and 84.0 (21.8) respectively. In our study population, age had a significant positive relationship with vitality and a significant negative relationship with physical functioning. Non-Hispanic blacks had significantly lower physical functioning. An increase in BMI was significantly related to both lower vitality and physical functioning. LFFM had a positive relationship with both vitality and physical functioning after adjusting for BMI as did FFM when used in lieu of LFFM. QMT had a significant positive effect on physical functioning but was not related to vitality. In summary, we have identified physical characteristics that have significant effects on self-assessed vitality and physical functioning scores obtained using SF-36.
Co-Authors/Collaborators: Miryoung Lee, Ph.D., Wm. Cameron Chumlea, Ph.D., Audrey Choh, Ph.D., Stefan A. Czerwinski, Ph.D.

Computer Science

Trust Issues in Social and Sensor Networks

Student Presenter(s): Pramod Anantharam
Graduate student in Computer Science
Faculty Mentor: Amit Sheth
Department: Computer Science

Trust and reputation are becoming increasingly important in diverse areas such as search, e-commerce, social media, semantic sensor networks, etc. We review past work and explore future research issues relevant to trust in social/sensor networks and interactions. We advocate a balanced, iterative approach to trust

that marries both theory and practice. On the theoretical side, we investigate models of trust to analyze and specify the nature of trust and trust computation. On the practical side, we propose to uncover aspects that provide a basis for trust formation and techniques to extract trust information from concrete social/sensor networks and interactions. We expect the development of formal models of trust and techniques to glean trust information from social media and sensor web to be fundamental enablers for applying semantic web technologies to trust management.
Co-Authors/Collaborators: Dr. T K Prasad, Dr. Amit Sheth

Earth and Environmental Sciences

MASW Determination of Surface Layer Thickness and VS Reconciled with Mircrotremor Resonance Analysis – Greene County, Ohio

Student Presenter(s): Daniel Blake
Graduate student in Earth and Environmental Science
Faculty Mentor: Ernest Hauser
Department: Earth and Environmental Sciences

Multi-channel analysis of surface waves (MASW) was used to define the thickness and shear-wave velocity (Vs) structure of glacial drift at a site in Greene County, Ohio, where glacial drift varies from 10 m to 30 m thick and overlies limestone bedrock. The results were compared to that of microtremor resonance analysis of three-component passive seismic data collected with broadband seismometers at the same site. Both MASW and microtremor analyses resolved the Vs structure and apparent depth to bedrock to depths of ~20m. However, modeling experiments by J. Ivanov (SEG, 2011) suggest that settings such as this, with a low velocity surface layer over high velocity bedrock, require MASW data with larger source offsets than is conventional. It was suggested that longer source offsets are required to distinguish the dispersion of the fundamental and higher modes at longer periods. This phenomenon does not appear to pose a problem for these data. However, additional data are being collected with longer source offsets which will be analyzed to address this question.
Co-Authors/Collaborators: BLAKE, Daniel, HAUSER, Ernest C., WATTS, Doyle R., and DOMINIC, David F.,

Power Scaling to Forecast Water Height and Life Loss in Japan Tsunamis

Student Presenter(s): Andrew Lyda
Graduate student in Earth and Environmental Sciences
Faculty Mentor: Christopher Barton
Department: Earth and Environmental

We introduce power functions to forecast the probability of occurrence and recurrence intervals of tsunamis the size of the great 3/11/2011 Tohoku event in Japan. Two measures of tsunami magnitude are used; tide gauge water height and life loss, for five specific locations in Japan, and maximum water height (by any measure) and life loss for all of Japan. For all measures, data are well fit by power scaling functions on size-cumulative frequency plots, which are the basis of probabilistic forecasts. The historic Japanese tsunami data, including the 3/11/2011 tsunami, are from the NOAA National Geophysical Data Center. The data were aggregated for all of Japan, and for five specific locations on the east coast of Honshu Island, the area most affected by the 3/11/2011 event. Tide gauge water heights at the five locations are well fit by power functions with scaling exponents ranging between 0.9 and 1.6 for water heights ranging between 1.21 and 4.0 meters. The recurrence interval for a tide gauge tsunami water height reported for the 3/11/2011 tsunami

at each location, ranges from 70 to 487 years. Maximum water heights (measured by any method) for all of Japan from 684 to 2003 exhibit power scaling with a scaling exponent of 0.7. The recurrence interval for a maximum tsunami water height of 40 m (reported for the 3/11/2011 tsunami) or greater, at any location along the Japanese coast, is ~264 years. Tsunami life loss for specific locations in Japan from 1905 to 1993 exhibits power scaling with a scaling exponent of 0.72. The recurrence interval for the maximum life loss experienced at any location in Japan due to a tsunami of the size reported for the 3/11/2011 event is ~132 years.

Co-Authors/Collaborators: Christopher C. Barton; Sarah F. Tebbens

Sustained Aerobic Degradation of Trichloroethylene by Ammonia-Oxidizing Bacteria Naturally Associated with Wetland Plant Roots

Student Presenter(s): Ke Qin
Graduate student in Earth and Environmental Sciences
Faculty Mentor: Abinash Agrawal
Department: Earth and Environmental Sciencea

Bench-scale microcosms with wetland plant roots in aerobic growth media were used to characterize the microbial contributions to contaminant degradation during aerobic cometabolism of trichloroethylene (TCE) with ammonium. Aqueous growth media, ammonium, and TCE were replaced weekly in batch microcosms while retaining roots and root-associated biomass. Genetic results indicated that ammonium-oxidizing bacteria (AOB) can be enriched from wetland plant roots while analysis of contaminant and oxygen concentrations showed that those microorganisms can degrade TCE by aerobic cometabolism. Cometabolism of TCE, at 43 µg/L, was sustainable over the course of 9 weeks, with an ammonium concentration of 30 mg/L as nitrogen. However, at 64 µg/L of TCE, ammonium oxidation and TCE cometabolism were completely inhibited in two weeks. This indicated that at some point between 43 and 64 µg/L of TCE with ammonium at 30 mg/L as nitrogen there is a threshold. Cometabolism-induced inhibition of ammonium and TCE degradation did not equate to a lower abundance of the amoA gene in the microcosms, implying that the capacity to recover from TCE inhibition was still intact, given time and removal of TCE stress.

Co-Authors/Collaborators: Abinash Agrawal, Garrett C. Struckhoff

Which Scales of Stratal Architecture Are Relevant to Hyporheic-Zone Processes?

Student Presenter(s): Mohamad Reza Soltanian Pereshkafti
Graduate student in Earth and Environmental Sciences
Faculty Mentor: Robert Ritzi
Department: Earth and Environmental Sciences.

Processes within the hyporheic zone are influenced by connected high-permeability pathways, which, if extant within fluvial bed forms, create zones of greater flow. Recent work on modern rivers and ancient sediments has led to a conceptual model of the hierarchy of fluvial forms within channel-belts of gravelly braided rivers, and a quantitative model for the corresponding scales of heterogeneity within the stratal architecture (e.g. Lunt et al. 2004; Bridge and Lunt, 2006). In related work, a 3-dimensional digital model was developed which represents these scales of fluvial architecture, the associated spatial distribution of permeability, and the connectivity of high-permeability pathways across the different scales of the stratal hierarchy (Ramanathan et al., 2010; Guin et al., 2010). This poster reviews this work, discusses its relevance to understanding the processes associated with

hyporehic exchange, and presents our goals for future work in which these new ideas and methods will be used in creating models for hyporheic exchange.
Co-Authors/Collaborators: Robert Ritzi, David Dominic

Comparison of Earth Weather and other

Student Presenter(s): Marcia White
Undergraduate student in Middle Childhood Education
Faculty Mentor: Rebecca Teed
Department: Earth and Environmental Sciences

For this project many students know about the weather here on earth. What kind of weather is happening on other planets? Here students will explore different planets to find out if the weather on Earth really differs from other planets. Students will research information on other planets to determine if Earth really differs. Then the students will decide whether some planets could actually support life other than Earth. Students will then try to change a certain aspect about a planet to make it possible for life to be supported. Students will create a chart comparing and contrasting Earth with planets.
Co-Authors/Collaborators:

Earth and Environmental Sciences – Lake Campus

A review of the Chondrichthyans from the Mississippi System of Northern Alabama, USA

Student Presenter(s): Leigh Deuter
Undergraduate student in Earth and Environmental Sciences
Faculty Mentor: Chuck Ciampaglio
Department: EES Lake Campus

A REVIEW OF THE CHONDRICHTHYANS FROM THE MISSISSIPPIAN SYSTEM OF NORTHERN ALABAMA, USA It has been over a century and a half since Tuomey's (1858) seminal work on the geology and paleontology of Alabama, wherein he provided the first descriptions of Mississippian chondrichthyans in the state. Since that time very little has been published on the subject, which is surprising given the extensive Mississippian age exposures found throughout northern Alabama. Casual observation of the limestone benches in and around north-central Alabama has revealed diverse and abundant chondrichthyan faunas, and vertebrate fossil occurrences appear to be well known to local collectors. Recent fieldwork and examination of several museum and private collections has revealed that the number of chondrichthyan species occurring in upper Mississippian (primarily Chesterian) rocks of northern Alabama is greater than previously known. Combined with taxa documented prior to the present report, 24 chondrichthyans are found in calcareous strata within the Monteagle Limestone, Pride Mountain Formation, Bangor Limestone, Hartselle Sandstone, and Tuscumbia Limestone. We emend several earlier taxonomic identifications, with Cladodus newmani herein reassigned to C. sp. cf. C. bellifer, and C. magnificus is Saivodus striatus. Newly documented species include Polyrhizodus sp., cf. Ctenoptychius apicalis, Deltodus sp. cf. D. undulatus, and Deltoptychius sp. cf. D. acutus. In addition, occurrences of Carcharopsis wortheni are corroborated. We have no doubt that additional species will be discovered, especially when rock exposures are carefully inspected for macro- and micro-vertebrate remains.
Co-Authors/Collaborators: Chuck Ciampaglio, David J. Cicimurri, and Michael A. Taylor

Emergency Medicine

Purinergic receptors are critical for cell volume recovery after exposure to hypotonic environments.

Student Presenter(s): Melissa Bradshaw
Graduate student Participant in Grad-PREP **Faculty Mentor:** James Olson
Department: Emergency Medicine

A majority of cells exposed to hypotonic environments swell and consequently activate volume-sensitive ion channels that facilitate ion efflux as a means of reestablishing cell volume. The signaling pathway for this mechanism is not completely defined; but previous studies conducted on a variety of cell types propose that the swelling of a cell initiates the release of ATP which subsequently, stimulates purinergic receptors leading to the efflux of Cl- ions; thus, restoring cell volume. Many studies focus on a pharmacological approach to manipulate the purinergic signaling pathway. Because this approach is potentially non-specific we have adopted a genetic approach. The goal of our study is to determine whether the purinergic receptor plays a critical role in volume regulation. For this study we used two cell lines derived from 1321N1 cells obtained from a human astrocytoma. The first cell is the original clone of 1321N1 cells (parental) which lack P2Y receptors. And the second clone is stably transfected to express only the P2Y1 receptor. For the current study we measured cell volume changes during exposure to isotonic (290 mOsm) and hypotonic (200 mOsm or 150 mOsm) environments. Cells were maintained in culture in log-growth phase and replated weekly. To measure volumes, wells were removed from the culture dish with a brief exposure to trypsin and then incubated in isotonic solution for 30 min. Then cells were diluted into 20 ml of isotonic or hypotonic solutions. A Coulter Counter was used to measure cells volumes at various times of incubation in these solutions (0, 3, 7, 15, and 30 minutes). Cells from both clones had stable volumes in isotonic solution during the 30 min experimental period. Similarly, cells from both clones treated with 200 mOsm or 150 mOsm swelled to a similar extent within 3 min (127±6% and 142±6% of their isotonic volume, respectively). During the subsequent period in 200 mOsm solution, P2Y1 cells recovered their normal volume, while Parental cells remained swollen. It is apparent, according to the data collected that cell exposed to isotonic environments tend to maintain a relatively stable volume, as expected, while P2Y1 cells exposed to hypotonic environments tend to increase in volume and eventually return to a near homeostatic volume. In contrast, cells lacking purinergic receptors have not capacity for hypoosmotic volume regulation. We conclude that purinergic receptors are necessary for cellular volume regulation.

