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Wright State University

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Abstracts

Wright State University

2017

Celebration of

Research, Scholarship

& Creative Activities

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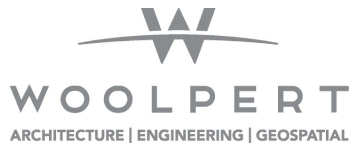
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1. Margaret Bertsos, Donovan L. Marshall, Adrianna E. DiMasso and Scott Bruce

Program: Athletic Training Mentor: Scott Bruce, Kinesiology and Health, CEHS

Musculoskeletal Injury Risk Among Army ROTC Cadets

Objective: The purpose of this study was to predict which Army ROTC cadets were at high risk for injury based on baseline testing and pre-participation survey of joint specific functional limitations.

Design and Setting: Cohort design at a four-year, primarily nonresidential, research doctoral, STEM-dominate university.

Participants: Fifty-three participants from an Army ROTC program volunteered for this study.

There were 39 males (age: 20.97 (\pm 3.8); Ht (cm) 177.41 (\pm 7.4); Wt (kg) 79.17 (\pm 9.7); BMI 25.18 (\pm 2.9)) 15 females (age: 19.8 (\pm 0.91); Ht (cm) 161.88 (\pm 10.6); Wt (kg) 62.38 (\pm 7.9); BMI 24.03 (\pm 4.02)).

Intervention: Baseline testing included 3 muscular endurance, core resistance exercises: singleleg wall sit hold, horizontal trunk extension hold, and postural balance test – unilateral squat hold; ROTC physical training baseline tests: push-ups, sit-ups, 2-mile run, and completion of the Sports Fitness Index, a joint specific, functional limitation survey. Participants were also baseline tested on a Dynavision unit to assess reaction time, central and peripheral vision. Bayesian analysis will be used to analyze the data.

Main Outcome Measurements: Musculoskeletal injury divided by body region: lower extremity, upper extremity, and core/spine.

Results: To be determined

Conclusion: To be determined

Key words: Injury prediction model, core stabilization, reaction time, military, ROTC

2. Kirsten Smith and Damaris Serrano

Program: Spanish (French minor), CoLA Mentor: Damaris Serrano, Modern Languages, CoLA

El terrorismo en Centroamérica y Sudamérica: Los efectos sociales, políticos y económicos (Terrorism in Central and South America: The Social, Political, and Economic Effects)

After the Second World War, political tides shifted throughout the world, as a fear of government regimes sprouted in even the smallest communities. Central and South America, like other continents throughout the world, experienced the same fears. However, these fears and changes manifested themselves in different ways, and starting in 1948, the political landscape of Central and South America changed forever. With the introduction of the Truman Doctrine in 1947, and the soon after assassination of presidential-hopeful Jorge Eliécer Gaitán on April 9th of 1948, a period of intense violence and civil war followed, starting in Colombia and taking influence throughout Central and South America. Current guerilla groups, paramilitaries, gangs, and terrorist groups throughout the Hispanic World are now in the midst of a new era of peace talks, but without a complete understanding of the history of these groups and their impacts on social, political, and economic issues in their respective countries, many do not understand the magnitude of these accords and what they will mean to the public and the future of government relations in Central and South America. By analyzing newly released CIA and FBI documents and case studies, news articles, newspapers, and scholarly essays from around the world released between 1948 to 2016, and studying the demographics throughout Central and South America, this study provides an in-depth analysis of Central and South American terrorism between 1948 to 2016.

3. Eugene Matthew P. Almazan and Labib Rouhana

Program: Biological Sciences, CoSM Mentor: Labib Rouhana, Biological Sciences, CoSM

Stem Cells Drive Auricle Regeneration and Reestablishment of Planarian Chemotactic Ability

Detection of chemical stimuli is crucial for survival of many species and contributes strongly to quality of life in humans. Since loss of olfaction becomes more prevalent with aging, longer life expectancies have fueled interest in understanding the molecular mechanisms behind the development and maintenance of chemical sensing. Planarian flatworms possess an unsurpassed ability for stem cell-driven regeneration that allows them to restore any damaged or removed part of their bodies. This includes ear-like appendages, or auricles, which have long been speculated to play a central role in planarian chemotaxis. The contribution of auricles to the detection of chemical stimuli was tested in this study using *Girardia dorotocephala*, a North American planarian species known for its morphologically prominent auricles. Behavioral experiments staged under laboratory conditions showed a significant decrease in planarians' ability to find food 24 hours after auricle amputation. Further analyses showed that full chemotactic capacity is restored as early as 48 hours post-amputation, days prior to the full reestablishment of the auricle morphology. Planarians subjected to stem cell depletion by means of irradiation were unable to regenerate auricles or restore chemotactic capacity post-amputation, indicating that reestablishment of auricle morphology and function requires stem cells. These observations suggest that specialized cell-types, present exclusively in the auricle, are required for proper chemotaxis. Alternatively, it is possible that auricle contributions to chemotaxis are based on morphological features that do not require auricle-specific cell types. To distinguish between these two possibilities, the transcriptome profiles of excised auricle were compared to those of whole planarians by Next-Generation RNA sequencing (RNAseq). Thus far, the majority of candidates identified through RNAseq appear to be expressed broadly in the planarian brain.

4. Sarah Tritle and Tony Somers

Program: Supply Chain Management, RSCoB Mentor: Tony Somers, PackH2O

PackH2O – Pure Water for the Thirsty

PackH2O is a non-profit organization that manufactures and distributes special water-carrying backpacks (called PackH2Os) to people in need of them around the world, namely women in Africa who travel long distances to acquire water. A case study was performed to determine the most economic and efficient ways to market and distribute PackH2Os among African countries.

A solution to this problem included distributing PackH2Os beside major watering holes. Women who would come to collect water for their families would bring the backpack back to their villages and market the product themselves. Another solution was to set up small, PackH2O manufacturing facilities in the countries in most need of the backpacks. This would provide both job opportunities and more backpacks to targeted peoples. These solutions were presented to the CEO of PackH2O, and he implemented them. Because of these solutions, hundreds of families now have access to large and long-lasting quantities of clean water.

Pioneer Room

- 10:00 **Joel Schmitz** *An Equilibrium Kinetics Study of Nitrosyl Bromide (BrNO) Formation*
 10:15 **Jeffrey Hollon** *Computational Approaches to Sequence Discovery*
 10:30 **Andrew Niklas** *Nondestructive Evaluation and Physical Parameter Extraction of Materials using Terahertz Frequency Radiation*
 10:45 **Jeffrey Book** *Solution Stability of Barite*

Explorer Room

- 10:00 **Blaine Bittorf** *Mapping of a Hybrid Lethal Gene on the X chromosome of *Caenorhabditis briggsae**
 10:15 **Aaron Berenson** *Regulation of the Sperm to Oocyte Transition in *C. briggsae* by *cbr-met-2**
 10:30 **Mary Westwood** *Infection Prevalence and Range Expansion of *Ixodes scapularis* in Northern Wisconsin*
 10:45 **Sara Seibert** *ddRADseq Identifies Gene Associated with Plasmodium Infection in Red-Billed Teal*

Cambiar Room

- 10:00 **Sarah Gregg** *A Pilot Study: CO₂ Sensitivity of the pH-stat Regulator *Coluber Constrictor**
 10:15 **Diane Bailey** *Bacterial Community Changes with Depth in Wetland Soils*
 10:30 **Daniel Hoffman** *Water Column Ammonium Dynamics and Harmful Cyanobacteria Blooms in Lake Erie*

Atlantis A Room

- 10:00 **Jason Shar** *Quantification of Ventricular Hemodynamic and Wall Shear Stress Abnormalities in Discrete Subaortic Stenosis*
 10:15 **Ashish Bhalchandra Madan** *Experimental Assessment of Effect of Aortic Valve Calcification on Ascending Aorta Hemodynamics and Left Ventricular Function*
 10:30 **Janet Liu** *Design of a Novel Multidirectional Fluid Shear Stress Bioreactor for Cardiovascular Tissue*
 10:45 **Truong Ba Nguyen** *Adaptive Moving Mesh Finite Difference Method for Early Stage Cancer Cells Invasion of Tissue Models*
 11:00 **Bo Whip** *Effect of Process Parameters on Surface Roughness of Additively Manufactured IN718*

Atlantis B Room

- 10:00 **Revathy Candrasekaran Venkataramanan** *kHealth Bariatrics: A Multi-Sensory Approach to Monitoring Patient's Post-Surgical Behavior*
 10:15 **Fan Yang** *A Study Using Wearable and Mobile App Data in Patients with the Sickle Cell Disease to Describe Painful Vasooclusive Crisis*
 10:30 **Jeanine Bochenek** *Easy Breathing for Elementary School Children with Asthma at Dayton Public Schools*
 10:45 **Ankita Saxena** *Scalable Interface for Biomedical Knowledge Graph Creation*

Discovery A Room

- 10:00 **Gabriel Crabb** *The Effects of TCDD on Immunoglobulin Heavy Chain Expression in a Human Plasma Cell Line*
- 10:15 **Hannah Shows** *Modulation of MAGI-1 PDZ1 Binding to CAREx8 via Small Peptide Interference*
- 10:30 **James Readler** *Isoform Specific Targeting of the Coxsackie and Adenovirus Receptor with CRISPR/CAS-9 Vesicle System*
- 10:45 **Lobna Elkhadragey** *Novel Insights into the Regulation of ERK3's Kinase Activity and its Ability to Promote Cancer Cell Invasiveness*
- 11:00 **Brian Caprul** *miR-6087 is a Gene Target of ERK3, and a Novel Factor Promoting Cancer Cell Migration, and Invasion*

Discovery B Room

- 10:00 **Nathan Northern** *Creation of a Novel Human Wound Model to Test Novel Wound Healing Approaches*
- 10:15 **Katherine Fahy** *Imipramine a Potent Inhibitor of Injury-Induced Microvesicle Particle Release in Keratinocyte Cell Line and Skin Explant Tissue*
- 10:30 **Amjad Aljagthmi** *$\Delta Np63\alpha$ Suppresses EMT by Targeting RAC1 through miR320a*
- 10:45 **Andrew Stacy** *$\Delta Np63\alpha$ and TIP60: Potential Implications in Cancer and Aging*

Endeavour A Room

- 10:00 **Montana Woolley** *What Makes a Superstar?*
- 10:15 **Joseph Pokorski** *The Ignored Crisis*
- 10:30 **Danielle Graham** *Athletic Identity and Moral Development: An Examination of NCAA Division 1 Athletes and Their Moral Foundations*
- 10:45 **Jamie Gaffin** *Fiction as a Corrective Gesture to Western Historiography*
- 11:00 **Tara Reilly** *Society Against the Woman as Represented in Cinematography*

Endeavour B Room

- 10:00 **Venkatesh Edupuganti** *Identifying Harassment Conversations on Twitter*
- 10:15 **Cheyne Brower** *The Quick and the Careless: Using Page Time to Measure Careless Responding*
- 10:30 **Goonmeet Kaur Bajaj** *Analysis of Geographical Distribution of Depression in the Twitter Population*
- 10:45 **Michele Miller** *What Are People Tweeting About Zika? An Exploratory Study Concerning Symptoms, Treatment, Transmission and Prevention*

Endeavour C Room

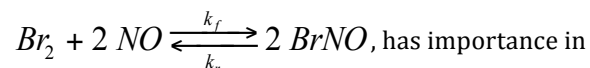
- 10:00 **Aaron Vargas** *Housing Affordability in Washington DC: How the Crash of Housing Value Increased Unaffordability in our Nation's Capital*
- 10:15 **Noah Shook** *Caring About Caregivers: The Impact of Elder Care on Social Reproduction in Australia*
- 10:30 **Garrett Goodman** *Caregiver Assessment Using Intelligent Serious Gaming Technology: A Preliminary Approach*
- 10:45 **Kaylee Reese** *Mingling Cultures: Mutual Learning of Science*

5. **Joel Schmitz** and David Dolson

Program: Chemistry, CoSM Mentor: David Dolson,
Chemistry, CoSM

An Equilibrium Kinetics Study of Nitrosyl Bromide (BrNO) Formation

The gas phase reaction of bromine and nitric oxide to produce nitrosyl bromide,



atmospheric kinetic modeling and in the chemistry of an infrared NO ($v=2 \rightarrow 1$) laser that is excited by E-V energy transfer from spin-orbit excited $\text{Br}^*(^2P_{1/2})$ atoms arising from photolysis of Br_2 . Previous studies of this reaction have employed methods such as laser photolysis and pseudo first- or second-order kinetics. This present research investigation has used two experimental methods. One is to mix the two reactants and fit the early time reaction observations to a third-order integrated rate law for only the forward reaction. The second, relaxation kinetics method, imposes an “instantaneous” perturbation on the reaction initially at equilibrium, and then monitors the reaction system’s return to equilibrium. The time dependence of the equilibrium approach can yield the forward and reverse rate coefficients for the reaction. In this work a rapid volume expansion of the equilibrium gas mixture serves as the perturbation. In both methods, the equilibrium constant of the formation of BrNO is determined from equilibrium partial pressures. The forward rate coefficient determined from early time observations of the formation reaction, $k_f = 1.55(5) \times 10^{-5} \text{ torr}^{-2} \cdot \text{s}^{-1}$, combined with the equilibrium constant, $K = 0.26(3) \text{ torr}^{-1}$, yielded a reverse rate coefficient, $k_r = 6.4(6) \times 10^{-5} \text{ torr}^{-1} \cdot \text{s}^{-1}$. Agreement with literature is good ($k_f = 1.6(2) \times 10^{-5} \text{ torr}^{-2} \cdot \text{s}^{-1}$, $k_r = 7(1) \times 10^{-5} \text{ torr}^{-1} \cdot \text{s}^{-1}$, $K = 0.23(2) \text{ torr}^{-1}$), demonstrating the validity of this experimental method. Relaxation kinetics results are included in the poster.