Co-Authors/Collaborators: Melissa Bradshaw, James Olson Ph.D

English

A manly, and almost womanly tenderness: Imagining a Unified Masculinity in Trollope's Doctor Thorne

Student Presenter(s): Hayley Hughes
Undergraduate student in English
Faculty Mentor: Barry Milligan
Department: English

On the surface, Anthony Trollope's Doctor Thorne features a conventional Victorian marriage plot; however, there is much more than merely love at stake. While the romance between Mary Thorne and Frank Gresham plays a major role, it is the legacy of Greshamsbury and violent conflicts between wealth, blood, and class

that the novel is most concerned with. James R. Kincaid argues that "The real battle [in Doctor Thorne] is not that of romance… such battles are waged, but they amount to nothing in comparison to the all-out class war, the fight between the worlds of Scatcherd and Gresham" (117). I agree with Kincaid that the two households seem almost diametrically opposed—the Scatcherds having new money and no blood, high class but low manners, and the Greshams, of noble blood but badly in debt—but I would extend his observations to include not only class but gender conflicts. The majority of both men and women in the novel, especially husbands and wives, exhibit character flaws which often stem from their inability to complement or complete each other in the Lacanian sense of "[filling] a gap, a void in being" (qtd. in Walton 42). Because of his ability to straddle certain parameters of class and gender, Dr. Thorne, who is characterized by kindness, selflessness, and a "…manly, and almost womanly tenderness" (Trollope 35), is positioned as the novel's moral center. This positioning is accomplished through his uniquely unified subject position: unlike the fractured households of Scatcherd and Gresham, Thorne, as a doctor, operates largely outside of class, moves between public and private spheres, and embodies a neutral, almost androgynous gender identity. As such, I argue that his ability for altruism is, for the most part, unfettered by the liminal modes of class and gender to which the novel's other characters subscribe.
Co-Authors/Collaborators:

History

Carl Schurz, The Revolutions of 1848, and Abolition: The Forty-Eighters in America

Student Presenter(s): Sarah Aisenbrey
Undergraduate student in History
Participant in UROP Summer Program 2012
Faculty Mentor: Susan Carrafiello
Department: History

This project determined the connections between the Revolutions of 1848 and the radical changes in politics in the United States before, during and after the Civil War, as well as the significance of these connections. Also, this analysis examined how did German "Forty- Eighters," specifically Carl Schurz, influenced the American abolitionist movement through politics, social policy, and culture. The radical nature of Carl Schurz's view of slavery as an institution, as well as his view of African Americans in post- slavery America was determined. This view was analyzed through Schurz's participation in the Revolutions of 1848 and any other contributing factors. Finally, conclusions were drawn on the success of Schurz's views on the abolitionist movement, as well as the influence of the forty- eighters on American politics before, during, and after the Civil War. Through this investigation of the radical nature of Schurz's stance on the American abolitionist movement, a novel facet of the European influence on the United States was be analyzed.

The Warrior Image in Modern Japanese Media and its Implications for Social and Political thought within Japan

Student Presenter(s): Joshowa Yost
Undergraduate student in History
Faculty Mentor: Dr. Meyer
Department: History

A society's media reveals many important aspects of the cultures underlying beliefs and ideologies. There has been a lot of research regarding Western media and the lessons that can be learned about western culture as a result. Research in the field of modern Japanese media has been largely ignored, especially in the West. The purpose of this project is to analyze modern

Japanese media, specifically anime and manga, for their portrayal of the warrior image. It will address the lessons that can be learned about Japanese political and social thought through the shifting image of the warrior.

Marketing

An empirical investigation of the students' attitudes and opinions toward texting while driving

Student Presenter(s): Heather Boyd
Undergraduate student in Marketing
Participant in UROP Summer Program 2012
Faculty Mentor: Pola Gupta
Department: Marketing

Drivers today are facing more distraction on the road than ever before. Cell phones are among the many devices competing for drivers' attention while they are behind the wheel. In recent years text messaging has drastically risen in popularity making cell phones even more dangerous to drivers and roadways. One study by the Virginia Tech Institute found that those who text while driving are 23 times more likely to have an accident than those who don't. Texting while driving is a serious and complex problem in today's society and is the focus of this study. Despite the seemingly obvious dangers of texting and driving, many people continue to do it. To assess the attitudes and opinions of texting while driving and uncover some of the motivations behind this dangerous activity, surveys were administered to 344 business students. Results from these surveys were used to test hypotheses suggesting connections between texting while driving and self-control, attitude, social responsibility, addiction, and risk-taking. For example, results of multiple regression tests supported our hypothesis that those with lower levels of self-control are more likely to text while driving. These tests also showed that those who have an addiction to texting will text while driving more than those who do not. In addition to discussing the results of our hypotheses, we suggest future research topics to elaborate on this field of study.
Co-Authors/Collaborators: Dr. Pola Gupta and David Burns

Mathematics and Statistics

Non-Existence of Relative Difference Sets in Several Previously Unresolved Cases

Student Presenter(s): Jonathan Esala
Undergraduate student in Mathematics
Faculty Mentor: K.T. Arasu
Department: Mathematics & Statistics

A sequence a = (a0 ,a1 ,a2 , ... ,an) is said to be an almost p-ary sequence of period n + 1 if a0 = 0 and ai = (ζp)bi for 1 ≤ i ≤ n, where ζp is a primitive p-th root of unity and bi א {0, 1, . . . , p − 1}. Such a sequence a is called perfect if all its out-of-phase autocorrelation coefficients are zero. In the group G isomorphic to H1 × H2 where H1 and H2 are cyclic groups of order n + 1 and p respectively, it has been shown that a is perfect if and only if a subset R of G is an (n + 1, p, n, (n − 1)/p) relative difference set relative to H2. Since almost p-ary perfect sequences are useful in some engineering applications, it is of interest to know whether or not, depending on the parameters n and p, a relative difference set R exists in G. We seek to establish the non-existence of such an R in several previously unresolved cases.
Co-Authors/Collaborators: K. T. Arasu, Ph. D.

On the bounds of the entropy defined for an orthogonal matrix

Student Presenter(s): Akhilesh Pathak
Graduate student in Mathematics
Faculty Mentor: KT Arasu
Department: Mathematics and Statistics

The optimization bounds for the Shannon's entropy of an orthogonal matrix have been found for the various classes of orthogonal matrices. A universal upper bound on the entropy for all n has been analytically proved and that it is achievable if and only if Hadamard matrix for that n exists. For the cases of n≡1,2,3 (mod 4) sharper bounds have been found. For n=3,5,6,10 we have analytically proved the result using Householder reflections given by Stewart. For the general n two results have been obtained for the problem through Lie groups.
Co-Authors/Collaborators: Akhilesh Pathak, KT Arasu, R Ramchandran

Mechanical and Materials Engineering

Alkaline Fuel Cells

Student Presenter(s): Matthew Finke
Undergraduate student in Mechanical Engineering
Faculty Mentor: Andrew Hsu
Department: Mechanical Engineering

Alkaline Anion Exchange Membrane Fuel Cells (AFCs) consume hydrogen and oxygen producing potable water, heat, and electricity. The advantage of using an alkaline media is that the electrocatalytic process should be more facile in alkaline solutions than in acidic solutions (such as in Proton Exchange Membrane Fuel Cells (PEMFC)) due to the weakening of the adsorption energy. Another advantage is the improved material stability from the use of alkaline electrolytes. AFCs have been used successfully by NASA since the mid-1960s. The fundamental problem with AFCs is the aqueous KOH electrolyte reacts with CO2 (cathode air supply) to form carbonate species, which lowers the performance and lifetime of the cell. Our current research involves the use of solid anion exchange membrane to replace the aqueous electrolyte, which solves many problems faced by the conventional AFCs and PEMFCs. With research AFCs can be used for practical services and make the transition from hydrogen feasible.

Electric wheelchair Design

Student Presenter(s): Dewei Guan
Graduate student in Mechanical Engineering
Faculty Mentor: Hong Huang
Department: Mechanical and Materials Engineering

1.Data collect 2 week battery life data colleted for the following compare 2.solidworks design (engineering drawing animation and simulation) 2.solidworks design (engineering drawing animation and simulation)

Modeling the Liquid Phase Exfoliation of Graphene

Student Presenter(s): Cory Knick
Graduate student in Engineering
Faculty Mentor: Amir Farajian
Department: Mechanical and Materials Engineering

Graphene is a revolutionary nanomaterial with wide ranging applications from nanoscale electronics to high strength alloys. Liquid phase exfoliation from graphite is a feasible, large scale method for the production of graphene. A good understanding of the solvent stabilization of graphene is necessary to fine-tune the experimental procedures. In this work, our approach is to elucidate the energy barrier

separating graphite and single-layer graphene. Accurate simulation methods, including quantum-mechanical contributions, are used to model the graphene exfoliation process. A plot of shift distance vs. energy shows that completely stacked bilayer graphene is more stable than the fully separated sheets. Hence, the exfoliation of graphene from bulk graphite is an activated process (i.e. a driving force is necessary for the reaction to happen). The results of several different simulations methods are compared. After the energy barrier separating the graphene sheets is calculated, it would be possible to estimate the kinetics of the reaction.
Co-Authors/Collaborators: Amir Farajian

Molecular Vibrational Effects in Electron Transport of Ultra Thin and Narrow Gas Sensors: An ab-initio Study

Student Presenter(s): Kirti Kant Paulla
Graduate student in Engineering
Faculty Mentor: Amir Farajian
Department: Mechanical and Materials Engineering

We study the electron transport properties of one atomic layer thin (ultra thin) and ~1 nm wide (ultra narrow) graphene nanoribbons (GNR), with carbonous oxides (CO/CO2) adsorbed on GNR lattice. We use accurate quantum mechanical modeling that includes dispersive forces, together with Greens Function methodology to calculate trasnport. Electron-phonon interactions and room-temperature effects are included. We observed that both CO and CO2 are physisorbed on the GNR lattice. We discuss the contribution of each phonon mode to electron transmission.
Co-Authors/Collaborators: Amir Farajian

Computational modeling of silicene hydrogenation

Student Presenter(s): Tim Osborn
Graduate student in Engineering
Faculty Mentor: Amir Farajian
Department: Mechanical and Materials Engineering

Silicene, a honey-comb sheet with sub-nanometer thickness made of silicon atoms, is a newly synthesized nanostructure with unique features and promising potential. Using accurate quantum mechanical simulations, the geometries and energetics of partially hydrogenated silicene are calculated. We find that the hydrogenation energy increases with the hydrogenation ratio. Molecular dynamics simulations reveal the stability of the adsorption configurations. Our results show that partial and patterned hydrogenation provide the attractive possibility of metal/semiconductor/insulator functionality within the same silicon nanosheet.
Co-Authors/Collaborators: Amir Farajian, Olga Pupysheva, Lok C. Lew Yan Voon, Rachel Aga,

Modern language

Los Ninjas, insight into modern Cuba

Student Presenter(s): Thomas Knickerbocker, M, Kathryn Barber, Meygan Rose
Graduate student in Spanish
Participant in Spn 311/511 final project
Faculty Mentor: Damaris Serrano
Department: Modern language

Los Ninjas, an insight into modern day Cuba, is an informative, yet whimsical short film created with pictures and video footage taken by one of the presenters in December of 2011 while travelling on a restricted travel visa issued by the US State Department. The film is the collaborative work of three Wright State students enrolled in an advanced Spanish conversation class taught by Damaris E. Serrano G., Ph.D, Associate Professor

of Spanish, Department of Modern Languages. The film skillfully captures the attention of the audience through slap stick comedy and the story of two martial arts students who are being trained to be ninjas. As part of their training, they end up in Cuba where they document many interesting cultural aspects unique to modern day Cuba. Few countries in the world have continued to evoke such strong emotion and opinion amongst the population of the United States as Cuba. This is in large part due to its proximity to the United States and the remarkably tenacity of Fidel Castro to pursue the communist dream against extreme external pressures. Recognizing the strong emotions and political opinions that many people have in regard to the trade embargo that the United States has enforced against Cuba since 1961, the film remains nonpartisan and does not advance any political agenda. The film allows a rare glimpse into the daily lives of the Cuban people and their daily struggles to survive against great odds. Viewers are offered a unique opportunity to step into this forbidden land and interact with their mysterious neighbors to the south. The audience is left to draw their own conclusions about today's Cuba, the often vilified country that has been so hated and so loved by so many for so long.

The Lost Children of Franco

Student Presenter(s): Angela Borgerding, Tyler Chilton, Briana Weisner, Kourtney Yarger
Undergraduate students in Spanish
Faculty Mentor: Damaris Serrano
Department: Modern Languages

From 1936-1939 Francisco Franco was the leader of the Nationalist forces that overthrew the Spanish democratic republic during the Spanish Civil War. He then went on to become the dictator of Spain until his death in 1975. Many people know the general political history of Franco and his policies; however there is little knowledge of the 30,000 plus children that went missing during his reign. In 1940, Franco's government passed laws that prevented parents contact with their offspring if they did not share the same ideology of the government. In fact there are records that show 9,000 children of political prisoners had been moved to state-run orphanages in 1943 and in 1944 the total rose to 12,000. This video portrays a fictional story about one of the survivors of these crimes. After a day of learning about Franco, Sofia comes home from school and is surprised by the story her grandmother reveals.
Co-Authors/Collaborators:

Fin del Mundo

Student Presenter(s): Francisco Cronin
Undergraduate student in Spanish
Faculty Mentor: Damaris Serrano
Department: Modern Languages

A video in Spanish about the end of the world (Fin del Mundo), that talks about the Mayan prophecies and alludes to other folk legends, sayings, and the culture of many Spanish-speaking countries. It is set to the theme of a newscast dealing with the end of the world, and has subtitles in English.
Co-Authors/Collaborators: Rebeca Guzman, Holly Hylton

Innocence Kidnapped

Student Presenter(s): Michael Garison
Undergraduate student in German
Faculty Mentor: Damaris Serrano
Department: Modern Languages

In Winter Quarter of 2011, enrolled in Spanish 312 with Dr. Damaris Serrano, Jessica Burley, Melinda Phillis, and I studied the history and current events of many Latin American countries.

As this was a conversation class, Dr. Serrano found creative ways to incorporate a particular country's past/present/future into thought-provoking conversation topics. During this class, we discussed the Dirty War in Argentina, a period of time from 1976 until 1983, during which many Argentians were terrorized by the dictatorial government and thousands of children were kidnapped. For our final project, our group decided to create a short film highlighting this social disaster in Argentina's history. Our film, while containing just the right amount of romance, suspense, and action, ends with a cliffhanger that causes the viewer to contemplate the reality of the thousands of Latin Americans whose children were taken from them without warning. This film is culturally relevant, being that there are still many survivors from this time period that were either directly involved, or remember it happening. One of the aims of this film is to remind our generation of this particular travesty, one that is only a few years removed, so that we can all acknowledge the presence that the United States has had in Latin America, both good and bad, and so that we can continue developing relations with our international neighbors.
Co-Authors/Collaborators: Melinda Phillis and Jessica Burley

Music

Music Instruction for Students who are Blind: A Collection of Methods and Materials for the Music Educator

Student Presenter(s): Leslie Matthews
Graduate student in Music Education
Faculty Mentor: Christopher Chaffee
Department: Music

In today's music education classroom, teachers will encounter students with a variety of disabilities that require accommodation. In order to provide the most meaningful education in music, teachers must be informed of how to enhance their teaching technique in order to reach all students. The purpose of this document is to provide music educators with a variety of tips, teaching methods, and preparation techniques for educating students who are blind. With proper preparation, resources and knowledge of assistive technology, we can become better educators and increase the quality of life for our students with visual disabilities.

Neuroscience, Cell Biology and Physiology

HCN1 Immunoreactivity of α-motoneurons Following Peripheral Nerve Injury

Student Presenter(s): Saif Ahmed
Graduate student in Biological Sciences
Faculty Mentor: Robert Fyffe
Department: Neuroscience, Cell Biology and Physiology

Peripheral axotomy causes significant alterations in intrinsic motoneuron activity and excitability. Despite successful reinnervation of peripheral targets after injury, the recovery of motor function is incomplete. Following axotomy in the cat, there is an increase in the Afterhyperpolarization (AHP) of the action potential (Gustaffson and Pinter, 1983). AHP duration can be inversely correlated with the amount I_h or sag current and further shaped through SK currents. Hyperpolarizing-cyclic nucleotide gated (HCN) channels underlie sag currents and are critical to neuronal function by their unique property of a reverse voltage-dependence that leads to activation upon hyperpolarization. There are four isoforms of HCN channels with only HCN1 being observed

post-synaptically in motoneurons. Because there is an increase in AHP after injury, we hypothesize that there will be a decrease in expression of HCN1 Immunoreactivity (IR) in the Medial and Lateral gastrocnemius (MG/LG) α-motoneurons following tibial neve axotomy. To test this hypothesis, we used two in vivo injury models. The tibial nerve crush model will allow peripheral reinnervation of the peripheral targets and the tibial nerve cut and ligation model prevents peripheral reinnervation from occurring, thus allowing us to distinguish between mechanisms that may or may not be dependent proper reinnervation of peripheral targets. Spinal cord tissue was analyzed using immunohistochemical techniques to identify retrogradely labeled MG/LG alpha motoneurons and HCN1-IR. These data suggest that following injury there is a decrease in HCN1-IR followed by a recovery in HCN1-IR after peripheral reinnvervation.
Co-Authors/Collaborators: Shannon Romer, Adam Deardorff, Lan-Anh Bui

Placental, Lineage-Specific Lentiviral Gene Transfer

Student Presenter(s): Renee Albers
Graduate student in Biological Sciences
Faculty Mentor: Thomas L. Brown
Department: Neuroscience, Cell Biology and Physiology

Preeclampsia and intrauterine growth restriction are pregnancy-related disorders. Preeclampsia, a disorder involving inappropriate placental development, is also known as toxemia or pregnancy-induced hypertension. The placenta is composed of trophoblast cells that are organized into three layers: the giant cell layer, the spongiotrophoblast layer, and the labyrinthine layer. Previous studies have shown that oxygen is an important mediator of trophoblast differentiation. Hypoxia inducible factor-1 alpha is a critical component of the cellular oxygen-sensing machinery and is essential for placental formation and embryonic survival. Preliminary data indicates that prolonged activity of HIF-1a, restricted to trophoblast cells in the mouse placenta, results in changes to placental architecture, failure of trophoblasts to remodel the maternal arteries, premature birth, and low birth weight offspring. In order to address the role of hypoxia in the intermediate spongiotrophoblast layer of the placenta, we created a lentiviral construct using a cell-specific, spongiotrophoblast-lineage promoter, Tpbpa. The first of the lentiviral constructs created for testing includes a green fluorescent protein gene driven by Tpbpa. To test hypoxia, the green fluorescent protein gene will be replaced with the HIF-1a gene. This final construct will then be used in embryo transfer studies to test oxygen sensing in the spongiotrophoblast layer of the placenta.
Co-Authors/Collaborators: Thomas L. Brown

Lentiviral Gene Targeting

Student Presenter(s): Renee Albers
Graduate student in Biological Sciences
Faculty Mentor: Thomas L. Brown
Department: Neuroscience, Cell Biology and Physiology

Lentivirus is becoming a more widely used gene transfer system due to its ability to integrate into the host genome and provide stable gene expression. One advantage of this system includes having ubiquitous gene expression in the embryo and placenta by infection at the two-cell to eight-cell stage of the embryo. Alternatively, we can direct placental-specific expression by infection exclusively at the blastocyst stage of the embryo. Development of cell-specific promoters will allow even greater selectivity for future analysis. This method of gene transfer should prove highly useful in many different applications

from studying placental abnormalities to the induction or prevention of numerous diseases. **Co-Authors/Collaborators:** Melissa Kaufman and Thomas L. Brown

Cell-Specific Knockdown of AMPK Alpha Subunits

Student Presenter(s): Erica Baker *Graduate student in Biological Sciences* **Faculty Mentor:** Thomas L. Brown **Department:** Neuroscience, Cell Biology and Physiology

AMP-activated protein kinase (AMPK) regulates metabolism in cells by promoting ATP production. Previous studies suggest that AMPK may also play a role in oxygen sensing by the carotid body, which is a major organ for controlling breathing rate to ensure the proper amount of oxygen in the blood is maintained. The catalytic α subunit of AMPK, which is naturally found in two isoforms, is a promising target for directed RNA interference. The research presented describes RNAi of both isoforms, AMPKα1 and AMPKα2, through the use of an shRNA via a lentiviral delivery system. Tissue-specificity is achieved using the tyrosine hydroxylase promoter, which should eliminate the embryonic lethality associated an AMPKα1 and AMPKα2 double knockout. The resulting model can be used as a way to study the role of AMPK in oxygen sensing in the carotid body. **Co-Authors/Collaborators:** Larissa Tangeman, Christopher Wyatt, and Thomas L. Brown

Generation of a Labyrinthine-Committed, Placental Progenitor Cell Line

Student Presenter(s): Rebecca Bricker *Graduate student in Biological Sciences* **Faculty Mentor:** Thomas Brown **Department:** Neuroscience, Cell Biology and Physiology