6. **Jeffrey Hollon** and KT Arasu

Program: Interdisciplinary Applied Science & Mathematics, CoSM Mentor: KT Arasu, Mathematics & Statistics, CoSM

Computational Approaches to Sequence Discovery

Algebraic sequences have uses in many engineering applications. For example, specialized sequences are

critical for radar and communication systems. Here we investigate computational techniques for increased efficiency in the search to find ternary sequences with desirable properties. Specifically, we are interested in finding sequences whose periodic and aperiodic autocorrelation functions are small. The techniques implemented include optimization of existing code structures and parallel computing.

7. **Andrew Niklas** and Jason Deibel

Program: Interdisciplinary Mathematics and Science PhD, CoSM Mentor: Jason Deibel, Physics, CoSM

Nondestructive Evaluation and Physical Parameter Extraction of Materials using Terahertz Frequency Radiation

The time-domain measurement of scattered Terahertz frequency radiation from materials, combined with physical parameter extraction algorithms, enable the determination of material properties such as material thickness, index of refraction, and absorption coefficient. The research investigates the ability of computer-based mathematical optimization to solve the inverse illumination problem using the Fresnel model of electromagnetic scattering. The physical measurements are obtained using a Terahertz laser system and the measurements are configured from a design of experiments which guarantee an exactly determined system of equations. The physical model leverages the Transfer Matrix Method to generate the reflection and transmission transfer functions representing the effective interaction of electromagnetic radiation with multi-layered materials. The mathematical optimization is performed in the time-domain and frequency-domain using the derivative-free Nelder-Mead simplex and Differential Evolution genetic algorithm. The feasibility and accuracy of the approach is verified by the presentation of quantitative results which demonstrate the performance of the technique.

8. **Jeffrey Book** and Steven Higgins

Program: Chemistry, CoSM Mentor: Steven Higgins, Chemistry, CoSM

Solution of Stability of Barite

The solution stability of barite solutions on a mica surface was tested near equilibrium using atomic force microscopy (AFM). Mica samples were blasted with nitrogen, examined with AFM to ensure flatness, placed in undersaturated barite solutions for 2 hours, blasted with nitrogen to remove moisture, and examined with AFM. Because mica is atomically flat and the barite was undersaturated, no deposits were expected, especially once it was blasted with nitrogen.

Instead, the AFM revealed huge deposits on the surface, prompting investigation how each salt interacted. Two mica samples, each with only BaCl₂ or Na₂SO₄, was examined in a similar method to the undersaturated solution. The images of the surface showed very little interactions with BaCl₂, but showed large deposits from Na₂SO₄, suggesting that even in extremely small amounts, sodium salts are capable of interacting with a mostly unreactive mica surface.

9. Blaine Bittorf, Rachel Slater, John Dougherty and Scott Baird

Program: MS in Biological Sciences, CoSM Mentor: Scott Baird, Biological Sciences, CoSM

Mapping of a Hybrid Lethal Gene on the X Chromosome of *Caenorhabditis briggsae*

In the cross of *C. nigoni* males to *C. briggsae* hermaphrodites, all F1 males arrest during embryogenesis. In the reciprocal cross there are some viable F1 male progeny. This unidirectional male-specific lethality in the F1 hybrids has been attributed to a hybrid lethal gene in a 500 Kb region of the X chromosome of *C. briggsae*. *Cbr-him-8* is a recessive maternal-effect suppressor of the male-specific lethal phenotype. *Cbr-him-8* is required for X chromosome pairing. Without proper pairing, the X chromosomes are expected to be transcriptionally silenced (meiotic silencing of unpaired chromosomes, MSUC). It has been proposed that MSUC-based silencing of the X-linked hybrid lethal gene is the mechanism by which the male-specific lethality is suppressed. Based on this model, a co-suppression assay was used to map the hybrid lethal gene. Transgenic strains were constructed via microinjection of bacterial artificial chromosomes (BACs). The BACs were mixed with pCFJ909, a plasmid containing a functional *cbr-unc-119* gene. This mixture was microinjected into the gonad of *cbr-unc-119* mutant hermaphrodites. Transgenic offspring were selected based on the rescue of the *cbr-unc-119* phenotype. *C. nigoni* males were mated to transgenic hermaphrodites. These crosses were scored for viable F1 male progeny. A single BAC has been identified that rescues the male-specific hybrid lethal phenotype. Multiple other BACs have failed to rescue, including two overlap the rescuing BAC. The non-overlapping region of the rescuing BAC is 71.1 kb long. The corresponding region of the *C. briggsae* X chromosome contains five gene predictions. Co-suppression assays will continue until a single gene can be definitively identified as the male-specific hybrid lethal gene.

10. Aaron Berenson and Scott Baird

Program: BS in Biological Sciences, CoSM Mentor: Scott Baird, Biological Sciences, CoSM

Regulation of the Sperm to Oocyte Transition in *C. briggsae* by *cbr-met-2*

Within *Caenorhabditis*, three species reproduce primarily through self-fertilization: *C. elegans*, *C. briggsae* and *C. tropicalis*. Hermaphrodites from these species produce and store sperm during L4. During adulthood, the gonad undergoes a permanent transition from spermatogenesis to oogenesis. The timing of this transition limits the number of sperm produced leading to an overall restriction on the total achievable brood size in these populations. In *C. elegans* the transition is regulated through post-transcriptional control of *fem-2* and *fem-3*. Both genes are required for spermatogenesis in *C. elegans* hermaphrodites. However, the orthologs of these genes are not required for sperm development in *C. briggsae*. We have identified *cbr-met-2* as a regulator of this transition in *C. briggsae*. *cbr-met-2* mutant hermaphrodites transition from spermatogenesis to oogenesis around the time of the L4 molt whereas wildtype animals remain spermatogenic until 2.5 to 3 hours into adulthood. This early transition results in decreased brood sizes and in an early cessation of egg laying. Wildtype (AF16) *C. briggsae* hermaphrodites have an average brood size of 325.9 ± 21.8 whereas three strains containing *cbr-met-2* mutations (*xoe1*, *xoe2* and *bd28*) had broods of less than 200 animals. Interestingly, the reduction in brood size, the early cessation of egg laying and the premature transition to oogenesis associated with mutations in *cbr-met-2* had little impact on intrinsic growth rate. The early transition observed in *cbr-met-2* mutant animals leads to a modest increase in progeny on the first day of egg laying. Since intrinsic growth rate is dependent upon the number of progeny as well as the timing of their appearance, it is possible that the decrease in brood size is offset by the early onset of reproduction.

11. Mary Westwood, Tom Rooney, Jeff Peters

Program: MS in Biological Sciences, CoSM Mentor: Dr. Thomas Rooney, Biological Sciences CoSM

Infection Prevalence and Range Expansion of *Ixodes scapularis* in Northern Wisconsin

Ixodes scapularis (i.e. the blacklegged or deer tick) is an important vector of emerging human pathogens. Over the past few decades, an increase in the blacklegged tick's geographic range has been accompanied by an increase in blacklegged tick-associated zoonotic disease incidence. A novel population of these ticks, constituting part of the

blacklegged tick invasion front, was identified in Vilas County, Wisconsin. I examined the infection prevalence and vector ecology by collecting 459 blacklegged ticks during the summer of 2016. The ticks were screened using a standard polymerase chain reaction assay for three emerging zoonotic pathogens: *Borrelia burgdorferi*, *Anaplasma phagocytophilum*, and *Babesia microti*. The probability of infection was 30%, 25%, and 14% respectively. The probability of co-infection ranged from 2 to 6%, but the conditional probability of co-infection was not significant. Blacklegged ticks were found in two main vegetation types: Oak and Northern Hardwood. These vegetation types are typical blacklegged tick habitat since they provide an adequate layer of leaf litter, which is necessary to prevent desiccation. Data concerning the infection prevalence of blacklegged ticks in this region is highly variable and fragmentary. This study aids in a better understanding of the geographic range increase of blacklegged ticks in North America and the entomologic risk posed by these novel populations.

12. Sara Seibert, Brittany Bowers, Graeme Cummings and Jeff Peters Program: Biomedical Sciences PhD, CoSM Mentor: Jeff Peters, Biological Sciences, CoSM

ddRADseq Identifies Gene Associated with *Plasmodium* Infection in Red-Billed Teal

Migratory waterfowl can serve as reservoir hosts for infectious diseases, spreading pathogens across landscapes and potentially between different landmasses. Although wild birds are infected by different lineages of *Plasmodium* than humans, they serve as good model systems for ecological and genetic associations between hosts and parasites. Previous research has found South African waterfowl have a low prevalence of *Plasmodium* infection (7%) in comparison to other South African birds, especially songbirds (25%). We tested for regions of the genome associated with *Plasmodium* infections in six different populations of Red-billed Teal (*Anas erythrorhyncha*), which are dabbling ducks found in freshwater habitats of southern and eastern Africa. Using double-digest restriction site associated DNA sequencing (ddRAD-seq), we screened over 3,000 loci. Our genetic analyses did not detect significant levels of population structure between the six Red-billed Teal populations (mean $F_{st} < 0.01$). However, we did identify a single nucleotide polymorphism (SNP) that appears to be associated with *Plasmodium* infections; 57% of the variation at this locus was partitioned between Teal with and without *Plasmodium* infections. This single nucleotide

polymorphism is located in an intron of a gene coding for a heparin-binding protein (HBP). Heparin is known to influence protein-protein interactions during the invasion of *Plasmodium* merozoites into their vertebrate host's red blood cells (RBCs). Our study suggests Red-billed Teal, and perhaps other species of aquatic birds, have a genetic mechanism for mitigating *Plasmodium* infections.

13. Sarah Gregg and Lynn Hartzler

Program: Biological Sciences, CoSM Mentor: Lynn Hartzler, Biological Sciences, CoSM

A Pilot Study: CO₂ Sensitivity of the pH-stat Regulator *Coluber Constrictor*

While most ectotherms utilize alpha-stat regulation to compensate for changes in body temperature, a few species, including monitor lizards (*Varanus exanthematicus*) and black racer snakes (*Coluber constrictor*) use pH-stat regulation. Ventilation is used to compensate for acid-base disturbances in arterial blood. Based on previous work done on *V. exanthematicus* (Zena *et al.*, J Ex Bio, 2016), we predict that *C. constrictor* will show fewer locus coeruleus (LC) neurons activated by high CO₂ concentrations at low temperatures. This will be examined by utilizing whole-cell patch-clamp electrophysiology to monitor the firing rate of neurons in the LC, using brain stem slices immersed in an artificial cerebrospinal fluid (aCSF) prepared based on mixtures used in literature sources. We aim to find a connection between the ventilation changes that are known to occur at lower temperatures and a decrease in CO₂ sensitivity at lower temperatures.

14. Diane Bailey and Megan Rúa

Program: Environmental Sciences PhD, CoSM Mentor: Megan Rúa, Biological Sciences, CoSM

Bacterial Community Changes with Depth in Wetland Soils

Water pollution is a widespread source of environmental degradation. Wetlands can provide a natural way to address this problem since they are known to host a community of bacteria important for metabolizing pollutants, rendering them non-toxic. Many of these bacteria live in unique conditions, such as low oxygen environments. As the soil increases in depth, environmental variation may provide pockets of these unique conditions allowing for a more diverse bacterial community in wetlands compared to other environments. However, how bacterial community composition changes with soil depth is poorly understood. To investigate this premise, soil samples were taken from four depths beneath three dominant plant species in a wetland in southwest Ohio. From

each sample, we extracted DNA and sequenced a portion of the 16S rRNA on an Ion Torrent. From these data, 242 different bacterial classes were recovered. Regardless of the dominant plant species, the bacterial community at the surface had significantly more bacterial species than communities found deeper than 90 cm; however, rarefaction analysis did not level out, indicating that despite the large number of species recovered, we did not capture the full extent of the bacterial community. When bacterial classes were sorted into functional groups which reflect their potential metabolic pathways, we found an equal abundance of dechlorinators, methane oxidizers, nitrifiers, ammonia oxidizers, nitrate oxidizers, and denitrifiers. Our results suggest that conditions required for a diverse range metabolic pathways are potentially available at all soil depths, increasing the total area available for pollution to be broken down. Overall, our study indicates that soil depth is an important factor in a wetland's ability to metabolize pollutants since it provides an area for a more diverse community of bacteria to live, suggesting a key avenue by which wetlands can improve environmental degradation.

15. Daniel Hoffman, Mark J McCarthy, Timothy W Davis, Duane Gossiaux, Ashley Burtner, Tom Johengen, Danna Palladino, Wayne S Gardner, Justin A Meyers and Silvia Newell

Program: Environmental Sciences, CoSM Mentor: Silvia Newell, Earth & Environmental Sciences, CoSM
Water Column Ammonium Dynamics and Harmful Cyanobacterial Blooms in Lake Erie

Cyanobacterial harmful algal blooms (HABs) in western Lake Erie are largely driven by agricultural nitrogen (N) and phosphorus from the Maumee River watershed. Cyanobacterial dominance and HAB development may depend on ammonium availability, and increased ammonium has been linked to toxin production. ¹⁵N tracers were used to quantify rates of ammonium regeneration and potential uptake, ammonia oxidation to nitrite (the first step of nitrification), and total nitrification. Ammonia oxidation and total nitrification rates were greater than known coastal ocean rates. However, nitrification rates were an order of magnitude lower than total community ammonium uptake rates, indicating that ammonia oxidation and nitrification are not the dominant uptake pathways. During non-bloom months, regeneration rates could account for approximately 80% of potential community uptake,

but during the height of the bloom, when community ammonium demand was much greater, regeneration could only support 44% of potential uptake. These results suggest that management of external total N loads, which are readily converted to ammonium, may be necessary to reduce bloom biomass and toxicity.

16. Jason Shar and Pilippe Sucusky
Program: Engineering, CECS Mentor: Philippe Sucusky, Mechanical & Materials Engineering, CECS
Quantification of Ventricular Hemodynamic and Wall Shear Stress Abnormalities in Discrete Subaortic Stenosis

Discrete subaortic stenosis (DSS) is an acquired lesion that obstructs blood flow through the left ventricular outflow tract (LVOT). The precise etiology of the lesion is not known, but thought to have multifactorial causes ranging from inflammatory responses, secondary genetic factors, and cell proliferation due to shear forces imposed by morphological abnormalities. Wall shear stress (WSS) can be measured *in vivo* by echocardiography via calculation of the spatial blood flow velocity gradients. However, this modality is limited by poor spatial resolution. Computational fluid dynamics has the potential to provide a more accurate characterization of the hemodynamic environment within the left ventricle. The objective of this study was to computationally quantify WSS near the LVOT in a contracting left ventricle, in both a normal and DSS geometry. The hypothesis is that DSS creates higher WSS conditions at the LVOT. As a first approximation, the left ventricle geometry was modeled as an axially-contracting cylinder. A second geometry was created with DSS, narrowing the LVOT by 32%, imposed at the LVOT approximately 20 mm away from the outlet. Ansys CFX was used to compute the fluid flow. Mass flow rate profiles were prescribed at the mitral valve inlet and aortic valve outlet to simulate fluid ejection during systole and ventricular refill during diastole under a physiologic cardiac output of 5.0 L/min at approximately 70 beats per minute. As hypothesized, average and maximum WSS were significantly higher (by 33% and 15.2 %, respectively) in the stenosed geometry than in the normal geometry. While the WSS overload imposed by the DSS lesion near the LVOT combined with the increased flow recirculation may trigger some biological cascades involved in DSS pathogenesis, a better hemodynamic characterization using a more physiologic left ventricle model and accompanying mechanobiological experiments are needed to assess this hypothesis.

17. Ashish Bhalchandra Madan and

Phillipe Sucusky Program: Mechanical Engineering, CECS Mentor: Philippe Sucusky, Mechanical & Materials Engineering, CECS

Experimental Assessment of Effect of Aortic Valve Calcification on Ascending Aorta Hemodynamics and Left Ventricular Function

Calcific aortic valve disease is a common valvular heart disease, that affects about 25% of the population above 65 years of age. The initial stage of the disease is marked by mild valve thickening, followed by formation of calcific lesion within the leaflet and narrowing of the valve orifice causing altered hemodynamics in ascending aorta and left ventricular overload. Although hemodynamics is considered potential contributor to aortopathy, the effect of valve calcification on aortic flow remains largely unknown. The objective of this study is to measure the impact of valvular calcification on aorta hemodynamics as well as left ventricular function.

Three porcine valves were constructed to replicate the aortic valve (AV) anatomy, two of them were mild and severely calcified using glue lesions and were placed in a left-heart simulator featuring a realistic silicone aorta. PIV experiments were carried-out to capture both mean and turbulent flow characteristics at 43 phases of the cardiac cycle in the middle sections of the aortic root and the ascending aorta (AA).

While the AV model managed to generate a centrally aligned jet with peak systolic velocity of 2.5 m/s, the calcified AV models generated higher peak velocities and jets with slight eccentricity and distortion. Higher ventricular pressure values were observed for calcified AV models as compared to the normal AV model.

This study helps to identify hemodynamic differences in normal and calcified AV aortas and dependence of the flow characteristics on the severity of calcification. It also demonstrates the existence of left ventricle overload in case of a calcified AV which is non-existent when compared to a normal AV.

18. Janet Liu and Philippe Sucusky Program:

Mechanical Engr, CECS Mentor: Philippe Sucusky, Mechanical & Materials Engineering, CECS **Design of a Novel Multidirectional Fluid Shear Stress Bioreactor for Cardiovascular Tissue**

Cardiovascular tissue interacts with the surrounding blood flow to drive critical biological processes. In particular, the aortic wall responds to the wall shear stress (WSS) environment and transduces stress abnormalities into biological events that may lead to aortopathy. The elucidation of the cause-and-effect relationships between blood flow and tissue biology

requires a device capable of subjecting native tissue to its local hemodynamic stress environment. This study aimed at designing a new bioreactor capable of replicating the magnitude and directionality of the local WSS on native aortic tissue. The design was adapted from the cone-and-plate viscometer principle, in which an inverted cone is rotated in culture medium to generate a fluid flow on the surface of four circular samples mounted on a stationary plate and a uniform shear stress environment directly proportional to the cone velocity. Changes in WSS directionality on each sample are achieved by rotating the tissue mounts. The device was validated by designing a computational fluid dynamics model of the bioreactor, and comparing a target WSS magnitude and directionality waveform to the WSS predicted on the tissue surface. In the preliminary study, simple cosine waveforms were used and the device was shown to generate less than 7% error in WSS magnitude and directionality over one cycle. This demonstrates the ability of the device to replicate the desired WSS magnitude and directionality. Future work includes demonstrating that the device can replicate the native WSS environment of aortic tissue by using a new target WSS waveform extracted from a fluid-structure interaction aorta model, as well as using the device to determine the effects of flow abnormalities generated by heart valve defects on aortopathy.

19. Truong Ba Nguyen & Mohamed

Sulman Program: Applied Mathematics PhD, CoSM Mentor: Mohamed Sulman, Mathematics & Statistics, CoSM **Adaptive Moving Mesh Finite Difference Method for Early Stage Cancer Cells Invasion of Tissue Models**

We consider an adaptive moving mesh finite difference method for solving a mathematical model of early stage cancer cells invasion of tissue (extracellular matrix). The model consists of a system of five nonlinear reaction-diffusion-taxis partial differential equations (PDEs) describing the dynamics of the tumor cells due to proteolytic enzyme activity, such as urokinasetype plasminogen activator (uPA). The solutions of the PDEs involve a very rapid variation at the boundary of the healthy and cancer cells. The proposed adaptive grid method captures well these fine features. Several numerical experiments are conducted to illustrate the accuracy and efficiency of the moving mesh method. The numerical results show improvement of using about 50% less grid points compared to that when using fixed uniform grid.

20. Bo Whip, Joy Gockel, Luke Sheridan and Eric Tatman Program: Mechanical Engineering, CECS Mentor: Joy Gockel, Mechanical Engineering, CECS **Effect of Process Parameters on Surface Roughness of Additively Manufactured IN 718** Additive manufacturing (AM) has the ability to create metal components with complex internal geometries. The internal surfaces cannot easily be post machined, so these internal surfaces are rough. It has been reported that fatigue failures commonly initiate on the surface of as-built components. This work investigates the relationship between process parameters, surface roughness and fatigue life of Inconel 718 fabricated on a laser powderbed fusion AM machine. Samples are built with different contour laser powers and speeds to obtain a variety of surface features. The external surface of the components is characterized using both 3D surface metrology and 2D destructive cross-sections, to expose any features obscured in the 3D surface measurements. The potential life-limiting surface features are identified from the current study, and fatigue test bars will later be fabricated with a variety of these features. Overall, the results will be used to develop the processing-structure-properties-performance relationship, which provides an understanding of process limitations and the potential for improvement of the fatigue performance in AM components.

21. Revathy Candrasekaran Venkataramanan, Amit P Sheth Joon K Shim Dene S Berm Priti Pari & Utkarshani Jaimini Program: Computer Science, CECS Mentor: Amit Sheth, Computer Science, CECS

kHealth Bariatrics: A Multi-Sensory Approach to Monitoring Patient's Post-Surgical Behavior
The rate of obesity is on the rise reaching epidemic proportions. According to American Society for Metabolic and Bariatric Surgery (ASMBS), 500 million people all over the world are obese. The data from Centers for Disease Control and Prevention(CDC) shows that more than 36% of adults in the United States have obesity. According to World Health Organization (WHO), 65% of the world's population lives in countries where the occurrence of death due to overweight and obesity is higher than being underweight. It is well established that weight loss surgery can play a significant role in reducing, or even eliminating medical problems associated with obesity. Weight recidivism is one of the biggest challenges following bariatric surgery. As many as 50% of

patients may regain a small amount of weight two years or more following their bariatric surgery. A lifetime commitment to diet and behavior modifications after surgery are essential for success after undergoing surgery.
In this project, computer scientists working at Kno.e.sis, an Ohio Center of Excellence in BioHealth Innovation, are collaborating with a bariatric surgeon and a psychologist to bolster weight loss surgery patients for appropriate postsurgical progress. In our mobile personalized digital health solution, we use an Android application coupled with sensors to monitor patient's compliance with post-surgery progress and motivate patients to have proper follow-ups. The sensors include a wireless weighing machine that automatically sends data to the cloud, activity and sleep monitoring wristband which also measures heart rate, water bottle sensor and pill bottle sensor which prompts the patient for proper intake of water and vitamin pills. Additionally, the android app with its simple questionnaire helps in monitoring the patient's diet and emotional well-being.
One of the key challenges for the surgeon is to continuously monitor the patient to identify the deviations from recommended postsurgical guidelines. We aid bariatric surgeons to identify noncompliance with direction by providing aggregated data of all the primary parameters to be monitored. We also monitor patient's mental health, following diet and sleep cycle. Thus, a joint effort with the surgeon and psychologist to track patient's postsurgical behavior differentiates our approach from others and contributes to improved outcomes for bariatric surgery patients.

22. Fan Yang, Kalindi Narine, Tanvi Banerjee, Jude Jonassaint and Nirmish Shah Program: Computer Science & Engineering, CECS Mentor: Tanvi Banerjee, Computer Science, CECS **A Study Using Wearable and Mobile App Data in Patients with the Sickle Cell Disease to Describe Painful Vasoocclusive Crisis**
Introduction Sickle cell disease (SCD) is an inherited red cell disorder that is typically complicated by painful vaso-occlusion, the most common cause for hospitalization. Through an innovative and interdisciplinary approach involving both clinicians and computer scientists, we have utilized a combination of novel mobile apps combined with wearable technology to improve measurements of subjective (such as pain) and objective data (such as heart rate and activity). We now describe our novel TRU-Pain system (Technology Resources to better Understand Pain) that uses statistical analysis and

machine learning to map the patients' physiological information with their pain scores as a means to assist with documentation of pain, interventions, sleep and overall general health.

Methods Patients recorded their symptoms daily including pain and general health using the TRU-Pain application while wearing the wearable device up to 7 days while hospitalized. The wearable sensor Microsoft Band 2 measured objective data including heart rate (HR), activity (steps), galvanic skin response (GSR), barometer, and ambient light. The patient controlled analgesia (PCA) and pain data were analyzed using statistical measures including multiple imputation and correlation, as well as machine learning techniques such as logistic regression and Bayesian networks. Sensor data were preprocessed using signal processing techniques such as signal magnitude area and interpolation.

Results We have enrolled 9 patients, 44% females, median age 22 (range 13 to 54) who were admitted for a median 5 days (range 2 to 8). Different sampling rates were tested to explore the feasibility of recording sensor data at lower frequencies to reduce data storage space, as well as battery consumption. We found a sampling rate reduction of 10 to be reliable for data recording i.e. wearable data entries of 1 per 10 seconds. Using the GSR, barometer and ambient light data, we were able to detect the patients' sleep behavior. Finally, we were successfully able to identify the patients' pain score using HR, respiratory rate, and blood pressure data. For example, for Patient 3, we were able to achieve a prediction accuracy of 80% using a logistic regression model to predict the pain scores using multiple imputation method for missing data handling.

Conclusion Our TRU-Pain system shows strong potential in being able to predict the subjective pain in SCD patients using physiological measures. Our next steps include testing our system using a larger patient cohort.

23. Jeanie M. Bochenek & Tracy Brewer
Program: DNP-Leadership Indirect Care, CoNH
Mentor: Dr. Tracy Brewer, CoNH **Easy Breathing for Elementary School Children with Asthma at Dayton Public Schools**

Asthma is a chronic disease, which is managed rather than cured (National Institute of Health-National Heart, Lung, Blood Institute, 2013) leaving it an expensive condition to treat if not adequately managed due to the need for advanced emergency care (Bahadori et al., 2009). School absences and unscheduled health care visits via the hospital or emergency room are indicative of those with poorly controlled asthma (CDC, 2013) which can decrease

academic performance, learning opportunities, (Cicutto et al., 2014; Meng, Babey, & Wolstein, 2012) and parent work attendance which may lead to long term economic disadvantages. Within the Dayton Public School District, 14% of students were identified with either an asthma diagnosis or asthma symptoms. Within the school district, respiratory related symptoms are the number one reason for accessing emergency medical services.

The purpose of the presentation is to discuss how a school-based program (Open Airways curriculum by the American Lung Association) was implemented and utilized to educate children in grades 2 through 5 with asthma across 7 elementary schools in asthma self-management. The presentation will highlight how the Model for Evidence-Based Practice Change (Larabee, 2009) guided the project implementation and evaluation of program outcomes. In addition, project results and lessons learned will be discussed.