The The placenta is a multifunctional organ that forms during pregnancy and acts as the interface to exchange nutrients, gases, and wastes between maternal and fetal environments. It also provides protection for the fetus from the maternal immune system. Placental defects such as pre-eclampsia and intrauterine growth restriction (IUGR) are two complications that can occur during pregnancy. Pre-eclamptic mothers develop high blood pressure and proteinuria around their 20th week of pregnancy. In IUGR, babies are under the 10th percentile of birth weight. These complications are due to lack of trophoblast invasion of the maternal arteries and reduced branching of the labyrinth layer of the placenta. The placenta consists of three lineages: giant cells, spongiotrophoblasts, and labyrinthine trophoblasts. The labyrinth layer includes three layers: sinusoidal trophoblast giant cells and two layers of syncytiotrophoblast. Using cell line models to study placental development can lead to new understandings of placental defects. We developed an immortal cell line that can be used to study syncytiotrophoblast differentiation. The mouse cell line, SM10, contains primary cells that have a limited life span of 35 passages in cell culture. To determine if lentivirus was capable of enhancing gene transfer in trophoblast progenitor cells, we constructed a lentivirus with a green fluorescent protein (GFP) gene and infected SM10 progenitor cells before and after differentiation using transforming growth factor-beta (TGF-beta). Surprisingly, SM10 progenitor cells were significantly easier to infect than differentiated cells. Additionally, these infected progenitor cells became immortalized. The new immortal cell line, SM10-GFP, and the primary the SM10 cell line displayed nearly identical functional, morphological, and biochemical responses. Lineage markers further indicated that the SM10-GFP cell line is specifically committed

to becoming cells of the syncytiotrophoblast lineage upon differentiation.
Co-Authors/Collaborators: Rebecca Bricker, Kaisa Selesniemi, and Thomas L. Brown

Lentiviral, Invasive Trophoblast-Specific Gene Targeting

Student Presenter(s): Savannah Doliboa
Undergraduate student in Biological Sciences
Faculty Mentor: Thomas Browm
Department: Neuroscience, Cell Biology and Physiology

Preeclampsia is a placental disorder involving shallow embryonic invasion is also known as toxemia or pregnancy-induced hypertension (PIH), and occurs in ~7% of all births in the United States. The placenta is composed of trophoblast cells that are organized into three layers: the giant cell layer, the spongiotrophoblast layer, and the labyrinthine layer. Preliminary data indicates that prolonged placental activity of the hypoxia inducible gene, HIF-1 alpha, results in changes to placental architecture, failure of trophoblast giant cells to invade and remodel the maternal arteries, premature birth, and low birth weight offspring. In order to address the role of giant cell invasion and oxygen regulation in the placenta, we created a lentiviral construct using a cell-specific, invasive trophoblast giant cell lineage promoter, mPL1 via genomic PCR. The first of the lentiviral constructs created for testing includes a green fluorescent protein (GFP) gene driven by mPL1 promoter. To subsequenly test hypoxia, the green fluorescent protein gene will be replaced with the HIF-1 alpha gene. This final construct will then be used in in vivo embryo transfer studies to test oxygen sensing in the invasive giant cell layer of the placenta and provide a better understanding of pre-eclampsia. **Development of Ia Sensory Afferents**

Student Presenter(s): Jon Harvey
Graduate student Participant in GRAD-PREP **Faculty**
Mentor: David Ladle
Department: Neuroscience, Cell Biology and Physiology

Sensory-motor circuits are a critical component of proprioception, the awareness of one's limbs in space. Proprioception is required for adjustment of motor commands in response to unexpected external stimuli. The monosynaptic stretch reflex regulates muscle length; therefore, this involuntary response is crucial for prevention of muscle strain and is a fundamental element of proprioception. The Ia afferents provide sensory information from the muscle and synapse with motor neurons in the ventral horn of the spinal cord. Activation of motor neurons causes muscle contraction and completes the stretch reflex arc. There is evidence that suggests anatomical characteristics of synaptic terminals of Ia afferents are correlated with the strength of a particular synapse. However, currently there are no studies that investigate morphological changes of Ia sensory afferent terminals throughout development. We attempt to shed light on the development of this circuit, by reconstructing afferent terminal projections in the spinal cord using immunohistochemisty and image analysis software.

Induced expression of human store-operated calcium channel components: Orai1, Orai3 and STIM1 in stable Drosophila S2 Cell Lines

Student Presenter(s): Siham Hourani
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We have used Drosophila melanogaster Schneider 2 (S2) cell line for heterologous

expression of human store-operated calcium channel components: Orai1, Orai3 and STIM1. Orai1 and 3 proteins are believed to constitute the pore subunits of store operated channels whereas STIM1 is the calcium sensor in endoplasmic reticulum membrane that signals calcium store emptying to the channel subunits located in the plasma membrane. We have generated stable S2 cells lines expressing these genes by transfecting with Orai1+STIM1 and Orai3 using constructs in Drosophila expression vectors. The vector used pUChygMT vector contains an inducible promoter, the Mtn (metallothionein) promoter, and only at specific concentration of copper does the protein expression occur. Additionally, the plasmid carries resistance to Hygromycin B antibiotic. The S2 cells lines were created by selection in presence of Hygromycin B over the period of several months. After each cell line is induced with Cu2+, with controls/uninduced lines held on the side, RT-PCR reactions were conducted from the collected total RNA. The STIM1, Orai1, and Orai3 genes are downstream of the Mtn promoter and it is expected that Orai-s and STIM1 gene expression will only occur upon induction with copper but not in its absence. Hygromycin B resistance gene, on the other hand, will be expected to express both in induced and uninduced cell lines. We present the results of our RT-PCR experiments demonstrating that stable S2 cell lines have been created.

Lentiviral, Placental Giant Cell-Specific Gene Targeting

Student Presenter(s): Angela Krupka
Undergraduate student in Biological Sciences
Faculty Mentor: Thomas Brown
Department: Neuroscience, Cell Biology and Physiology

Pre-eclampsia and intrauterine growth restriction (IUGR) are pregnancy-related disorders that stem from abnormal placental development. Pre-eclampsia, a disorder involving shallow embryonic invasion, is also known as toxemia or pregnancy-induced hypertension (PIH), and occurs in 6-8% of all births in the United States. The placenta is composed of trophoblast cells that are organized into three layers: the giant cell layer, the spongiotrophoblast layer, and the labyrinthine layer. Previous studies have shown that oxygen is an important mediator of trophoblast differentiation. Hypoxia inducible factor-1 alpha (HIF-1a) is a critical component of the cellular oxygen-sensing machinery and is essential for placental formation and embryonic survival. Preliminary data indicates that prolonged activity of HIF-1a, restricted to trophoblast cells in the mouse placenta, results in changes to placental architecture, failure of trophoblasts to remodel the maternal arteries, premature birth, and low birth weight offspring. In order to address the role of hypoxia in the giant cell layer of the placenta, we created a lentiviral construct that is a cell-specific, trophoblast giant cell lineage promoter, mPL2. The first of the lentiviral constructs created for testing includes a green fluorescent protein (GFP) gene driven by mPL2 promoter. To subsequently test hypoxia, the green fluorescent protein gene will be replaced with the HIF-1a gene. This final construct will then be used in in-vivo embryo transfer studies to test oxygen sensing in the giant cell layer of the placenta and provide a better understanding of pre-eclampsia and intrauterine growth restriction.

Co-Authors/Collaborators: Angela Krupka, Renee Albers, and Thomas L. Brown

Normoxia Influences Cell Growth and Total Mitochondrial Volume in Cell Culture

Student Presenter(s): J. Chika Morah
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Participant in BioSTAR
Faculty Mentor: Christopher Wyatt

Department: Neuroscience, Cell Biology and Physiology

Cancer cell lines are routinely grown in hyperoxic conditions (21% O2) that they would never experience physiologically. The partial pressure of O2 in the kidney cortex is 40-50 mmHg (4-6% O2, Welch et al, 2001). The experiments described here have tested the hypothesis that growing a Human Embryonic Kidney cell line (HEK 293) at more appropriate physiological PO2 will result in differences in the cell growth and also in the mitochondrial content of the cells. HEK 293 cells were cultured in DMEM supplemented with 10% fetal calf serum and penicillin / streptomycin. Cells were seeded at a density of 7 x 106 cells / flask and grown for 96 hours in incubators set at 5% CO2 and 5%, 10% and 21% O2. Cells were then counted using a hemocytometer and final cell density was recorded. Cells were loaded with mitotracker (Invitrogen) and the nucleus stained with Hoechst 33342. Images were acquired using a DeltaVision microscope (Applied Precision). Multiple z-sections were acquired and images were deconvolved. 3D reconstruction and quantification of mitochondrial volume was assessed using the scientific software module Imaris XT (version 7.0, Bitplane, Zurich Switzerland).Results indicate that HEK 293 cells grown at physiological concentrations of O2 (5%) grow slower than those grown in hyperoxic conditions (10% and 21%) and have a larger volume of mitochondria. These results indicate that there are differences between cells grown at physiological PO2 and those grown at inappropriate levels of O2. Therefore, a consideration of the physiological environment that cell lines were originally acquired from should be made before culturing cells in vitro. Thanks to BioSTAR program for support. Welch et al, (2001) Kidney International; 59: 230-37 J. Chika. Morah, Barbara. L. Barr, Huong-Thao. Tran, Julia. E. Paulet and Christopher. N. Wyatt

Co-Authors/Collaborators: Barbara L. Barr, Huong-Thao Tran, Julia E. Paulet and Christopher N. Wyatt

Modulation of Afterhyperpolarization by Recurrent Inhibition

Student Presenter(s): Ahmed Obeidat
Graduate student
Faculty Mentor: Timothy Cope
Department: Neuroscience, Cell Biology and Physiology

Afterhyperpolarization (AHP) is a major determinant of motoneuron (MN) firing rate. However, it is not the sole factor since it is shaped by excitatory and inhibitory synaptic conductances during different motor tasks. One likely candidate is recurrent inhibition which shared similar timing with the known undershoot of MN action potentials following antidromic stimulation of peripheral nerve. That observation prompted us to directly examine the extent by which recurrent inhibition contributes to MN hyperpolarization. Data were obtained by in vivo intracellular recordings from identified lumbar MNs. Recordings were obtained from 63 MNs in 16 adult rats acutely deafferented and Isoflurane anesthetized. In each MN, action potentials were evoked either by suprathreshold current injection or by antidromic electrical stimulation of the whole peripheral nerve activating the autogenic recurrent inhibition circuit. Changes in the degree of peak hyperpolarization, rate to negative peak, and rate of decay were investigated. Recurrent inhibition added an average increase of 646µV to the peak hyperpolarization ranging from 18µV to 3.46mV. That corresponds to an average increase of 46.5% and up to 1.64 times of original AHP amplitudes. The mean rate of rise increased by 1.53 times ($P<0.0001$) and the mean rate of decay increased by 1.4 times ($P=0.0018$). Collectively, recurrent inhibition addition to AHP resulted in significantly larger and faster hyperpolarization following action potentials. That modification is likely to influence firing (rate, the ability to fire for longer durations) and provides direct evidence that further validates the method used to measure recurrent inhibition in humans which pre-requires that recurrent inhibition magnitude is not negligible when compared to that of AHP
Co-Authors/Collaborators: Tim Cope

Pharmacology and Toxicology

ETI-385 as a Novel Anti-emetic Against Drug Induced Emesis

Student Presenter(s): Theresa Fennell
Undergraduate student in Biological Sciences
Faculty Mentor: James Lucot
Department: Pharmacology and Toxicology

Drugs currently used to prevent emesis (nausea and vomiting) target only one or a few of the pathways used by emetic stimuli to trigger the reflex. Thus, an anti-emetic drug will only be effective against some stimuli. Prior work determined that 8-OH-DPAT (DPAT, a 5-HT1A agonist) was a universally effective anti-emetic. Although DPAT prevented emesis, it also elicited an extreme anxiety response making it unsuitable for therapeutic use. Presently, there exists no universal anti-emetic drug. We tested a proprietary drug developed from DPAT, ETI-385, which successfully prevented emesis in musk shrews against chemotherapy, drug and motion stimuli. For FDA purposes, we are required to test ETI-385 in another species before taking the drug into clinical trials. Work at Epiomed Therapeutics used ETI-385 to successfully prevent emesis in cats using motion stimuli. Currently, ETI-385 is being tested in cats against a drug stimulus, Xylazine, which is a common veterinary sedative. We determined a dose response curve for ETI-385 against Xylazine over the range of 0.0225mg/kg to 0.36mg/kg. The animals received an ETI-385 pretreatment injected subcutaneously (SC) followed by an injection of Xylazine (also SC). During observation the animals were scored for symptoms of both emesis and anxiety. The dose

0.0225mg/kg was unsuccessful in preventing emesis and produced a higher symptom score than Xylazine alone, suggesting nausea. The dose 0.045mg/kg was 66.7% effective against vomiting but had an increase in symptom score while 0.09mg/kg was 83.4% effective against vomiting with a marked decrease in symptom score. At the 0.36 mg/kg dose we achieved 100% efficacy and a complete eradication of emetic symptoms. Unlike DPAT, only the highest dose produced any defensive behavior.

Co-Authors/Collaborators: Samantha Spitak, Emily Smith,Teresa Garret, Dr. James Lucot

Hs3A/hs1,2 or Hs3B/hs4 is Sufficient to Mediate TCDD-Induced Inhibition Of the 3'IgH In A Transgenic B-Cell Line

Student Presenter(s): Brooke Johnson
Undergraduate student in Biological Sciences Participant in BioSTAR
Faculty Mentor: Courtney Sulentic
Department: Pharmacology and Toxicology

Immunoglobulin (Ig) gene expression is inhibited by AhR ligands including TCDD in both in vivo and in vitro animal models and human cellular models. In mouse models, Ig inhibition correlates with AhR expression and function. Ig heavy chain (Igh) gene expression involves a complex interaction between several regulatory elements including the 3'Igh regulatory region (3'IghRR), which is typically associated with four enhancers (hs3A; hs1,2; hs3B; hs4). We have demonstrated in a mouse B-cell line CH12.LX that TCDD inhibits LPS activation of luciferase reporters regulated by the 3'IghRR or the hs1,2 enhancer alone. Surprisingly, a luciferase reporter regulated by the hs4 enhancer was synergistically activated by LPS and TCDD. The objective of this study was to determine in the context of chromatin if the inhibitory effect of TCDD is mediated through the hs1,2 enhancer. CH12.LX cells were stably transfected with constructs containing an LPS-inducible γ2b reporter regulated by the 3'IghRR with LoxP sites flanking either the hs3B/hs4 or the hs3A/hs1,2 enhancer pairs. Transfection with CRE-recombinase induced LoxP recombination generating cell lines either expressing γ2b regulated by hs3A/hs1,2 or by hs3B/hs4. TCDD inhibited LPS-induced activation of both the parental 3'IghRR and the deletional derivatives, hs3A/hs1,2 and hs3B/hs4, suggesting that either enhancer pair can mediate the inhibitory effect of TCDD on the 3'IghRR but together do not produce a synergistic or additive effect. These results are in contrast to the effect of TCDD on the hs4 luciferase reporter which may be due to the addition of hs3B in the stable reporter. In conclusion, it appears that either 3'IghRR enhancer pair can be targeted by TCDD and is sufficient to mediate the inhibitory effect on 3'IghRR activity. Altered 3'IghRR activity likely contributes to the TCDD-induced inhibition of the antibody forming cell response due to the well-established association between the 3'IghRR, Igh expression, and antibody levels. (Supported by NIEHS R01ES014676)

Co-Authors/Collaborators: Jayharsh Panchal, Michael Wourms, Eric Romer, Courtney Sulentic

Localization of Renin Angiotensin Peptidases In Mouse Kidney Using Dual Immunofluorescence and Microscopy

Student Presenter(s): Orly Leiva
Undergraduate student in Biological Sciences Participant in BioSTAR
Faculty Mentor: Mariana Morris,
Department: Pharmacology and Toxicology

The kidney renin angiotensin system (RAS) plays a pivotal role in the regulation of blood pressure. There is emerging evidence that the two main Ang peptide mediators, angiotensin (Ang) II and Ang-(1-7), have counter-regulatory roles. While Ang II functions as a potent vasoconstrictor, the vasodilator Ang-(1-7) has been found to protect

against renal damage and cardiovascular disease. Ang II is converted to Ang-(1-7) by the renal peptidases: Ang converting enzyme 2 (ACE2), prolyl carboxypeptidase (PCP) and prolyl endopeptidase (PEP). Using dual immunofluorescence microscopy, we determined the expression pattern of ACE2, PCP and PEP in mouse kidney. The first step was to optimize the staining methodology. Factors adjusted were chemical constituents, incubation period and antisera dilutions. Following optimization, fixed kidney sections (20 µm) were incubated in primary antisera mixtures overnight (1:50-1:100 diluted in PBS containing 0.3% tritonX). Immunoreactive sites were revealed on day 2 with secondary antisera (diluted 1:100 in PBS containing 0.3% tritonX). ACE2, PCP and PEP were localized in renal tubules. In dual immunofluorescent preparations, we tested the combination of PCP+ACE2 and PEP+ACE2. PCP and PEP expression were co-localized with ACE2. As expected ACE2 was not seen in kidney tissue from ACE2 knockout mice. PCP and PEP expression remained unchanged in ACE2 KO. This approach will aid in our understanding of the role and site of Ang II processing to Ang-(1-7) in various renal pathologies. Supported by NIH R01HL093567 and 1R25GM090122.
Co-Authors/Collaborators: Nadja Grobe, Mariana Morris, Valerie Neff

Transcriptional regulation by 2,3,7,8-tetrachlorodibenzo-ρ-dioxin within the human polymorphic hs1,2 enhancer

Student Presenter(s): Jing Liu
Graduate student in Biological Sciences
Faculty Mentor: Courtney Sulentic
Department: Pharmacology and Toxicology

The environmental contaminant 2,3,7,8-tetrachlorodibenzo-ρ-dioxin (TCDD) inhibits Ig expression and secretion. Within the IgH gene, the 3'IgH regulatory region (3'IgHRR) has been identified as a transcriptional target of TCDD. TCDD inhibits mouse 3'IgHRR and induces aryl hydrocarbon receptor (AhR) binding to dioxin response elements (DREs) within the hs1,2 and hs4 enhancers. The human hs1,2 enhancer is polymorphic due to the presence of one to four invariant sequences (IS) which has been correlated with several autoimmune disorders. Interestingly, TCDD inhibits the transcriptional activity of the mouse hs1,2 enhancer, while the human polymorphic hs1,2 enhancer activity is increased. Several transcription binding sites are located within both the mouse and human hs1,2 enhancer, while others are only in the mouse or human. Thus we hypothesize that the specific transcription factor within the mouse and the human enhancer lead to differential effects by TCDD. Our data show that insertion of Pax5, deletion of the whole IS, or mutation of the AP-1/Ets site outside the IS decreases overall transcriptional activity. However, mutation of the transcription binding sites within the IS or the Oct site outside the IS increase the transcriptional activity. These results underscore the complexity of the transcriptional regulation of the hs1,2 enhancer and suggests an interaction between multiple transcription factor, many of which have been shown to be modulated by TCDD.
Co-Authors/Collaborators: Sharon Ochs, Dr. Courtney Sulentic

Determining the role of the AhR in TCDD-induced suppression of immunoglobulin heavy chain expression

Student Presenter(s): Nadine Morgan
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Participant in GRAD-PREP
Faculty Mentor: Courtney Sulentic
Department: Pharmacology and Toxicology

The aryl hydrocarbon receptor (AhR) is a ligand-activated transcription factor which plays a role in the inhibition of immunoglobulin (Ig)

expression by the potent environmental toxicant 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD). Some studies have postulated that the TCDD-inhibited Ig expression may be mediated through a direct binding of AhR to dioxin response elements (DRE). Our previous studies have identified functional DRE binding sites in the 3`*Igh* regulatory region (3`*Igh*RR) and hypothesized that activated AhR inhibits Ig expression by inhibiting 3`*Igh*RR activity. We have developed a new cell line model that expresses a γ2b transgene under the regulation of the 3'*Igh*RR and through lentiviral transduction expresses shRNA targeted to *Ahr* message. This shAhR cell line has a heterozygous population of cells that express a reduction of AhR as seen with western blot analysis. In our current study we have utilized limiting dilution to select the greatest AhR-knockdown clonal populations. Our western blot analysis demonstrated a marked reduction in AhR expression in comparison to both the well-characterized parental cell line (CH12.LX) and the CH12.LX variant expressing the 3'*Igh*RR-regulated γ2b transgene (CH12.LX γ2b-3'*Igh*RR). Further studies include evaluating the ability of these cells to induce Cyp1A1 expression (hallmark endpoint of AhR activation), and the effect of TCDD on 3'*Igh*RR-regulated γ2b expression and endogenous Ig expression. (Supported by NIH RO1ES014676 and ARRA supplement 04S1 and NIH PREP 5R25GM086257-02

Co-Authors/Collaborators: Mike Wourms and Courtney Sulentic

Measurement of Urinary Catecholamines

Student Presenter(s): Emily Smith
Undergraduate student in Psychology
Participant in BioSTAR
Faculty Mentor: James Lucot
Department: Pharmacology and Toxicology

Analysis of catecholamines in small samples of urine is difficult and is greatly affected by collection methods. It requires either pooling of samples or expensive separation by double mass spectrometry. Peripheral catecholamines are increased by stress thus a reduction of stress during collection of samples from subjects is essential to decrease variability. A method for extraction of unconjugated catecholamines in 20 µL samples of urine was developed using alumina prior to analysis by high performance liquid chromatography (HPLC) with electrochemical detection (ECD). Collection occurred in the morning and evening prior to handling, and in the morning after three days of handling. After the urine was passively obtained, it was added to alumina with 0.05N hydrochloric acid with 5mM sodium metabisulfite, 2,3-dihydroxybenzoic acid (DHBA) internal standard, and brought to pH 8.5 with 0.2M tris buffer. The mixture underwent two wash steps for purification and 0.1N perchloric acid was added to elute the catecholamines. Samples were run on HPLC with ECD. This novel extraction method using low amounts of urine yielded on average between 30 to 43% recovery in the samples and between 50 to 70% recovery in the standard extraction. Unconjugated catecholamine levels did not show significant differences between the different collection times, nor between handled and unhandled techniques. Experiments are currently being conducted to compare this technique to an active collection method.