24. Ankita Saxena, Swati Padhee and Manas Gaur
Program: Computer Science, CECS
Mentor: Manas Gaur, Computer Science, CECS
Scalable Interface for Biomedical Knowledge Graph Creation

With dramatically growing volume of information in the biomedical domain, there is an unmet need for automatic extraction of contextual, semantic, and schematic information. The extracted information, representing structure and semantics, can aid domain experts in managing and organizing emerging knowledge. Although the majority of the existing approaches rely on simple entity extraction which doesn't use semantics; we extend entity recognition task in the domain of healthcare by employing an entity phrasing approach. We developed a Scalable Interface for Biomedical Knowledge Graph (SciKG) which is a healthcare platform for extraction, enrichment, and annotation of social media data using existing knowledge bases. It provides the users (naive or domain expert) information that is contextually relevant to their query. SciKG offers a platform for extraction of semantically relevant domain-specific information about a text from social media as well as recent medical literature. It will provide medical domain experts an insight into the general public awareness in their domain. Simultaneously, it will provide a window for a naive user to access multiple social media sources along with latest research works in the biomedical domain.

25. Gabriel Crabb, Andrew Snyder & Courtney Sulentic Program: Biological Sciences, CoSM Mentor: Courtney Sulentic, Pharmacology & Toxicology, Boonshoft School of Medicine **The Effects of TCDD on Immunoglobulin Heavy Chain Expression in a Human Plasma Cell Line**

An environmental toxin and an immunosuppressant, TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) inhibits gene expression of immunoglobulin heavy chain (*Igh*) and antibody secretion in mature B cells in an aryl hydrocarbon receptor (AhR)-dependent manner and perhaps through the inhibition of a large transcriptional regulatory region within the *Igh* gene i.e 3'*ighRR*). Contrasting with the inhibitory effect of TCDD on the mouse 3'*IghRR* and Ig, a human study demonstrated an increase in IgE secretion by TCDD in B cells isolated from atopic patients versus control patients. The role of the 3'*IGHRR* in *IGH* expression is not known, and it is not clear if the human 3'*IGHRR* is a target of TCDD. The objective of this study is to determine if *IGH* expression in human plasma cells is a target of TCDD. Utilizing the U266 cell line, a human plasma cell line that underwent class switch recombination to produce IgE, we evaluated the effect of TCDD exposure on *IGH* gene expression by real-time PCR analysis. Results suggest that TCDD does not affect *IGH* gene expression. However, further evaluation of the U266 cells suggests that the AhR is dysfunctional and completely inactive in this class of B cells. Future studies will focus on expressing a functional AhR in the U266 cells and evaluating the effect of TCDD on *IGH* expression and 3'*IGHRR* activity. An active AhR will allow us to observe and compare TCDD's effect on a class of mature plasma cells that have undergone class switch recombination and immature B cells to see differences in expression.

26. Hannah Shows, Priyanka Sharma, Mahmoud Alghamri, Michael Raymer and Kate Excoffon Program: Biomedical Sciences PhD, CoSM Mentor: Kate Excoffon, Biological Sciences, CoSM **Modulation of MAGI-1 PDZ1 Binding to CAREx8 via Small Peptide Interference**

Adenovirus is a common pathogen that typically causes cold-like symptoms in the majority of the population. However, rates of morbidity and mortality due to adenovirus infection are very high in cohorts such as immunosuppressed patients, members of the armed services, and patients with severe infections such as acute respiratory distress syndrome. The coxsackievirus and adenovirus receptor (CAR) is the primary receptor for most serotypes of adenovirus. While the CAREx7 isoform localizes on the basolateral

side of epithelial cells, the CAREx8 isoform is present on the apical side where it can facilitate adenovirus entry into the airway epithelium. MAGI-1, a cellular scaffolding protein, has been shown to regulate CAREx8 expression via two of its PSD-95/Dlg/ZO-1 (PDZ) domains, PDZ1 and PDZ3. It has been demonstrated that the PDZ3 domain of MAGI-1 promotes the degradation of CAREx8, while MAGI-1 PDZ1 protects CAREx8 from degradation. Our lab has found that blocking the interaction between MAGI-1 PDZ1 and CAREx8 can decrease adenovirus infection and pathogenesis. Preliminary data of three peptides targeting the PDZ domains of MAGI-1 show high affinity binding via fluorescence resonance energy transfer (FRET). We hypothesize that MAGI-1 PDZ1 binding peptides can be optimized to bind with higher specificity and decrease adenovirus infection more efficiently than first generation peptides. To test this, we are using a combination of fully-flexible protein docking and peptide design algorithms to create new small peptide candidates for PDZ domain binding. These peptides will be further tested experimentally via a fluorescent high throughput screening assay to evaluate their effect on CAREx8 expression. By optimizing peptide binding specificity, we can increase our ability to modulate adenovirus susceptibility and improve future therapeutic potential.

27. James Readler, Priyanka Sharma and Katherine JDA Excoffon Program: Biomedical Sciences, CoSM Mentor: Katherine Excoffon, Biological Sciences, CoSM **Isoform Specific Targeting of the Coxsackie and Adenovirus Receptor with the CRISPR/CAS-9 Gescicle System**

The Coxsackievirus and adenovirus Receptor (CAR) is the primary receptor for the majority of adenovirus serotypes and Coxsackie B viruses. CAR is a cell-cell adhesion molecule in the immunoglobulin superfamily that functions to maintain epithelial junctions and promote leukocyte transepithelial migration. CAR, encoded by the *CXADR* gene, has two transmembrane isoforms that localize very differently in epithelial cells. The high abundance seven exon-encoded isoform (CAREx7) localizes below the tight junctions of polarized epithelial cells whereas the eight exon-encoded isoform (CAREx8) localizes to the apical surface of polarized epithelial cells. We have previously shown that this difference in localization results in the abundance of CAREx8 being a major determinant of apical adenovirus infection of polarized epithelial cells. Studies on CAREx8 have been limited by potentially confounding effects exerted by

CAR^{Ex7}. To address this, we are using CRISPR/Cas-9 technology (TAKARA Gesicle System) to produce isoform specific CAR^{Ex8} knockout airway epithelial cells. Multiple sgRNA sequences, with no anticipated off-target effects, that target regions flanking the 42 nucleotides composing the 8th exon of the *CXADR* gene were identified. *In-vitro* reactions with recombinant Cas-9 protein containing these sgRNA sequences show efficient cutting at the expected site in airway epithelial cells. These sgRNA sequences were then cloned into the TAKARA gesicle production plasmid and subsequently transfected into a gesicle production 293T cell line. Gesicles were isolated from the media of these cells and the presence of Cas-9 was confirmed by WB. These gesicle populations, containing sgRNAs that cut 5' and 3' of the *CXADR* exon 8 region, were applied to Calu-3 and KB cells. Future experiments will involve the isolation and expansion of single cells, and then validating the degree of knockout by PCR. CAR^{Ex8} knockout epithelial cells are expected to be powerful tools for probing CAR isoform-specific contributions to virus infections.

28. Lobna Elkadragy, Hadel Alsan and Weiwen Long Program: Biomedical Sciences PhD Program, CoSM Mentor: Weiwen Long, Biochemistry and Molecular Biology, CoSM & BSoM **Novel Insights into the Regulation of ERK3's Kinase Activity and its Ability to Promote Cancer Cell Invasiveness**

In comparison with the well-studied MAPKs ERK1/2, much less is known about the activation and downstream targets of ERK3. Whereas dual phosphorylation of the TXY activation motif in ERK1/2 is critical for their activation, it is unclear if phosphorylation of the single phospho-acceptor site in the SEG activation motif of ERK3 is important for its kinase activity. In addition, little is known about the function of the structurally distinct elongated C-terminus extension of ERK3 in regulating its kinase activity. We have recently identified steroid receptor co-activator 3 (SRC3) as a substrate of ERK3 and revealed an important role for ERK3 in promoting cancer cell migration and invasion. Here we aim to study the importance of the phospho-site S189 in the SEG motif and the elongated C-terminus for ERK3 kinase activity. By performing *in vitro* kinase assays, we found that as compared to the purified wild type (WT) ERK3 protein, ERK3-S189A protein has remarkably reduced kinase activity towards SRC3. Interestingly, S189A mutation did not alter the interaction of ERK3 with SRC3. To study the importance of the C-terminus for ERK3 kinase activity, we expressed and purified a C-terminus deletion mutant of ERK3 (aa1-340) that retained the kinase domain. ERK3 (aa1-340) showed higher kinase

activity than that of the full length ERK3 protein. Notably, ERK3-S189A (aa1-340) exhibited kinase activity equivalent to that of WT ERK3 (aa1-340). These results suggest that the C-terminus may play an auto-inhibitory role on ERK3 kinase activation through intramolecular interaction and that the phospho-S189 is required for relieving this auto-inhibition. In line with the critical role of S189 in ERK3 kinase activity, mutation of S189 to alanine greatly reduced ERK3's activity in promoting cancer cell migration and invasion. Taken together, our study unravels molecular mechanisms for the regulation of ERK3 kinase activity and invasiveness-promoting ability in cancer cells.

29. Brian Caprul, Lobna Klkhadragy, Natasha Hill, Madhavi Kadakia and Weiwen Long Program: Biological Sciences, CoSM Mentor: Weiwen Long, Biochemistry & Molecular Biology, CoSM & BoSM **miR-6087 is a Gene Target of ERK3, and a Novel Factor Promoting Cancer Cell Migration, and Invasion**

Alteration in signaling pathways is a characteristic of cancer cells. Extracellular signal-regulated kinase 3 (ERK3) is upregulated in cancers, and is important for cancer cell migration, and invasion. However, little is known about the downstream targets of ERK3 that mediate its activity of promoting cancer cell invasiveness. microRNAs (miRNAs) are short nucleotide transcripts that act as post-transcriptional regulators of gene expression by repressing mRNA translation and/or facilitating mRNA degradation. In this study, we aim to identify miRNAs that are regulated by ERK3, and are important for breast cancer cell invasiveness. For this purpose, we generated MDA-MB-231 breast cancer cells with stable knockdown of ERK3 and performed Next Generation RNA Sequencing (RNA-Seq). Next, we analyzed the differentially expressed miRNAs by ERK3 knockdown and found that miR-6087 is one of the top 6 regulated miRNAs by ERK3. We then validated the changes of these top 6 regulated miRNAs using RT-qPCR. Our results showed that knockdown of ERK3 in MDA-MB-231 led to a remarkable decrease of miR-6087 expression, indicating that miR-6087 is positively regulated by ERK3. To determine the role of miR-6087 in cancer cell invasiveness, we transfected MDA-MB-231 cells with miR-6087 mimic and performed transwell migration and invasion assays. Overexpression of miR-6087 greatly increased breast cancer cell migration and invasion, suggesting that miR-6087 acts as a downstream target of ERK3 and mediates ERK3's action in promoting cancer cell invasiveness. We are currently investigating the gene targets of miR-6087 in breast cancer cells and

determining their roles in regulating cancer cell invasiveness.

30. Nathan Northern, Katherine Excoffon, Michael Johnson, Priyanka Sharma, Upasana Niyogi, Greg Gould, Ike Northern and Sunishka Walawamsa Program: Biological Sciences, CoSM Mentor: Katherine Excoffon, Biological Sciences, CoSM **Creation of a Novel Human Wound Model to Test Novel Wound Healing Approaches** In the US there is a growing prevalence of chronic wounds such as such as leg ulcers, diabetic foot ulcers, and pressure ulcers. These wounds persist for long periods of time and are expensive to manage. Improved human-based model systems that emulate the wound healing process in humans would accelerate the identification of novel healing strategies that are directly translatable to humans. The goal of this study was to develop a novel wound model able to imitate the human wound healing process. To do this, 8mm punch biopsies were taken from human abdominoplasty samples and 2mm wounds were created in the center of the punches. Punch biopsies were maintained in transwells at the air-liquid interface. The viability of the model was confirmed by MTT staining and the structure evaluated with H&E staining. Two approaches to induce wound healing, Adipose Derived Stem Cells (ASC) and Red Light Therapy (RLT), were investigated. It was found that the human tissue wound models were able to persist for at least 4 months without “wound” closure. H&E staining demonstrated that they maintained normal skin structure and MTT indicated that the tissues were alive. ASCs were isolated from fat and their purity and ability to differentiate were confirmed by flow cytometry and differentiation assays. Whereas ASC or RLT were able to partially close the wounds, a combination of ASC and RLT resulted in wound expansion. However, this latter result may have been due to bacterial contamination. These wound models could revolutionize wound healing studies because they are derived from human skin and maintain their integrity. In the future, we will confirm the degree to which they replicate chronic wounds and determine the efficacy of novel stem cell, RLT, human skin equivalent, and other growth-factor based treatments to mediate wound closure.

31. Katherine Fahy, Langni Liu, Christine Rapp, Richard Simman, Ji Bihl and Jeffrey Travers Program: Medicine, BSoM Mentor: Jeffrey

Travers, Pharmacology & Toxicology, BSoM **Imipramine a Potent Inhibitor of Injury-Induced Microvesicle Particle Release in Keratinocyte Cell Line and Skin Explant Tissue** Microvesicle particles (MVP) are fragments of the cell membrane, 100-1000 nm in diameter, that bud off and contain many biologically active proteins and lipids. Though initially dismissed as cellular debris, MVP have been determined to play an important role in intercellular communication locally and systemically through their abilities to transport bioactive substances. After a thermal burn injury or UVB radiation, some patients experience systemic effects, even though their injury is localized to the skin. We propose that MVP released from keratinocytes after thermal burn injury carry cytokines through the blood stream and induce the systemic effects. Our lab has previously determined that both UVB and an agonist of the Platelet-activating factor receptor (CPAF) treatment can release MVP from human keratinocytes *in vitro* and *ex vivo*. It has also been found that in macrophages the use of an acid sphingomyelinase (aSMase) inhibitor, imipramine, can block the increase in MVP release after being exposed to cigarette smoke. This study was designed to determine if thermal burn injury can stimulate an increase in MVP release in keratinocytes and if these burn-induced MVP can be blocked by imipramine. Using *in vitro* keratinocyte cell line and *ex vivo* human skin explant studies we have determined that all three treatments (CPAF, UVB, and thermal burn injury) significantly increased MVP release, and was completely inhibited by pre-incubation with imipramine. We also found that there was a significant decrease in CPAF, UVB and burn induced MVP released if imipramine was topically applied up to 30 minutes after treatment with the stressors. This findings indicate that imipramine is an effective inhibitor of injury-induced MVP release in keratinocytes and the skin. If MVP are involved in the systemic effects observed in some burn and UVB patients, then imipramine may function as an important therapeutic agent.