Co-Authors/Collaborators: Abigail Schwartz, James Lucot

ETI-415 as a novel anti-emetic against motion and chemical stimuli

Student Presenter(s): Samantha Spitak
Undergraduate student in Biological Sciences
Faculty Mentor: James Lucot
Department: Pharmacology/Toxicology

There is no drug that is successful in preventing emesis elicited by all stimuli. Commercially available anti-emetic drugs act on specific pathways and are not effective on all types of emesis. The aim of this study is to test ETI-415 for efficacy against multiple emetic stimuli using both drug-induced emesis and motion sickness. ETI-415 is a novel anti-emetic developed as a second generation drug to follow ETI-385. It has not been tested previously. Testing was done using a species of musk shrew, Suncus murinis, an animal commonly used in emetic research, with stimuli of nicotine at a dose of 10mg/kg to activate the chemical trigger zone and motion at a frequency of 1.0Hz to disturb the vestibular processing to elicit motion sickness. ETI-415 was a potent drug effective against both stimuli. Its duration of action will be determined and compared with that of the prior drug and receive further testing in a second species.
Co-Authors/Collaborators: James Lucot, Teresa Garrett

Physics

Characterization of Composite Materials using Millimeter-wave Techniques

Student Presenter(s): Matthew Bischoff
Graduate student in Physics
Faculty Mentor: Doug Petkie
Department: Physics / Electrical Engineeri

Millimeter-wave reflection and transmission measurements were performed on various composite materials in order to characterize the changes in the structural and optical properties prior to and after being subjected to thermal and mechanical stresses. This poster discusses the methods used to make the measurements, and how the material properties were developed from said measurements.
Co-Authors/Collaborators: Adam Cooney

Analytical Chemical Sensing using high resolution Terahertz/submillimeter wave spectroscopy

Student Presenter(s): Alyssa Fosnight
Undergraduate student in Engineering Physics
Participant in UROP Summer Program 2011
Faculty Mentor: Ivan Medvedev
Department: Physics

Molecular ro-vibrational spectral signatures enable chemical sensors that are highly sensitive and selective. These sensors compare favorably to establish techniques for gas analysis. Unlike methods based on mass spectrometry (MS), Terahertz/submillimeter (THz/smm) spectrometers do not require calibration and rely on library spectra for quantitative analysis, thus eliminating the need for calibration, usually done via analysis of calibration standards. They interrogate a very large number of resolution elements and approach near 'absolute' specificity of chemical detection. In an ongoing experiment we attempt to perform first of a kind chemical analysis of a TO-14 calibration standard mix of 39 volatile organic compounds diluted in Nitrogen. 26 chemicals in the mixture are spectroscopically active in the THz range. Here we present our most recent results and analysis. This proof of principle study will serve as basis of our future research in chemical sensing with focus on analysis of exhaled human breath.
Co-Authors/Collaborators: Benjamin Moran, Dr. Ivan Medvedev

Characterization and Modeling of Laser Micro-Machined Periodically Corrugated Metallic Terahertz Wire Waveguides

Student Presenter(s): Satya Ganti
Graduate student in Engineering
Faculty Mentor: Jason Deibel
Department: Physics

Following the first demonstration of cylindrical metal wires as low-loss/low-dispersion terahertz (THz) waveguides, it was proposed that surface corrugations of a metal wire with radial grooves would manipulate the energy confinement, dispersion, and loss dynamics of the propagating surface plasmon polariton. We present here the first characterization of such a wire. Finite element method (FEM) simulations are used to simulated and define the design of the periodic corrugation. Parameters are chosen such that loss, operating frequency, and electric-field confinement can be optimized. An engineered copper waveguide is accomplished via laser micromachining yielding a corrugated wire with grooves 20 um wide, 40 um deep, and spaced at 250 um. Parameters were chosen for an operational frequency of 250 GHz. THz pulses from a fiber-coupled THz time-domain source are focused onto a sub-wavelength coaxial aperture that is used to couple the linearly polarized THz light to the primary radial mode of the wire waveguide. A THz detector is placed at the end of the waveguide such that the frequency-dependent diffraction can be characterized. Control tests are made on the same type of 0.6 mm radius copper wire that is laser machined into corrugated wires. Characterization of the far-field diffraction pattern at the same detector position shows differences between the plain wire and corrugated waveguide. Other characterization measurements that will be presented include the diffraction at the end of the waveguide, the loss, and the electric-field confinement.

Characterization of Terahertz Frequency Scattering from Multi-Walled Carbon Nanotube Arrays

Student Presenter(s): Andrew Niklas
Graduate student in Physics
Faculty Mentor: Jason Deibel
Department: Physics

Carbon nanotube based physics is a relatively new field of study and electromagnetic characterization of oriented carbon nanotube materials is still in its infancy. We will present past and preliminary results of time domain terahertz spectroscopy measurements of scattering from vertically aligned arrays of multi-walled carbon nanotubes. Theoretical understanding of the observed phenomenon will be explored using results generated by Finite Element Method electromagnetics simulations. We will also discuss results from our more recent, ongoing experimentation efforts. The intent of this research is to both corroborate results from independent research groups conducting similar experiments and to further increase understanding in the scientific community with respect to carbon nanotube scattering phenomena.

Characterization of Ceramic Composite Materials using Terahertz Reflection Imaging Technique

Student Presenter(s): Lindsay Owens
Graduate student in Physics
Faculty Mentor: Jason Deibel
Department: Physics

Terahertz time-domain reflection imaging is performed to do non-destructive evaluation on ceramic composite materials in order to characterize changes in material properties due to mechanical and thermal strain.
Co-Authors/Collaborators: Matthew Bischoff, Adam Cooney, Doug T. Petkie, and Jason A. Deibel

The Mechanisms of Luminescence from ZnO under Electron Irradiation

Student Presenter(s): Devin Todd

Graduate student in Physics
Faculty Mentor: Gary Farlow
Department: Physics

Zinc Oxide has been utilized for centuries in a wide range of applications including medical, food, and materials. It is now that ZnO draws much attention to its potential as a high frequency semiconductor and UV laser. As a result there has been much investigation into the properties of ZnO and many papers published in the area. Despite this fact, there is still much that is unknown about its electronic defect structure. This research investigates the broad region of the Zinc Oxide luminesecnece spectrum known as the green band, about which there is much debate as to its origin. Electron irradiation is employed to excite the ionization characteristics of ZnO and to create native defects which may be luminescent centers. Specifically, the mechanisms which result in the reported quenching of the green band under electron irradiation are to the studied. This is a novel effort with high hopes and expectations for identifying some of the mechanisms responsible for the luminescence.
Co-Authors/Collaborators: Gary Farlow

Remote Vital Signs Instrument

Student Presenter(s): James Trame
Undergraduate student in Engineering Physics
Faculty Mentor: Douglas Petkie
Department: Physics

Human vital signs have been detectable by instruments for many years but require physical contact to determine a subject's pulse or respiration rate. A terahertz radar system can measure these rates remotely and non-invasively, such as in human subject trials or for triage. Our 35GHz radar system is able to pick up respiration rates at long distances and pulse rates in close proximity. We will discuss the advantages and challenges in the development of such a system.
Co-Authors/Collaborators: Carl Cross, Julie A. Skipper

Political Science

Clash of the Titans: The Future of Competing Spheres of Influence in the South China Sea

Student Presenter(s): Spencer Brannon
Undergraduate student in Political Science
Faculty Mentor: Donna Schlagheck
Department: Political Science

As the Soviet Union collapsed and the Cold War reached an end, the West refocused its attention from East Asia's susceptibilities to strengthening a unified Europe and addressing crises in the Middle East. Newly freed from its precarious tango with the competing USSR and USA interests, China used the following two decades to consolidate its home front and increase its role in discussion surrounding its borders and the oft-disputed resources they hold. With Europe unified – if struggling – and the conflicts in Iraq and Afghanistan nearing their final stages, the United States has reinvigorated its efforts to focus on the Asian-Pacific region. This analysis discusses the role of the South China Sea, as the pre-eminent flashpoint for the Asian-Pacific region, in the twenty-first century relationship between China and the US. It assesses the claims that China is the next superpower and addresses the possibility of conflict in the South China Sea as the American and Chinese political and economic spheres directly compete, for the first time since the end of the Cold War. With one half of the world's shipping trade and one sixth of the world's oil traversing the South China Sea, and with the contentious Taiwan a littoral State to the area, the South China Sea serves as the

first test of dedication for mutually prosperous Sino-American relations.

Solutions to the Problem of Corruption in Brazil

Student Presenter(s): Kathryn Chaney
Undergraduate student in International Studies
Faculty Mentor: December Green
Department: Political Science

Corruption is an issue all around the world, and Brazil is no exception. Even though Brazil is not the worst offender, many Brazilians are still concerned about corruption's effects on their country, especially in their government. This corruption costs the country about $45 billion a year and limits Brazil's economic and political development. Unfortunately, the past government approaches have not been very successful with getting rid of corruption, and the institutions set up to deal with it do not work efficiently. They focus too much on investigation after the fact without punishment and are lacking when it comes to oversight and prevention. The current president of Brazil, Dilma Rouseff, seems to be making progress in reducing corruption, but she has had to face corruption distractions within her own cabinet as well. Two solutions that could better deal with the problem of corruption are 1) reformist, to emphasize the importance of oversight within established institutions and 2) transformative, to change the way people get into positions of power in the government. This paper discusses how each of these proposed solutions could be implemented in Brazil. Finally, it explains that the reformist solution would ultimately work best in Brazil because it is more culturally appropriate, given Brazil's historic preference for evolutionary or incremental change.

When Prohibiton and Violence Collide: The Case of Mexico

Student Presenter(s): Kyleigh Clark
Graduate Student in Political Science
Faculty Mentor: December Green
Department: Political Science

Some theorists have found a positive correlation between increased drug prohibition enforcement and a rise in violence. These studies focus on the United States and Colombia, arguing that prohibition amplifies violence, rather than decreasing it. Much like the United States and Colombia earlier in their histories, Mexico has recently experienced an escalation in violence. Since beginning a democratic transition in 2000, the Mexican government has intensified a war on drugs by strengthening the rule of law, battling corruption, and cooperating with the United States' drug war. This study, using a congruence method with process-tracing, will analyze the Mexican case in depth, with the goal of determining whether increased drug prohibition enforcement has escalated drug-related violence in Mexico, and what effect the violence has on the legitimacy of democracy itself in Mexico.

When 'Boys Will Not Be Boys': Variations of Wartime Sexual Violence by Armed Opposition Groups in Sri Lanka, Sierra Leone, and Nepal

Student Presenter(s): Matthew Conaway
Graduate student in Political Science
Faculty Mentor: December Green
Department: Political Science

Wartime sexual violence is often assumed to be inevitable during conflict yet empirical evidence indicates that sexual violence varies in type and frequency within and across conflicts as well as among armed groups. A solid understanding of what variable(s) and causal pathway(s) permit the variation of systematic sexual violence in intrastate conflict situations by specific groups has yet to be developed. What factors explain the

variation of sexual violence by certain armed opposition groups during conflict situations? This comparative study employs process-tracing and the congruence method to consider the utility of hypotheses drawn from the work of Elisabeth J. Wood and Kathryn Farr using data from the Sri Lankan (1983-2009), Sierra Leonean (1991-2002), and Nepalese (1996-2005) civil wars. It finds that insurgent leadership prohibition of sexual violence against civilians and equitable intragroup gender dynamics are correlated with a lower frequency of sexual violence against civilian populations by insurgencies during civil wars.

Keeping the Faith: Student Reflections on the 12th Congressional Civil Rights Pilgrimage

Student Presenter(s): Allison Dissemio, Sherita Jackson, Phillip Logan, Chad Lovins, Rebekkah Mulholland, Michael Tyler
Undergraduate and Graduate students in Political Science
Participant in
Faculty Mentor: Tracy Snipe
Department: Political Science

This session examines an innovative curricular/pedagogical approach to revisiting and reexamining critical sites and passages of the Civil Rights Movement from the perspective of the youth of today. Recently, seven Wright State University students attended the 12th Congressional Civil Rights Pilgrimage from March 2-4, 2012 in Alabama along with Dr. Snipe, an associate Professor in Department of Political Science at Wright State University. This annual pilgrimage is sponsored by the Faith and Politics Institute, which is based in Washington, D.C. The pilgrimage included visits to sacred sites in Selma, Montgomery and Birmingham. In addition to traveling to Alabama, they toured the Lorraine Motel (site of the assassination of the Reverend Dr. Martin Luther King, Jr.) in Memphis, Tennessee. Students were selected to participate based on the quality of essays written about the16th Street Baptist Church bombing or presentations on other significant passages of the Movement, especially as they relate to today's generation. During the pilgrimage they had an unprecedented, first-hand opportunity to dialogue with pioneers and unsung heroines of the Movement, some members of Congress, and people from other walks of life throughout the nation and abroad. As such they were required to attend breakout sessions, journal, and write critical essays regarding this community-based experience in order to enhance their learning outcomes and receive academic credit. Using pictures and videos that they composed, students will share facets about this unique educational experience. This twenty minute panel should benefit observers who seek to become better informed about this vital part of history from the unique vantage point of Generation Next or the so-called 'Millennial Generation' as well as those young in spirit. This panel, which includes a Q & A, will be moderated by Dr. Snipe who convened it.

'Cullah Mi Gullah,' African American Female Artists and the Sea Islands: Exploring Africanisms and Religious Expressions in Creative Works

Student Presenter(s): Rebekkah Mulholland
Graduate student in African and African American Studies
Faculty Mentor: Tracy Snipe
Department: Political Science

This research provides a historiography of Africanisms and religious expressions explored in Geechee cultural and literary traditions, specifically within African-American women's fiction. The Sea Islands, off the coasts of Georgia and South Carolina, have captured the imagination and interests of black female artists

since the 1930's. Whereas interests in the Sea Islands by scholars never completely dissipated, it waned in the 1950s while the 1960s and 1970s saw a resurgence of African-American literature vis-a-vis the Black Arts Movement. During the 1970s, black women writers also highlighted the importance of oral history and folklore as an important source for recovering what they viewed as not only a maligned history of black Americans but also black women. The coalescence of cultural and academic interests, publication of new research materials, and discovery of historical works such as Drums and Shadows enabled the Sea Islands to emerge in the national black imagination in new ways that visual artists and writers would illuminate. During the late twentieth century, Diasporic female voices such as Maryse Condé responded to the legacy of writing established by our literary foremother, Zora Neale Hurston. Likewise, Toni Morrison, Toni Cade Bambara and Paule Marshall laid the groundwork for other novelists and filmmakers like Julie Dash and Tina McElroy Ansa to signify upon with regards to the Sea Islands and Gullah cultural traditions

The Impact of U.S. Media Bias on the Palestinian Israeli Conflict

Student Presenter(s): Rana Odeh
Graduate student in Political Science
Faculty Mentor: Vaughn Shannon
Department: Political Science

The purpose of the presentation is threefold. First, the presentation will illustrate the U.S. media bias in the Palestine-Israel conflict, via an analysis of the over-reporting of Israeli casualties and the under-reporting of Palestinian deaths in 2001 and 2004. Second, the presentation will demonstrate the influence of biased media reporting on American public opinion through an analysis of a series of public opinion polls conducted in the U.S. by Gallop, CNN, Pew Research Center, CBS News, ABC News, Ipsos/McClatchy, Los Angeles Times, USA Today, NBC News/Wall Street Journal, and Newsweek; to be contrasted with a YouGov poll conducted in the U.K. where media coverage of the conflict is more balanced. This presentation will also include an analysis of the misinformation presented to the American public prior to the 2003 invasion of Iraq, and the consequences it had on public opinion and foreign policy. Third, the presentation will argue that the political dynamics in the U.S. are such that public opinion drives election results, and thus, public opinion is taken into consideration during the policy making process. U.S. public opinion, largely shaped by biased media, is in favor of Israel, which affects policy making toward Israel and Palestine; often to the detriment of Palestine and U.S. interests in the Middle East. In order to protect U.S. security interests and geo-strategic interests, it is vital that U.S. foreign policy toward Israel shifts to a more balanced position. Change in policy making toward Israel is unlikely unless it becomes favorable among voters and politicians; the first step is to provide more balanced reporting on the Palestinian-Israeli conflict.

Psychology

Bio-Behavioral Analysis of a Dual-Exposure Pesticide Model and its Implications in a Silent Vulnerability to Parkinson's Disease

Student Presenter(s): Seanceray Bellinger
Graduate student in Psychology
Participant in GRAD-PREP
Faculty Mentor: Gale Kleven
Department: Psychology

Parkinson's disease (PD) is a neurodegenerative disorder characterized by motor disturbances and a loss of dopaminergic neurons in the substantia nigra pars compacta (SNc). High rates

of idiopathic PD have been linked to environmental factors, including pesticide exposure. Research has suggested that pre-natal treatment with maneb, a fungicide, may imbue a silent vulnerability to PD that is only unmasked in adulthood during subsequent exposure to the herbicide paraquat. The purpose of this study was to confirm the developmental results found in the dual-exposure pesticide model using different behavioral and neurochemical measures. Pregnant C57BL/6J mice were treated with a 1mg/kg dose of maneb or an equivalent dose of saline on gestational days 10-17. The offspring were then injected with a 5mg/kg dose of paraquat or saline on postnatal days 48-55. On postnatal day 60, mice were given three behavioral tasks: open field, pole climb, and swim test. Nuclear Magnetic Resonance (NMR) spectroscopy was performed to quantify neurometabolite concentrations. We hypothesize that there will be significant changes in locomotor behavior between the maneb-paraquat group and the other two experimental groups and no significant differences evident between the saline-saline control group and the maneb-saline group. Finally, we expect NMR analysis to reveal differences in neurometabolite concentrations suggesting that the nigrostriatal dopaminergic neurons have been comprimised. If our hypotheses are correct, it would provide more evidence to support the dual-exposure pesticide model and imply that prenatal exposure to maneb potentiates the effects of paraquat and mimics a silent vulnerability pathway for Parkinson's disease within the Fetal Basis of Adult Disease (FeBAD) model.

Co-Authors/Collaborators: C. T. Fitch , A. E. Neuforth, N. V. Reo, G. A. Kleven

Job Quality and Webpage Aesthetics

Student Presenter(s): Raquel Dues
Undergraduate student in Psychology
Faculty Mentor: Gary Burns
Department: Psychology

Companies are becoming increasingly dependent upon online recruitment for jobs because it conserves time and resources, with up to a 90% reduction of the cost of traditional recruitment methods. In light of the use of webpages for job recruitment, the current study attempts to determine whether web page aesthetics effect perceived job quality. Two hundred participants from the Psychology Department Human Subjects Pool will view one of four webpages, each containing a description for a job. Eight different conditions will be used to examine whether the webpage aesthetics will affect the perceived quality of a job. Conditions will include low and high aesthetics paired with low and high job qualities for a sales representative or administrative assistant position. Participants will then answer questions pertaining to the job, the quality of the job, and the aesthetics of the webpage as well as their fit with the job, whether they are actively seeking a job, and their own aesthetic preferences. It is hypothesized that a high aesthetic condition will increase job quality regardless of the initial level of job quality. Data collection will begin in March and will conclude at the end of March. After the data is collected we will examine the data with proper analyses. These results will be presented at the Celebration of Research, Scholarship & Creative Activities event.

Co-Authors/Collaborators: Sarah Drought, Ashley Ford, Leah Miller, Andrea Stojsavljevic, Brittany Dapice, Ashley Grinstead, Jeffrey Bauerle, Brittany Radford, Megan Morris

Maternal behavior impacts during development of the PITX3 Parkinson's mouse

Student Presenter(s): Christina Estrada
Graduate student in Psychology
Participant in GRAD-PREP
Faculty Mentor: Gale Kleven

Department: Psychology

The Pitx3ak/2J aphakia mouse model exhibits useful characteristics for the study of Parkinson's disease. Research has revealed a 90% reduction in substantia nigra pars compacta (SNc) dopaminergic neurons in adult Pitx3 mice, exceeding the 80% loss threshold for symptoms seen in humans with Parkinson's disease. Similarly, these mice display motor deficits that are reversed by L-DOPA. Our work has shown these behavioral deficits emerge prior to birth, raising the possibility of altered maternal-pup interaction. In the current study, we hypothesized that behavioral outcomes in adult mice are altered depending on the genetic composition of the litter during early rearing. This hypothesis is being tested by mating Pitx3 heterozygous females to homozygous (mutant) males in order to produce both heterozygous (control) and mutant offspring in roughly equal numbers. On the day after birth (Postnatal day 1, P1), mouse pups were fostered into three different litter types: (a) mixed litter with equal numbers of mutant and control pups, (b) all mutant offspring, and (c) all control pups. Males and females from each litter and condition were tested with measures sensitive to nigrostriatal impairment at P60. These behavioral tests are: (a) open field test, (b) pole climb, and (c) swim test. In order to determine if any differences in maternal behavior are due to chemical signals from the pups themselves as opposed to behavioral differences, urine will be collected from pups on each of the testing days, and analyzed by NMR Spectroscopy for metabolomic profiles. We expect to find results that suggest behavioral functioning is impacted by early rearing environment and is independent of genotype. Consequently, design and husbandry considerations may be important epigenetic factors to consider in studies with genetically altered mice.
Co-Authors/Collaborators: Kleven, Gale

Improving vigilance: Binaural beat technology and vigilance task performance

Student Presenter(s): Ashley Ford
Undergraduate student in Psychology
Faculty Mentor: Gary Burns
Department: Psychology

The vigilance decrement is when accuracy on a vigilance task declines as a function of time on the task. What this means is that people are more likely to miss critical signals the longer they are focusing on their task. This is problematic given the number of jobs requiring vigilance to monitor important processes (e.g., air traffic controller, diary processor monitoring). Binaural beat technology may be able to improve the vigilance decrement, with beta binaural beats being associated with increased levels of attention and alertness. Binaural beats occur when two separate frequencies are presented to each ear, resulting in a third perceived beat. This binaural beat is the difference between the two original frequencies. Vigilance data were collected from 65 participants (68% female), randomly assigned to either a pink noise control condition or a beta binaural beat experimental condition. Although overall results did not differ, beta binaural beats reduced the initial severity of the vigilance decrement.
Co-Authors/Collaborators: Elizabeth Shoda, Megan Morris

A job is what you craft of it: A critical review of popular self-help

Student Presenter(s): Michael Hoepf
Graduate student in Psychology
Faculty Mentor: Nathan Bowling
Department: Psychology

Hours spent working occupies a significant proportion of time in the lives of most adults, and work has been found to be significantly related to

one's overall happiness and well-being. Characteristics of one's work environment and personal characteristics of workers tend to produce more or less stable levels of job satisfaction across time and across work environments, but job crafting is a relatively unexplored are of research that may provide a way for individuals to improve their job satisfaction. Self-help books could be considered one type of literature on job crafting because they prescribe ways in which employees may become more satisfied with their job. The current research scientifically examines the validity of self-help books that are accessible from a popular book website. Results indicated that self-help books are often written without any reference to the scientific literature, which is unfortunate because this would likely result in more effective suggestions. In fact, some books reviewed even made claims that were inconsistent with the scientific literature. Furthermore, many books relied on making vague suggestions such as "think positively," and "be a team player." It is concluded that future self-help books should be based on empirical evidence, and they should offer specific suggestions. Vague suggestions are difficult to follow, and if they are not grounded in science, they are unlikely to be effective.
Co-Authors/Collaborators: Steve Khazon, Caleb Bragg, Jeannie Nigam, Nathan Bowling