32. Amjad Aljagthmi, Natasha T Hill, Suraj Sakaram and Madhavi Kadakia Program: MS in Biochemistry and Molecular Biology, CoSM Mentor: Madhavi Kadakia, Biochemistry & Molecular Biology, CoSM & BSoM **$\Delta Np63\alpha$ suppresses EMT by Targeting RAC1 through mi320a** $\Delta Np63\alpha$, a member of the p53 family of transcription factors, is overexpressed in a number of cancers and known to

play a role in proliferation, differentiation, migration and invasion. Δ Np63 α has been shown to regulate several miRNAs that play a role in both development and cancer, but to date there has not been a global analysis of p63-regulated miRNA. Our laboratory has identified a number of Δ Np63 α -regulated miRNAs using RNA-Seq analysis performed on RNA isolated from HaCaT cells transfected with non-silencing control siRNA or siRNA specific to p63. We identified a novel miRNA, miRNA-320a which is positively regulated by p63. Previous studies have shown that miRNA-320a is downregulated in colorectal cancer and targets Ras-related C3 botulinum toxin substrate 1 (RAC1), leading to a decrease in non-canonical WNT signaling and EMT and thereby a corresponding decrease in tumor metastasis and invasion. We hypothesize that Δ Np63 α decreases cell migration and invasion through down-regulation of RAC1 activity via miRNA-320a in colorectal cancer cells. We showed that knockdown of Δ Np63 α in HaCaT and A431 cell lines lead to a decrease in miRNA-320a levels and a corresponding increase in the phosphorylation of RAC1 at Ser71, while overexpression of Δ Np63 α in SW480 and Caco2 cells led to an increase in miRNA320a message and a decrease in the phosphorylation of RAC1. Taken together, our data suggest that Δ Np63 α -mediated increase in miRNA-320a levels has potential implications for cancer migration and metastasis.

33. Andrew Stacy, Jin Zhang, Michael P Craig, Natasha T Hill and Madhavi P Kadakia
Program: PhD in Biomedical Sciences, CoSM Mentor: Madhavi Kadakia, Biochemistry and Molecular Biology, CoSM & BSoM **Δ Np63 α and TIP60: Potential Implications in Cancer and Aging**
 Δ Np63 α , a p53 transcription factor family member, is the dominant p63 isoform in the basal layer of the skin. Δ Np63 α plays a vital role in epithelial morphogenesis and is up-regulated in non-melanoma skin cancers, such as basal cell and squamous cell carcinomas, implicating it as a proto-oncogene. Previously, it was demonstrated that p53 is a direct target of the Tat Interacting Protein 60 kDa (Tip60) histone acetyltransferase (HAT). Due to the high homology between p53 and Δ Np63 α , we investigated whether Tip60 can target and alter Δ Np63 α function. Overexpression of Δ Np63 α with increasing levels of Tip60 resulted in a dose dependent increase in Δ Np63 α protein, while Tip60 protein was likewise found to increase in a dose dependent manner with

increasing levels of Δ Np63 α . Furthermore, silencing endogenous Tip60 diminished endogenous Δ Np63 α protein levels. Co-expression of Δ Np63 α with a Tip60 HAT domain deletion mutant revealed Δ Np63 α expression levels are not affected in opposition to wild type Tip60. By contrast, Δ Np63 α protein levels were elevated when co-expressed with a Tip60 double sumoylation mutant which retains its acetyltransferase ability. This demonstrates the importance of Tip60 HAT activity in influencing Δ Np63 α expression. Analysis by qPCR revealed that higher Δ Np63 α protein levels upon Tip60 coexpression are not due to an increase in transcription. Inhibition of protein biosynthesis by cycloheximide demonstrated an increased Δ Np63 α half-life in the presence of Tip60. Taken together, these results indicate that Δ Np63 α is regulated by Tip60 at the post-translational level. Δ Np63 α and Tip60 were found to co-localize and co-precipitate using immunofluorescence and immunoprecipitation, respectively. Preliminary evidence demonstrates that Tip60 coexpression results in increased Δ Np63 α acetylation. Collectively, these data suggest that Tip60 stabilizes and modulates Δ Np63 α levels by acetylating Δ Np63 α at one or more lysines. These results suggest a potential biologically relevant interaction between Δ Np63 α and Tip60 which requires further investigation.

34. Montana Woolley & Gary Burns
Program: Industrial Organizational Psychology, CoSM
Mentor: Gary Burns, Psychology, CoSM
What Makes a Superstar? Identifying superstar (star) employees is a critical element in any talent management system, because superstar employees have a significant influence on the success or failure of an organization (Aguinis & O'Boyle, 2014). Star employees are highly visible in their organization because they generate exorbitant output levels and demonstrate superior performance in relation to other employees (Oldroyd, 2012). Despite being highly visible, there is no clear way to identify these star performers without a measurable output, which is a limitation in most professions. If management can identify superstar employees before they become highly visible, managers can focus on fast-tracking and retaining these employees to benefit their own organization, as well as target applicants with high potential during the selection process. To find a way to identify superstar employees before they become highly visible, researchers must discover what makes a superstar different from a good employee. Thus, the

purpose of my study is to identify the characteristics, traits, and behaviors that differentiate a star performer from a good employee.

35. **Joseph Pokorski** and Damaris

Elizabeth Serrano Program: Spanish & Biochemistry & Molecular Biology, CoLA Mentor: Damaris Elizabeth Serrano, Modern Languages, CoLA
The Ignored Crisis While conducting my research, I carried out a self-exploration through literary devices. I constructed essays that range from a radio clip to an academic exposition. Taking the point of view of a prospective bilingual physician and researching in Spanish not only allowed me to understand the language and culture, but allowed me to grasp an entirely fresh perspective to view a scientific topic: *La crisis ignorada*, or The Ignored Crisis is an expository analyzation where I compiled multiple sources to address a long-lived issue. How the world's abuse of the environment and the influence of our diet is prevalent. I highlight the evolution of nutritional modes, from the indigenous people to the inhabitants of our world now. It's intriguing to take a step back and observe other cultures, how they react with society, and the consequences they experience. The three main indigenous groups known as the Incas, Mayans, and Aztecs developed distinct ways to nourish themselves which proved to become efficient societies in agriculture and health. So much so that some experts in the field are studying the indigenous methods deeper to reapply them with a purpose to revamp modern agriculture. With today's culture, it is difficult to adopt these healthy and whole options since we have packaged food at our disposal. For this reason, our current world culture and the food industry are main components of my research. This is a relevant and crucial topic that we face and we must realize that our decisions with regards to diet impact our culture by creating a "demand" that the food industry can utilize.

36. **Danielle Graham** and Sharon

Heilmann Program: Educational Leadership, CEHS Mentor: Sharon Heilmann, Organizational Leadership, CEHS
Athletic Identity and Moral Development: An Examination of NCAA Division 1 Athletes and Their Moral Foundations This study investigates moral orientation in relation to athletic identity, specifically with respect to student-athlete development in college. As higher education administrators strive to bolster the holistic development of increasingly diverse student populations, it is important to understand the social-evolutionary differences unique to unconventional student groups. Research has

established that prolonged participation in sport contributes to the development of an athletic identity (Brewer & Cornelius, 2001; Brewer, Van Raalte & Linder, 1990; Cieslak, 2004). Research has also identified significant categorical differences in moral reasoning tendencies between student-athletes and non-athletes (Bonfiglio, 2011; Bredemeier & Shields, 2006; Howard-Hamilton & Sina, 2001; Lyons & Turner, 2015; Priest, Krause, & Beach, 1999). Two hundred and thirty-six NCAA Division I Intercollegiate student-athletes, Club sport student-athletes and Intramural sport student-athletes, possessing varying degrees of athletic identity, served as participants. Athletic Identity was measured with the 7-item, 3-factor abbreviated version of the Athletic Identity Measurement Scale (Brewer & Cornelius, 2001) and the Moral Foundations Questionnaire (MFQ) (Graham, Nosek, Haidt, Iyer, Spassena, & Ditto, 2011) was used to evaluate the moral foundations on which student-athletes rely. Regression analyses will be conducted in order to investigate the relationship between degree of athletic identity and each one of the five moral foundations of the MFQ (Harm/care, Fairness/Reciprocity, In-group/loyalty, Authority/respect, and Purity/sanctity). ANOVA analyses will then be administered to examine the factors of gender and years of collegiate sport participation in relation to degree of athletic identity and moral orientation. This study seeks to investigate whether or not a correlation exists between athletic identity formation and the moral foundations on which elite-level athletes rely.

37. **Jamie Gaffin** and Kirsten Halling

Program: BA in French, CoLA Mentor: Kirsten Halling, Modern Languages, CoLA

Fiction as a Corrective Gesture to Western Historiography Guadeloupean author Maryse Condé's novel *Moi, Tituba, sorcière noire de Salem* (*I, Tituba, Black Witch of Salem*) has a multinational setting, both on the island of Barbados and in the American colonies during the seventeenth century. This presentation analyzes the way in which the magical talents of the titular character serve as a socio-historical paradox within the text. In an inherent dichotomy, Tituba is persecuted for being a witch, yet her reviled magical powers also act as a liberating force. The presenter will demonstrate how Tituba manages to redefine the witch figure in a context that departs markedly from the rigid worldview of the Puritans in colonial America.

38. Tara Reilly & Melissa Doran Program: Spanish, CoLA Mentor: Melissa Doran
Society Against the Woman as Represented in Cinematography The history of the Latin American women contains a long list of characters who have had to confront the forced expectations of society. Cinematography has created a representation of some of these women like Manuela Sáenz, Sor Juanas Ines de la Cruz, and Catalina de Erauso. These representations allow us to observe through the window of a different time. Cinematography demonstrates that through the use of a disguise, in movies like *Libertador* (Alberto Arvelo, 2013), *Yo la Peor de Todas* (Maria Luisa Bemberg, 1990), and *La Monja Alférez* (Emilio Gomez Muriel, 1944), oppressed women can challenge the rules of the Latin-American colonial society. However, by challenging the society to find themselves, each woman pays a price- their personality, their will, and their family.

39. Venkatesh Edupuganti, Monireh Ebrahimi, Krishnaprasad Thirunarayan and Amit Sheth Program: Computer Science, CECS Mentor: Krishnaprasad Thirunarayan, Computer Science, CECS
Identifying Harassment Conversations on Twitter Harassment is a form of unprovoked aggression that can create an intimidating or hostile environment for an individual or group of individuals. As per the Online Harassment, Digital Abuse, and Cyberstalking in America report, 70% of young adults and 47% of internet users have been the target of online harassment. Also, 36% of internet users have experienced direct harassment, while 72% of American internet users have witnessed online harassment or abuse. Social media like twitter is a popular platform for all types of communication between two individuals. It has been observed that individual tweets containing curse words may be harassing to the recipient. Previous studies have shown that the use of curse words indicate harassment but there are incidents where friends punctuate their tweets with curse words casually, and hence, may not be harassing. In order to better characterize and recognize reliably harassing tweets, we consider additional context in the form of the series of tweets exchanged between a pair of users. This can enable us to find the relevant context for the tweets, and capture presence, nature and level of harassment between them. We propose a supervised machine learning approach to predict whether a conversation is harassing or not.

40. Cheyna Brower and Nathan Bowling Program: Industrial & Organizational Psychology, CoSM Mentor: Nathan Bowling, Psychology, CoSM
The Quick and the Careless: Using Page Time to Measure Careless Responding The presence of careless responding (e.i., responses made by respondents without regard to content) threatens the validity of inferences made from self-report data (Huang, Curran, Keeney, Poposki, & DeShon, 2012; Huang, Liu, & Bowling, 2015; McGrath, Mitchell, & Hough, 2010). For example, careless responding can in some cases attenuate (Huang et al., 2012) and in other cases inflate (Huang et al., 2015) observed relationships between variables. Although it takes only 5% of participants to be careless to threaten the validity of data (Huang et al., 2015), the current modal estimate of careless responders is 8-12% of study participants (Curran, 2016; Curran, Kotrba, & Denison, 2010; DeRight & Jorgensen, 2015; Maniaci & Rogge, 2014; Meade & Craig, 2012). Therefore, it is important to have efficient methods of detecting careless responding to allow researchers to effectively clean their data. One of the most convenient measures of careless responding is response time (e.g. total survey time or page time). Total survey time measures detect careless responding by using the total time respondents take to complete a survey. Page time measures detect careless responding by computing a score based on the amount of time spent on each page, the number of items on each page, and the number of seconds required to respond carefully to an item. This study compared the efficacy of two methods of careless responding, total survey time and page time. Results suggested that page time is more effective at detecting careless responding than total survey time. This study also provided empirical evidence that two-seconds per question is an appropriate measurement for careless responding.

41. Goonmeet Kaur Bajaj, Air Hossein Yazdavar, Krishnaprasad Thirunarayan & Amit Sheth Program: Computer Science, CECS Mentor: Amit Sheth, Computer Science, CECS
Analysis of Geographical Distribution of Depression in the Twitter Population Depression is a highly prevalent global public health concern and challenge. According to the World Mental Health Survey conducted in 17 countries, on average, about 5% of people reported having an episode of depression in 2011. Depression is also affecting 15 million or about 6.7% American adults each year.