Transient Prenatal and Postnatal Behavioral Deficits after Low-Dose Prenatal Toxin Exposure

Student Presenter(s): Lindsey Keene
Graduate student
Faculty Mentor: Gale Kleven
Department: Psychology

The Fetal Basis of Adult Disease (FeBAD) is a phenomenon in which prenatal insults lead to a silent damage or vulnerability that does not emerge as a functional deficit until later in life. Although numerous outcome studies have documented this phenomenon, little is known about functional changes that take place across development after such an insult. In prior work we have shown that prenatal behavioral deficits predict cognitive dysfunction in adulthood. In this cross-sectional study, a series of behavioral observations were made of prenatal (E18, E19, E20, & E21) and postnatal (P1, P5, P10, P30, & P45) rats. Subjects were the offspring of pregnant rats that had been exposed to a low dose (10 mg/kg) of the neurotoxin methylazoxymethanol (MAM, Midwest Research Institute), by intraperitoneal injection on E17. Behavioral observations included limb synchrony, nipple attachment, facial wipes, and open field scoring. For nearly all behavioral measures, the existence of differences was dependent upon the day of testing and the behavioral measure itself, suggesting recovery or compensation may have occurred between testing days. These transient behavioral deficits support findings from previous perinatal studies on the possible pattern of behavioral development likely to be observed during the emergence of FeBAD. Because deficits were observed in a transient pattern, traditional outcome measures may not detect deficits reliably. Consequently, these results suggest that the best methods for investigating the connection between neural insults and FeBAD are age-appropriate behavioral measures collected at numerous time points across development.
Co-Authors/Collaborators: J.S. Rodefer, S.R. Robinson, & G.A. Kleven

Emotional Intelligence as a moderator for self-reported questionnaires

Student Presenter(s): Steven Khazon
Graduate student in Psychology
Faculty Mentor: Nathan Bowling
Department: Psychology

Emotional intelligence (EI) is a set of abilities that accounts for how people's emotional reports vary in their accuracy and how the more accurate understanding of emotions leads to better problem solving in emotional life. This construct has attracted much scientific and popular attention over the past 20 years. Research on EI is split into two camps: the first treats it as a mental ability while the second treats it as a personality trait. Scholars disagree about which of these conceptualization best captures EI. We take the position that trait-based EI is flawed in that the act of endorsing a self-report questionnaire in itself requires self-knowledge. It may not be meaningful for an emotionally unintelligent person to rate their own level of EI. In the current study, we will evaluate this proposition by examining whether ability-based emotional intelligence will moderate self-reported criterion outcome relationships. We anticipate that individuals who score highly on ability-based EI measures will have higher criterion-outcome relationships by virtue of them being able to assess themselves more accurately. Our criterion variables will include trait-EI and personality, while our outcomes will include academic performance, trust, and coping strategies.

Perceptions of Masculinity and Femininity from Resumes

Student Presenter(s): Leah Miller
Undergraduate student in Psychology
Faculty Mentor: Gary Burns
Department: Psychology

The influence of individuals' personality perceptions on gay and lesbian applicants was investigated. Of interest in this study is the inclusion of sexual orientation cues in applicant resumes. We hypothesized that participants would assign gay male and lesbian applicants with personality traits uncharacteristic of their gender. This study consisted of 234 participants. We manipulated the resume job-type to reflect a masculine or feminine job, the gender of the applicant to reflect a male or female, and the sexual orientation of the applicant to reflect a heterosexual orientation or homosexual orientation. Participants examined resumes containing indicators of the applicant's sexual orientation and were asked to evaluate personality traits of the applicant. Results suggest that individuals use the implicit inversion theory when assessing the masculinity and femininity of potentially homosexual applicants. Support was found for the hypothesis that individuals perceive homosexual males and lesbians as gender atypical regarding some traits.
Co-Authors/Collaborators: Sarah Drought, Ashley Ford, Megan Morris

"We're Bringing Bio Back": Putting Biomedical Back into Lay Mental Models of Alcoholism

Student Presenter(s): Emily Polander
Graduate student in Psychology
Faculty Mentor: Valerie Shalin
Department: Psychology

Our culture provides the lay public with both biomedical and psychosocial information, both of which guide medical understanding, reasoning and decision-making (Gentner, 2002). However, biomedical as opposed to psychosocial information is typically more difficult for untrained individuals to fully comprehend because of the dynamic, abstract, and sometimes imperceptible nature of a complex system such as the body (Hmelo, Holton, & Kolodner, 2000). Researchers may study mental models and understanding through the analysis of language (Carley & Palmquist, 1992). Two ways that individuals use language to convey coherence, meaning, and understanding are through the construction of narrative (Pennebaker & Seagal, 1999) and figurative language (Lakoff & Johnson, 1980). The present study examines these

indicators of understanding in the use of biomedical content articulated in the lay dialogue of internet discussion forums, using both quantitative and qualitative methods. We hypothesized that, because of the complex nature of biomedical phenomena, posts higher in biomedical content would contain less figurative language and narrative than posts lower in biomedical content. We found that although posts with high biomedical content containing figurative language and narrative do exist, they were the exception to the rule. Posts high in psychosocial content contained more figurative language and narrative than posts high in biomedical content. The results suggest a dearth of understanding of the biomedical domain, as measured by figurative language and narrative usage. Exceptions to the rule demonstrate that it is indeed possible to relay biomedical information and experiences through figurative language and narrative. Individuals' struggles with the integration of understanding-based figurative language and narrative into their dialogue may be due to the tensions associated with shifting identities (i.e., healthy to ill) (Holland & Lave,2009). Individuals that are not well-adapted to this new medical culture may not be adopting the biomedical model as effortlessly as the psychosocial model.

Co-Authors/Collaborators: Valerie Shalin, Ph.D.

Effects of elevated glucocorticoids on dentate gyrus development

Student Presenter(s): Zachary Vallandingham[1], Sean Collins[2], Anne Brown[2],
[1]*Graduate*, [2]*Undergraduate students*
Faculty Mentor: Dragana I.Claflin
Department: Psychology

Particularly low and high glucocorticoid levels can affect cognitive performance and this impairment appears to be largely mediated by the hippocampus. Previously, we showed that protracted elevation of corticosterone (CORT) levels starting on postnatal day 15 (immediately after the stress-hyporesponsive period) impaired later learning on trace eyeblink conditioning (EBC). Further, at this developmental age, males appeared to be more susceptible to the effects than were females. In the present study we have examined potential anatomical differences in the hippocampus of male rats treated with 21-day-release CORT pellets versus placebo. CORT/placebo pellets were inserted subcutaneously on the back of the neck of 15-day-old rat pups. This was followed by 3 BrdU injections (50mg/kg) on day 16, 17 and 18. On day 28, the rats were sacrificed and brains harvested. Using fluorescent immunohistochemical co-labeling with BrdU, NeuN, GFAP and Sox-10 combined with stereology we have sampled newly differentiated neurons in the dentate gyrus of hippocampus. This allowed us to detect any CORT-induced changes in the dentate gyrus volume, total number of neurons, and neuronal density of young male rats.

Co-Authors/Collaborators: Lisa Kralich, Kevin Schmidt, Michal Kraszpulski

One Week Retention of Classical Eyeblink Conditioning in Pre-Weanling and Weanling Rats

Student Presenter(s): Sarah Wood[2], Shannon N. Collins[1], Feras J. Deek[1],
[1]*Undergraduate student in Psychology*
[2]*Participant in GRAD-PREP*
Faculty Mentor: Dragana Claflin
Department: Psychology

Classical eyeblink conditioning (EBC) in rats becomes robust around postnatal day (PND) 24 with dramatic development occurring between PND 17 (pre-weanling) and PND 24 (post-weanling). Past developmental studies of conditioning at PND 17 showed no behavioral evidence of learning. However, facilitation of

learning occurred when the same animals were re-tested on Day 20, compared to age-matched controls being conditioned for the first time (Stanton et al., 1998). This suggests a carry-over effect from Day 17 to 20. The present study explores the nature of this carry-over while also extending the findings over a one week test-retest period. Groups of pre-weanling (PND 17) and post-weanling (PND 24) rats were randomly assigned into one of three different exposure conditions: Paired, Context, or Shock. Paired exposure consisted of repeated trials of a tone conditioned stimulus (CS) followed by a periorbital shock unconditioned stimulus (US). Context exposure consisted of being put in the test situation with no stimulus presentations, while Shock exposure consisted of 90 shock-only presentations. One week later all animals received paired CS-US presentations. As expected, there was no learning evident in the Paired group at PND 17. When re-tested at PND 24, all three groups of animals showed similar rates of learning. The facilitation previously observed for paired training between PND 17 and 20 was not present between PND 17 and 24, suggesting it is a short-lived phenomenon. In contrast, the post-weanling Paired group showed significant learning at PND 24 with little change upon retesting at PND 31, thus indicating strong retention of learning. The Context and Shock control groups showed no learning at PND 24, but rapid learning at PND 31, matching that of the Paired group. Together, these data suggest that prior exposure to testing context or aversive stimuli does not influence conditioning over a one week retention interval.

Social Work

Horticultural Therapy with Juvenile Offenders and Their Families

Student Presenter(s): Caitlin McGee
Undergraduate student in Social Work
Participant in UROP Summer Program 2011
Faculty Mentor: Sarah Twill
Department: Social Work

Finding activities for the whole family to participate in can be a challenge for any parent, let alone a parent whose child is incarcerated. It is similarly difficult for facilities that house juvenile offenders to develop programs which support skill development as well as smooth transitions from facility to home and are beneficial to both youth and families. Preliminary research on offender gardening programs has shown that they may offer one solution to this dilemma. This research continues an evaluation began in 2010 on one such garden program. Qualitative and quantitative data gathered from seventeen youth living at the rehabilitation center, as well as eleven parents and/or guardians, suggest positive perceptions of the program. Current findings support the initial assertions that gardening promotes the development of empathy and positive self-concept among youth as a result of participating in the program, as well as improved behavioral and emotional management.

Co-Authors/Collaborators: Sarah Twill

Integrating Schools With Mental Health Systems

Student Presenter(s): Rebecca Holtkamp
Undergraduate student in Social Work
Participant in UROP Summer Program 2011
Faculty Mentor: Carl Brun
Department: Social Work

A focus group was conducted, in connection with the "Stakeholders to Partners" grant, with a sample (N=2) of caregivers of youths who had

utilized mental health services in a school district in southwest Ohio. The participants were both Caucasian, males who were permanent or temporary guardians of at least one grandchild who was receiving mental health services in the school district. The purpose of the grant is to improve how staff and teachers in the school identify and make referrals of youth to the appropriate mental health system, within and outside of the schools. The focus group was recorded, with the permission of the participants, and transcribed. The transcription was then coded and categorized in order to find the main themes discussed throughout the focus group. The importance of this study is that the participant's experiences are compared to intentions of the grant leaders and to other empirical research evaluating school service for youth with mental health concerns.

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