Traditional survey-based methods conducted via questionnaires for monitoring depression, mainly suffer from underrepresentation as well as sampling bias (due to small group of respondents). Often teenagers and college students are poorly represented in these methods, even though a recent study conducted by the National Youth Mental Health Foundation revealed that 83% of the 2600 university and vocational school students surveyed claimed that they suffered from stress, 79% reported anxiety, and 76% experienced “low moods”.

Millions of people express their moods, feelings, and daily struggles with mental health issues via social media platforms. Insights gleaned from social media such as Twitter can complement the current survey-based methods and assist both governmental and non-governmental organizations in policy development for managing clinical depression. For instance, the following Twitter profile @BeyondBrokenDep self-declares: “Trying to survive in this {f****} up crazy world, Diagnosed with Social Anxiety, Severe Depression, ADHD, OCD, BPD, SH, Suicidal Tendencies”. Additionally, @suicidalfreak28 tweeted “I could just slit my throat and die from bleeding tonight”.

In this study, we examine big (social) data for recognition and screening of depression in population. By incorporating geographical analysis of user-generated content on social media, we can capture depressive behavior in this population and study their access to and utilization of mental health services. Our geographical analysis findings in social media correlate with depression statistics reported by the Substance Abuse and Mental Health Services Administration (SAMHSA). Such crucial insights can assist policy designers investigate influence of location, socio-ecological and environmental factors on depressive behavior in populations, and help determine the nature and location of additional help centers.

42. Michele Miller, Tanvi Banerjee, Roopteja Muppalla, William Romine and Amit Sheth Program: Environmental Sciences PhD program Mentor: William Romine, Biological Sciences, CoSM

What Are People Tweeting About Zika? An Exploratory Study Concerning Symptoms, Treatment, Transmission and Prevention In order to harness what people are tweeting about Zika, there needs to be a computational framework that leverages machine learning techniques to recognize relevant Zika tweets and further categorize these into disease-specific categories to address specific societal

concerns related to the prevention, transmission, symptoms, and treatment of Zika virus. The purpose of this study was to determine the relevancy of the tweets and what people were tweeting about four disease characteristics of Zika: symptoms, transmission, prevention, and treatment. A combination of natural language processing and machine learning techniques were used to determine what people were tweeting about Zika. Specifically, a two-stage classifier system was built to find relevant tweets about Zika, and then categorize the tweets into the four disease categories. Tweets in each disease category were then examined using latent dirichlet allocation (LDA) to determine the five main tweet topics for each disease characteristic. 1,234,605 tweets were collected. Tweets by males and females were similar (28% (351,453/1,234,605) and 23% (284,207/1,234,605) respectively). The classifier performed well on the training and test data for relevancy (F=0.87 and 0.99 respectively) and disease characteristics (F=0.79 and 0.90 respectively). Five topics for each category were found and discussed with a focus on the symptoms category. We demonstrate how categories of discussion about an epidemic can be discovered so that public health officials can understand specific societal concerns within the disease-specific categories. Our 2-stage classifier was able to identify relevant tweets to enable more specific analysis, including the specific aspects of Zika that were being discussed as well as misinformation being expressed. Future studies can capture sentiments and opinions on epidemic outbreaks like Zika virus in real time which will likely inform efforts to educate the public at large.

43. Aaron Vargas and Sirisha Naidu Program: Social & Applied Economics, RSCoB Mentor: Sirisha Naidu, Economics, RSCoB

Housing Affordability in Washington DC: How the Crash of Housing Value Increased Unaffordability in our Nation’s Capital For my presentation, I will examine how the housing bubble and burst impacted the affordable housing crisis in the Washington DC metropolitan area (Washington MSA) and how a lack of housing affordability relates to social reproduction. Washington MSA is one of the most expensive areas to live in the United States. Washington MSA has the tenth-highest median home value in a metro area in the country as of 2015 (Kiplinger.com) and the fair market rent for a two-bedroom unit in the District of Columbia was the second highest of any state only to Hawaii in 2014 (National Low Income Housing

Commission). While housing costs have been extraordinarily high in Washington MSA since well before the 2000s, the recent financial crisis – more specifically the housing crash – actually increased the severity of the affordability crisis for this area. While housing value plummeted during the recession, rental costs continued to increase. Washington MSA between 2008 and 2012 was one of only seven metropolitan areas in the country in which the majority of households were renter occupied. This saturated renters market was faced with even more demand when the housing market crashed. Today, both housing costs and rental costs are increasing, leaving many residents severely cost burdened. Without stable housing or affordable housing, social reproduction becomes even more difficult for a growing number of households. Studies have shown that children without stable housing show more behavioral problems, higher dropout rates and lower adult educational attainment (Urban Institute) while many renter families are also food insecure, meaning it is difficult to obtain the financial means to provide sufficient food for their families (US Census Bureau). As Washington MSA's population continues to increase at a much faster pace than housing is being constructed, the affordability crisis in our nation's capital does not seem to be near its end.

44. Noah Shook and Sirisha Naidu

Program: Social & Applied Economics, RSCoB Mentor: Economics, RSCoB

Caring About Caregivers: The Impact of Elder Care on Social Reproduction in Australia

In Australia, more elderly individuals than ever before remain in their home for care rather than seeking care from an institution. This is the result of a combination of an increasing older population and an altered balance of policy regarding elder care, which places more responsibility on the individual. This shift has resulted in an increase of informal care being provided to the elderly by family members. While caregivers might increase the total number of combined formal or informal hours worked, a tradeoff still exists between the formal sector and informal care. Individuals who engage in informal care are more likely to reduce the number of formal hours worked or drop out of the labor market, limiting their lifetime earning potential. As lifetime earnings decrease, an individual's ability to care for themselves in old age may decrease, shifting the burden then to their family through continuation of intergenerational caregiving. The cycle of informal caregiving impacts social reproduction by requiring the household to take on the responsibility of elder

care while simultaneously reducing the living standard of those who engage in it. Using data provided by the Australian Bureau of Statistics this study examines the tradeoff that occurs between informal caregiving and work in the formal sector as it relates to social reproduction and an individual's ability to sustain themselves.

45. Garrett Goodman, Cogan Shimizu, Tanvi Banerjee, Jennifer Hughes, Sierra Drees and Larry Lawhorne Program: Computer Science, CECS Mentor: Tanvi Banerjee, Computer Science, CECS
Caregiver Assessment Using Intelligent Serious Gaming Technology: A Preliminary Approach

Recent studies are highlighting the importance of using cognitive adaptive testing to assess and assist in the intervention of cognitive decline in older adults. In this interdisciplinary study, we propose to personalize traditional games, that contain discrete subtasks, such as word scramble and activity sequencing games. Using a machine learning engine, it will continuously adapt the relative level of difficulty to match the individual's cognitive level as a means to evaluate their current cognitive and executive functions. We report our preliminary analysis on the use of a fuzzy inference system using a word scramble game to measure and update the game difficulty level to fit the user. Such a system can not only be used as a assessment tool to evaluate the current cognitive status of the older adult, but could possibly provide fine-grained information on the cognitive decline in older adults that can be used to not only assess caregiver stress, but also symptoms of dementia.

46. Kaylee Reese Kristi Elliott, Danielle Hardin, Colleen Saxen and Michelle Fleming Program: Early Childhood Education, CEHS Mentor: Michelle Fleming, Teacher Education, CEHS

Mingling Cultures: Mutual Learning of Science This study examines the "mingling" of cultures as they connect or disconnect to each other, particular activities, and scientific practices. How do preservice teachers' cultural perspectives change by participating in field-embedded experiences in a science methods course? Behaviors, language, and interactions among preservice teachers were examined over two years using ethnographic methods. Emerging themes will be presented.

47. Meenakshi Nagarajan, Raakesh Candrasekaran, David Wood, Alexandra Opp, Subhashini Ganapathy, Michelle Cheatham, John Gallagher, Jim Gruenberg and Jack Smith Program: MS in Industrial & Human Factors Engineering, CECS Mentor: Subhashini Ganapathy, Biomedical, Industrial & Human Factors Engineering, CECS

Using Model-Based Simulation for Augmenting Incident Command System for Disaster Response

The National Incident Management System has become the dominant organizational model for the management of emergency and disaster response and recovery operations. The Incident Command System (ICS) provides reporting and operational templates that structure activities and the management of resources and communications during an incident or event. In an emergency situation, information can be sometimes contradictory and may not be “clean”. In order for Command Officers to maintain good situation awareness of these dynamic situations, the system should be able to adapt by taking into account the type of information available, the specific task at hand, and knowledge derived from the information integration agent. This paper presents a design of ICS model and discusses the simulation architecture to support ICS commanders to potentially minimize cognitive load on decision makers, exploit semantic relationships in reports and sensor data to advice of invisible occurrences to better reflect ongoing developments during crisis management.

48. Hadel Alsarani, Lobna Elkhadragey and Weiwen Long Biochemistry and Molecular Biology, CoSM & BSoM Mentor: Weiwen Long, Biochemistry and Molecular Biology, CoSM & BSoM

Cancer-Related Mutations of ERK3 Promotes Cancer Cell Invasiveness Extracellular signal-Regulated Kinase 3 (ERK3) is an atypical member of the mitogen-activated protein kinase (MAPK) family. Recent studies have shown that ERK3 is highly upregulated in multiple cancers, such as lung cancer and colon cancer. In addition, ERK3 promotes cancer cell migration and invasion, at least partly by upregulating matrix metalloproteinase genes’ expression. Gene mutation is a major cause of human cancers. However, little is known about ERK3 mutations in cancer development and progression. By reviewing COSMIC database of gene mutations in cancers, we found two ERK3 mutations L290P and L290V which exist in cancers of lung, large intestine and skin. Notably, ERK3 L290 residue is located in the kinase domain of ERK3 and is conserved in

ERK1/2/3/4. In order to characterize these mutations, we generated plasmids for ERK3 with each of these point mutations, and overexpressed them in H1299 and A549 lung cancer cells. We found that in comparison with wild type (WT) ERK3, both of these cancer-related mutants had greatly increased ability in promoting cancer cell migration and invasion. To elucidate the underlying mechanism by which ERK3 L290 mutants increased cancer cell invasiveness, we examined the kinase activity of ERK3 mutants by *in vitro* kinase assay. We found that ERK3 L290P and L290V mutants have similar kinase activity to WT ERK3. ERK3 protein is known to shuttle between the nucleus and the cytoplasm, which may alter its function. Interestingly, we found that both L290P and L290V mutations greatly increased the cytoplasmic localization of ERK3 proteins, whereas WT ERK3 is mostly nuclear. We are currently trying to elucidate the molecular mechanisms by L290P (or V) mutations increase the cytoplasmic localization of ERK3 and its ability in increasing cancer cell migration and invasion. In conclusion, our present study has identified previously unstudied cancer-related ERK3 mutations and their importance in cancer cell invasiveness.

49. Jasmine Moore & Jacqueline Bergdahl Program: Applied Behavioral Sciences, CoLA Mentor: Jacqueline Bergdahl, Sociology & Anthropology, CoLA
Legalization of Gay Marriage and its Impact on Military Stereotypes of Homosexuals

Homosexuality has become a popular research topic in a variety of professional fields, and over the last decade has become a priority for the military. Since the implementation of the law repealing Don’t Ask Don’t Tell (DADT) researchers have questioned what effects repealing this law has had on the military as a whole. Particular attention has been spent on studying the attitudes and stereotypes about homosexuals after DADT was repealed. However, there is a lack of research examining how marriage equality affects society’s stereotypes about homosexuals serving in the United States military.

It was hypothesized that participants that have personal contact (friends or family members) with lesbian, bisexual, and transgender (LGBT) individuals will be less likely to hold negative stereotypes about LGBT serving in the armed forces than those participants who don’t have personal contact (friends or family members) with LGBT individuals. The purpose of this research is threefold: 1) reduce discrimination of homosexuals serving in the military 2) help to improve the quality of life for homosexuals serving in the armed forces and 3) improve society by increasing tolerance. Current literature does not

provide us with a clear and concise picture of how marriage equality impacts military stereotypes of homosexuals. This study utilized survey-sampling methods in an attempt to understand how opinions about marriage equality affect military stereotypes of gays and lesbians. The results supported the main hypothesis. Participants who had personal contact (friends or family members) with LGBT individuals were in fact less likely to hold negative stereotypes about LGBT serving in the armed forces than those participants who did not have personal contact (friends or family members) with LGBT individuals.

50. Sydney Lesko, Junichi Tasaki and Labib Rouhana Program: Biological Sciences, CoSM Mentor: Labib Rouhana, Biological Sciences, CoSM
Development, Regression, and Regeneration of the Planarian Reproductive System Development of multicellular organisms involves coordinated differentiation of stem cells. The signals that direct differentiation into many specific cell types remain to be identified. Planarian flatworms possess a population of adult stem cells that continuously differentiate into all cell types in their anatomy, including germ cells, making them a great model for uncovering the signals that specify cell differentiation. Past research has shown that planarian head amputation causes testes regression, suggesting that the signals produced by the brain are required for the maintenance of testes. Amputations of parts of the planarian anatomy leaving the brain intact were performed to test whether injury itself, rather than the absence of neuronal signals, leads to testes regression. The distribution of sperm producing testes was quantified in different regions and at different time points following head and/or tail amputations by confocal microscopy. Testis and ovary anatomies were analyzed by visualization of all cell nuclei through DAPI staining, as well as visualization of specific germ cells through *in situ* hybridization using multiple germ cell markers. Preliminary results show that regression of the testes occurred in animals in which the tail was amputated but the brain remained intact. Quantitative analysis shows that whereas a majority of testes regress almost immediately in fragments without a head, it is not until 16 days that a majority of testes regress in fragments subjected to a posterior amputation. The act of amputation itself is sufficient to induce testes regression. It is known that a wave of apoptosis follows amputation in asexual animals, an it is hypothesized that a similar apoptotic activity may play a role in testes regression, presumably to maximize cellular resources available for regeneration of lost tissue. Future directions include testing the involvement of apoptosis in testes regression and

identification of signals involved in reactivation of sperm production.

51. Hannah Shows, Priyanka Sharma, Mahmoud Alghamri, Michael Raymer and Kate Excoffon Program: Biomedical Sciences PhD, CoSM Mentor: Kate Excoffon, Biological Sciences, CoSM
Modulation of MAGI-1 PDZ1 Binding to CAREx8 via Small Peptide Interference Adenovirus is a common pathogen that typically causes cold-like symptoms in the majority of the population. However, rates of morbidity and mortality due to adenovirus infection are very high in cohorts such as immunosuppressed patients, members of the armed services, and patients with severe infections such as acute respiratory distress syndrome. The coxsackievirus and adenovirus receptor (CAR) is the primary receptor for most serotypes of adenovirus. While the CAREx7 isoform localizes on the basolateral side of epithelial cells, the CAREx8 isoform is present on the apical side where it can facilitate adenovirus entry into the airway epithelium. MAGI-1, a cellular scaffolding protein, has been shown to regulate CAREx8 expression via two of its PSD-95/Dlg/ZO-1 (PDZ) domains, PDZ1 and PDZ3. It has been demonstrated that the PDZ3 domain of MAGI-1 promotes the degradation of CAREx8, while MAGI-1 PDZ1 protects CAREx8 from degradation. Our lab has found that blocking the interaction between MAGI-1 PDZ1 and CAREx8 can decrease adenovirus infection and pathogenesis. Preliminary data of three peptides targeting the PDZ domains of MAGI-1 show high affinity binding via fluorescence resonance energy transfer (FRET). We hypothesize that MAGI-1 PDZ1 binding peptides can be optimized to bind with higher specificity and decrease adenovirus infection more efficiently than first generation peptides. To test this, we are using a combination of fully-flexible protein docking and peptide design algorithms to create new small peptide candidates for PDZ domain binding. These peptides will be further tested experimentally via a fluorescent high throughput screening assay to evaluate their effect on CAREx8 expression. By optimizing peptide binding specificity, we can increase our ability to modulate adenovirus susceptibility and improve future therapeutic potential.

52. Hitham Aldharee and Weiwen Long Program: MS in Biochemistry and Molecular Biology, CoSM Mentor: Weiwen Long, Biochemistry and Molecular Biology, CoSM & BSoM
ERK3's Role in Regulating RhoGDI-PAK Signaling Axis in Cancer Cells Extracellular signal-regulated kinase 3 (ERK3) is a member of the atypical mitogen activated protein kinase (MAPK) subfamily. ERK3

possesses a single Ser-Glu-Gly (SEG) phospho-acceptor motif in its activation loop, instead of the Thr-Xaa-Tyr (TXY) motif conserved in the classic MAPKs, such as ERK1/2. In comparison with the well-established ERK1/2 signaling cascade, much less is known about ERK3 signaling. ERK3 promotes cancer cell migration and invasion and is found to be overexpressed in multiple types of cancers. RhoGTPases, including Rho, Cdc42 and RAC1, are important factors regulating cell morphology and motility. RhoGDIs are Rho GTPase-GDP dissociation inhibitor. They inhibit Rho-GTPases' activities by rendering Rho-GTPases at GDP-bound inactive status. Cdc42 and RAC1, also known as p21 GTPases, activate PAKs (p21 GTPase-activated protein kinases) by binding to PAKs' auto-inhibitory domains and relieving PAKs' auto-inhibition. PAKs were recently shown to phosphorylate ERK3 at S189 of the SEG activation motif. In line with this finding, our proteomic analysis of ERK3 protein complexes by Immunoprecipitation-Mass spectrometry identified PAKs as interacting partners of ERK3. Interestingly, RhoGDI1 was also shown to interact with ERK3 by our proteomic analysis. These findings raise an intriguing hypothesis that ERK3 regulates RhoGDI/PAKs signaling, thereby affecting cancer cell motility. To test this hypothesis, we first confirmed the interactions of ERK3 with RhoGDI1, PAKs and Cdc42/RAC1 GTPases by co-Immunoprecipitation and immunofluorescence. Interestingly, ERK3 co-localizes with PAK signaling complex in the leading edge of cell membrane. In addition, we have found that ERK3 increases cellular levels of GTP-bound active form of Rac1 and Cdc42 and promotes PAKs' activation (phosphorylations). Next, we will test whether ERK3 phosphorylates RhoGDI1 and promotes the dissociation of RhoGDI1 with Rho-GTPases, which leads to activation of PAKs. We will investigate the importance of ERK3-mediated PAKs signaling in cancer cell migration and invasion.

53. Clayton Buckner, Andrew Snyder, Siham Abdulla and Courtney Sulentic
 Program: Microbiology & Immunology, CoSM Mentor: Courtney Sulentic, Pharmacology & Toxicology, BSoM
Functional Characterization of the Polymorphic hs1.2 Enhancer using CRISPR/Cas9 Gene Editing and Nanopore Sequencing Technology

The human immunoglobulin heavy chain gene locus (IGH) has two 3' regulatory regions (3'IGHRR), each containing three enhancers (hs3, hs1.2, hs4). In animal models, the 3'IghRR regulates Igh expression and class switch recombination (CSR) to different Ig isotypes. The 3'IGHRR hs1.2 enhancer in humans is polymorphic in that an invariant sequence (IS) can be repeated one to four times in tandem. The hs1.2 polymorphism is of interest due to its association with

several human autoimmune disorders and its sensitivity to exogenous substances such as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD or dioxin). In mouse models, TCDD inhibits the hs1.2 enhancer and 3'IghRR activation, which correlates with Ig inhibition. However, in humans TCDD activates the hs1.2 enhancer, decreases IgG secretion and increases IgE secretion, suggesting differences in hs1.2 activity and overall 3'IGHRR function in humans. Using a human B-cell line that can be induced to secrete antibodies and undergo CSR, we utilized CRISPR/Cas9 gene editing to target the hs1.2. Several clones exhibited a functional effect on IGH expression with a reduction in the number of hs1.2 IS repeats within one or both of the 3'IGHRRs. The exact gene editing has not been fully characterized and may likely involve insertions and deletions within the remaining IS, which complicates interpretation of the functional effects on IGH expression. To further characterize the gene edits within our clones, the use of a new sequencing technology involving nanopores and long sequence reads was used. Implementation of this technique has provided long-range sequencing data that is impossible to achieve with standard sequencing due to redundant sequences within and around the 3'IGHRR, and the identical nature of the 3'IGHRRs, excluding the number of IS repeats. Linking the functional effects to a specific genetic profile within the hs1.2 enhancer will be the first direct analysis of the role of the polymorphic hs1.2 enhancer in human Ig expression.

54. Jaree Naqvi, Scott Seider, Jason Miller, Cole Budinsky and Amol Soin Program: Medicine, BSoM Mentor: Amol Soin, Surgery, BSoM
Treating Chronic Post Herpetic Neuralgia Using Topical Superconcentrated Capsaicin

Post Herpetic Neuralgia is a pain condition that occurs after reactivation of the Herpes Zoster Virus. Following the initial pain associated with the rash, one in five patients report longstanding pain with burning and irritation lasting months to years. In severe cases where the pain is not treated adequately, it can lead to insomnia, weight loss, depression, and disability. Our study utilizes a superconcentrated form of capsaicin which is 300 times more concentrated than traditional over the counter capsaicin. The medication is administered in the form of a transdermal patch known as Qutenza 8% which is applied over the affected area to reduce pain. We are currently researching the most effective treatment protocol for Qutenza therapy in pain control for PNH. Capsaicin is the natural product found in peppers that causes the burning and heat sensation in the mouth. The main mechanism for this is through stimulation of capsaicin

nociceptor neurons which, upon activation, allows the passage of calcium into the neuron and subsequent depolarization of the neuron. Following depolarization, neurotransmitters are released which cause the classic painful sensation. However, at superconcentrated doses of capsaicin the nociceptor neurons can be killed off resulting in dulling of the painful sensation. Our study and proposed treatment algorithm involves 20 initial patients undergoing Qutenza therapy. Local anesthetic is applied over the affected area, Qutenza is applied for 30 minutes, and then the patch is removed and the area is cleansed. Patients were followed up at intervals of two weeks and one month to reassess. Upon follow-up, 16 out of 20 patients reported reduction in pain, 3 patients reported no relief, and 1 reported worsening pain. The 16 relief patients reported an overall 53.2% decrease in frequency and severity in pain, with pain relief averaging 4.2 months.

55. Morgan McArthur, Ryan Schultz, Matthew Ommert, Tracey Watkins and Scott Bruce Program: BS in Athletic Training, CEHS Mentor: Scott Bruce, Kinesiology and Health, CEHS
The Effect of Dynavision Training on King-Devick Performance

Objective: The purpose of this study is to determine if Dynavision training has an affect the King-Devick test performance.

Design and Setting: Randomized Controlled Trial in an athletic training clinical laboratory.

Participants: 34 college aged participants (treatment = 14, control = 20).

Intervention: Participants were baseline tested on the Dynavision for reaction time and central and peripheral vision using a sequence of fives tests, and on the King-Devick Test. Subjects were randomly assigned to treatment or control groups. The treatment group completed a series of three, one-minute training exercises on the Dynavision, 3 times per week for 6 weeks while the control group received no training. After the completion of the 6 weeks of training, both groups were post-tested on the same tests they did for their baseline testing.

Main Outcome Measurement: Change in King-Devick scores of the treatment group versus the control group.

Results: To be determined

Conclusion: To be determined

Key Words: Dynavision, King-Devick Test, Reaction time.

56. Donovan L. Marshall, Margaret Bertso, Adrianna E. DiMasso and

Scott Bruce Program: Athletic Training Mentor: Scott Bruce, Kinesiology and Health, CEHS
Musculoskeletal Injury Risk Among Army ROTC Cadets

Objective: The purpose of this study was to predict which Army ROTC cadets were at high risk for injury based on baseline testing and pre-participation survey of joint specific functional limitations.

Design and Setting: Cohort design at a four-year, primarily nonresidential, research doctoral, STEM-dominate university.

Participants: Fifty-three participants from an Army ROTC program volunteered for this study.

There were 39 males (age: 20.97 (± 3.8); Ht (cm) 177.41 (± 7.4); Wt (kg) 79.17 (± 9.7); BMI 25.18 (± 2.9)) 15 females (age: 19.8 (± 0.91); Ht (cm) 161.88 (± 10.6); Wt (kg) 62.38 (± 7.9); BMI 24.03 (± 4.02)).

Intervention: Baseline testing included 3 muscular endurance, core resistance exercises: singleleg wall sit hold, horizontal trunk extension hold, and postural balance test – unilateral squat hold; ROTC physical training baseline tests: push-ups, sit-ups, 2-mile run, and completion of the Sports Fitness Index, a joint specific, functional limitation survey. Participants were also baseline tested on a Dynavision unit to assess reaction time, central and peripheral vision. Bayesian analysis will be used to analyze the data.

Main Outcome Measurements: Musculoskeletal injury divided by body region: lower extremity, upper extremity, and core/spine.

Results: To be determined

Conclusion: To be determined

Key words: Injury prediction model, core stabilization, reaction time, military, ROTC

57. Ashley Kessler, Scott Bruce and Corey

Ellis Program: Sports Management, CEHS Mentor: Scott Bruce, Kinesiology and Health, CEHS

Case Report: PRP Injections used for MTSS in a Volleyball Athlete The objective of the following case report is to examine the benefits of Platelet-rich plasma injections (PRP) in the treatment of Medial Tibial Stress Syndrome (MTSS). Medial Tibial Stress Syndrome is commonly referred to as shin splints, and is an injury that affects the active population involved in repetitive running or jumping exercises. The reasons MTSS effects the active population is because of poor body biomechanics, coupled with an inability to completely recover from this pathology making it a chronic condition. The purpose of this study is to examine an intercollegiate volleyball athlete prescribed PRP injections to treat bilateral MTSS.

Platelet-rich plasma injections are a relatively new practice that involves injecting a patient with a concentrated amount of their own blood platelets, which is used to aid in the patient's body's healing process. The literature regarding the effects of PRP has focused on tendons and ligaments, but has not been reported to be injected into the bone. This case study is unique because the use of PRP injections are not generally used in bone; therefore, it will add to the current lack of literature specifically dealing with PRP injections into the bone used to treat MTSS. The volleyball student-athlete studied here, suffered from bilateral anterior compartment syndrome 3 years prior to the current case, and bilateral fasciotomies were performed shortly before the patient developed MTSS. Reoccurrence of compartment syndrome, MTSS, stress fracture, and periostitis were all possible conditions explored. A PRP injection was placed into the medial border of the tibia at the attachment of the posterior tibialis bilaterally. The PRP treatment for MTSS with an injection to the tibialis posterior attachment had a positive effect of relieving pain and inflammation to a tolerable level; thus, permitting the patient to participate in their senior season.

Key Words: Medial Tibial Stress Syndrome, Platelet-rich plasma injections, Compartment syndrome

58. Chein Poon, Jeremy Kress, Daniel J. Rohrbach, Jeffrey Travers, Ping He and Ulas Sunar Program: Engineering, CECS Mentor: Ulas Sunar, Biomedical Engineering, CECS
Combined Optical Imaging onad Ultrasound for Skin Disease Characterization One of the main aims in studying skin diseases is early and accurate diagnosis or characterization of the disease so that an appropriate intervention can be applied. Towards this aim, noninvasive imaging modalities that provide contrast between disease and healthy tissue can be used. Ultrasound imaging is a well-established technique that provides high resolution structural contrast, while optical imaging can provide functional contrasts such as skin perfusion and oxygenation. My current research is focused on combining both techniques so that skin diseases can be better characterized. Using the structural information provided with the Ultrasound signal, I am able to discriminate different skin layers, which allows me to distinguish superficial or deeper optical signals of blood flow and oxygenation.

59. Labib Rouhana and Robert Magley Biological Sciences, CoSM **Posters from BIO 4490: A Summer Laboratory Course for Discovery of Gene Function in Flatworms** Undergraduate research enhances the preparation and outlook of students

interested in careers in Science, Technology, Engineering and Mathematics (STEM). Unfortunately, opportunities for undergraduates to perform research are often overlooked by students, or unavailable by space limitations in departmental laboratories. Two courses in the Department of Biological Sciences at Wright State University have curricula centered on creating a *bona fide* research experience for undergraduate students. These courses are BIO3140, an introductory molecular biology lab offered during the Fall semester (formerly BIO2130); and BIO4490, an advanced 3-week laboratory course offered during the Summer semester. The experiments performed in both courses utilize planarian flatworms as a model system for studying gene expression and function during development of germ cells (sperm and ova). Here we present the outline of activities performed in BIO4490, and showcase an example of work performed by a student participant in this course.

60. Ciara Feichtner, L.G. Arlian, D.L.

Vyszynski-Moher and M.S. Morgan Program: Biological Sciences, CoSM Mentor: Larry Arlian, Biological Sciences, CoSM

Cold Tolerance of House Dust Mites

Rationale: The house dust mite, *Dermatophagoides farinae*, is a nidicole that lives in the nests of birds and mammals including human dwellings. In temperate climates in their natural environments in animal nests, the mites are likely exposed to cold and freezing temperatures. Likewise, these mites have been found in packaged baking mixes that consumers may refrigerate for storage and mites may survive these conditions. These mites may be adapted to tolerate low or freezing temperatures like many insects are. Freezing articles such as stuffed toys and pillows is recommended for killing mites in these items. The cold and freezing tolerance of house dust mites has not been extensively investigated. We determined the cold tolerance of *D. farinae* and report their survival in various cold and freezing conditions.

Methods: Female *D. farinae*, with and without a cold acclimation period at 4°C were subjected to -3°/-4° and -10°C temperatures for various durations. Female survival, egg production and larval emergence were determined at various times post-freezing.

Results: Many female mites survived up to 18 hours at -3°/-4°C. After returning to room temperature, many surviving females produced viable eggs from which larvae emerged. A few females survived -10°C for 2 to 12 hours but none of them produced eggs.

Conclusion: The results suggest that *D. farinae* can tolerate and survive refrigeration and some freezing conditions. Thus, refrigeration and freezing temperatures and their durations should be a

consideration in controlling dust mites in stuffed toys, pillows and food.

61. Jacob Audia, Te Carr and Scott Bruce

Program: BS in Athletic Training, CEHS

Mentor: Scott Bruce, Kinesiology and Health, CEHS

Prediction of Musculoskeletal Injuries Among NCAA Division II Football Players

Context: Injury prediction models have the potential to aid in the prevention of musculoskeletal injuries.

Objective: The purpose of this study was to identify pre-participation characteristics as possible indicator of elevated risk for musculoskeletal injuries.

Design: Cohort design

Setting: Division II intercollegiate football team

Participants: 72 intercollegiate football players that had a mean age of 20, height of 72 inches, and a weight of 214 lbs.

Methods: During pre-participation physical exams, athletes completed the Sport Fitness Index survey A series of core stability tests were administered including: unilateral squat hold test, on dominate and non-dominate foot, the horizontal trunk extension hold, and a single leg wall sit hold on dominant and non-dominant. Data analysis for the assessment of the association between predictors and injury occurrence included ROC analyses used to identify cut-points for dichotomization based on the best balance between sensitivity (Sn) and specificity (Sp) of predictors using Youden's Index (sum of [Sn + Sp - 1]). Predictor data were coded: "0" for \leq cut-point; "1" for $>$ cut-point followed by 2 X 2 cross-tabulation to calculate Sn, Sp, odds ratio (OR) and Relative Risk (RR) were used for univariable analysis of each predictor for inclusion in the multivariable analysis. Univariable OR \geq 2.0 or Fisher's Exact Test (one-sided) p-value \leq 0.20 were the criteria for retention. Multicollinearity analyses through the variance inflation factor (VIF) values of $>$ 10 or tolerance values $<$ 0.1 were performed to examine the potential overlap among predictors.

Predictors exhibiting multicollinearity were eliminated from the multivariable analyses. Prediction model development was achieved through a logistic regression, (backward entry), followed by ROC analysis to determine the optimal number of positive factors. A 2 X 2 cross-tabulation analysis for the derived prediction model produced Sn, Sp, OR, RFS and Fisher's Exact Test. Interaction effects for each possible combination of predictors was examined through stratified analysis and graphic representation of the potential interaction.

Results: To be determined

Conclusion: To be determined

62. Michaela Mitchell, Charles N.

Ciampaglio and Stephen J. Jacquemin

Program: Earth & Environmental Sciences, CoSM

Mentor: Charles Ciampaglio, Earth and Environmental Sciences, Lake Campus

Convergent Evolution in Tooth Morphology of Filter Feeding Sharks The Basking Shark (*Cetorhinus maximus*) and Megamouth Shark (*Megachasma pelagios*) are two species of filter feeding sharks, both belonging to the order Lamniformes. There are two conflicting hypotheses regarding the origins of filter feeding in Lamniform sharks; that there is a single origin of filter feeding within Lamniformes, or conversely, the filter feeding adaptations have been developed independently due to different ancestral conditions. Evidence obtained from several morphological and molecular studies strongly supports the latter hypothesis. Because evidence suggests that the Megamouth and Basking Sharks have developed their filter feeding adaptations independently, we hypothesized that convergent evolution in tooth morphology is taking place within these two lineages. Geometric morphometric analyses were performed on fossil and Recent teeth of Megamouth and Basking Sharks to determine if there is commonality among tooth shape. Resulting relative warp axes were interpreted using percent variation explained and compared by species. A series of multivariate analyses of variance (MANOVA) was used to test for significant differences in heterodonty and a series of one-way analyses of variance (ANOVA) with corresponding Tukey intervals (95% CI) was used to test for morphological differences in overall mean tooth shapes between fossil and Recent Megamouth and Basking Shark teeth for each significant relative warp axis. The results of the MANOVAs showed significant differences in heterodonty and support independently derived filter feeding adaptations and the results of the ANOVAs and corresponding Tukey intervals support convergent evolution in tooth morphology within these two species of filter feeding Lamniform sharks.

63. Gregory Bowers and Paul Seybold

Program: Chemistry, CoSM Mentor: Paul Seybold, Chemistry, CoSM

A Stochastic Cellular Automata Model of Tautomer Equilibria Tautomer equilibria are complex and dynamic, making modeling them a challenge. Cellular automata models are uniquely suited to address this challenge, allowing the equilibria to arise naturally from simple rules. In this study, a stochastic, asynchronous cellular automata model was employed to simulate the tautomer equilibrium of 9-anthrone

and 9-anthrol in the presence of their common anion. The observed K_E of the 9-anthrone \rightleftharpoons 9-anthrol tautomerization along with the measured tautomer pK_a values were used to model the equilibrium at pH values 4, 7, and 10. At pH values 4 and 7, the anthrone comprised >99% of the total species population, whereas at pH 10 the anthrone and the anion each represented just under half of the total population. The anthrol population was very small under all conditions.

64. Matthew Larson, Jerry Clark and John Middendorf
Program: Physics, CoSM Mentor: Jerry Clark, Physics, CoSM

***In situ* Selective Spectral Monitoring of Titanium Ablation Emissions in Additive Manufacturing Processes** The additive manufacturing (or more colloquially the 3D printing) industry is a fast-growing scientific field with high technical significance, but also a large number of faults. One of the largest issues in additive manufacturing is the current inability to produce parts with consistent build quality. In order to gain greater consistency, the first step is the development of monitoring techniques that can detect errors during processes. In Selective Laser Melting Additive Manufacturing (SLM-AM) a highpowered laser is used to melt metal or ceramic powders in two-dimensional slices based on a threedimensional model. During this process, the high temperature of the melted powder results in the production of a plasma with a characteristic emission profile of the ablated material. Through the use of photodetector with a spectral filter specifically chosen to monitor the dominant emission feature of titanium, the ability to detect variations of intensity that are characteristic of the build conditions has been shown. This allows for the real-time detection of locations within the build that have been disturbed by deposits of soot from sections of the build melted before the monitored location. The utilization of the selective spectral monitoring process allows for rapid detection of errors which is the first step towards the real time correction of structural defects within SLM-AM processes.

65. Baylee Stark and Stacey Hundley
Program: Environmental Sciences, CoSM Mentor: Stacey Hundley, Earth & Environmental Sciences, CoSM
A Scale-Up Classroom vs. a Traditional Instructor-Led Classroom: A Comparison of Learning Gains in an Earth Science Course
In 2015 Wright State University opened the doors to the new innovative Student Success Center with classrooms and resources available to students supporting active learning pedagogies. While many

studies have been conducted with physics students, active learning design has seen positive results in multiple disciplines (Beichner, 2008; Foote *et al.*, 2014; Gaffney *et al.*, 2008; McConnell and Ryker, 2013); however, there has been a deficit in active learning research in the Earth Sciences. For many years the Earth & Environmental Sciences Department has offered a physical geology course, The Dynamic Earth, to non-science undergraduate students. This course fulfills a natural science requirement within the Wright Core. In the fall of 2015 a section of The Dynamic-Earth was taught for the first time using a Student-Centered Active Learning Environment with Upside-down Pedagogies or SCALE-UP format. Due to the success of this pilot course, a section of The Dynamic Earth was again taught using the SCALE-UP format classroom during the fall of 2016. A second section of this course was also conducted using a traditional instructor-led lecture method. Student learning was assessed in both sections based on the administration of the Geoscience Concept Inventory (GCI). Student learning gains were determined through pre- and post-test analysis. Upon completion of the course, students also expressed their opinions through the Student Assessment of Learning Gains (SALG). A comparison of learning gains between the two teaching methods was then conducted. Furthermore, correlations between specific demographic groups and successes in the two classroom styles were analyzed.

66. Dharminder Singh Langri, Jeremy Kress, Daniel J Rohrbach and Ulas Sunar
Program: Biomedical Engineering, CECS Mentor: Ulas Sunar, Biomedical Industrial & Human Factor Engineering, CECS
Monitoring Functional Response in Brain Using Optical Imaging Brain Injuries due to hypoxia or asphyxia causes death of approximately more than 4 million neonates. Thus, there is a need for monitoring of cerebral oxygenation for this high-risk population. Present commercial devices are bulky and/or expensive. For neonates, the device needs to be compact and light-weight and preferably wireless for noncontact continuous brain response monitoring with minimal risk and perturbation to the subject while performing different tasks. Thus, my work focuses on constructing highly sensitive to brain, compact, wireless and inexpensive device that can be used for monitoring the brain functional brain by quantifying cerebral oxygenation and metabolism in intensive care units.

67. Andrew Stacy, Jin Zhang, Michael P Craig, Natasha T Hill and Madhavi P Kadakia
 Program: Biomedical Sciences, CoSM Mentor: Madhavi Kadakia, Biochemistry & Molecular Biology, CoSM & BSoM **Δ Np63 α and TIP60: Potential Implications in Cancer and Aging** Δ Np63 α , a p53 transcription factor family member, is the dominant p63 isoform in the basal layer of the skin. Δ Np63 α plays a vital role in epithelial morphogenesis and is up-regulated in non-melanoma skin cancers, such as basal cell and squamous cell carcinomas, implicating it as a proto-oncogene. Previously, it was demonstrated that p53 is a direct target of the Tat Interacting Protein 60 kDa (Tip60) histone acetyltransferase (HAT). Due to the high homology between p53 and Δ Np63 α , we investigated whether Tip60 can target and alter Δ Np63 α function. Overexpression of Δ Np63 α with increasing levels of Tip60 resulted in a dose dependent increase in Δ Np63 α protein, while Tip60 protein was likewise found to increase in a dose dependent manner with increasing levels of Δ Np63 α . Furthermore, silencing endogenous Tip60 diminished endogenous Δ Np63 α protein levels. Co-expression of Δ Np63 α with a Tip60 HAT domain deletion mutant revealed Δ Np63 α expression levels are not affected in opposition to wild type Tip60. By contrast, Δ Np63 α protein levels were elevated when co-expressed with a Tip60 double sumoylation mutant which retains its acetyltransferase ability. This demonstrates the importance of Tip60 HAT activity in influencing Δ Np63 α expression. Analysis by qPCR revealed that higher Δ Np63 α protein levels upon Tip60 coexpression are not due to an increase in transcription. Inhibition of protein biosynthesis by cycloheximide demonstrated an increased Δ Np63 α half-life in the presence of Tip60. Taken together, these results indicate that Δ Np63 α is regulated by Tip60 at the post-translational level. Δ Np63 α and Tip60 were found to co-localize and co-precipitate using immunofluorescence and immunoprecipitation, respectively. Preliminary evidence demonstrates that Tip60 coexpression results in increased Δ Np63 α acetylation. Collectively, these data suggest that Tip60 stabilizes and modulates Δ Np63 α levels by acetylating Δ Np63 α at one or more lysines. These results suggest a potential biologically relevant interaction between Δ Np63 α and Tip60 which requires further investigation.

68. Matthew Miller, Becca Ewing and Jason Debel Program: Physics, CoSM Mentor: Jason Deibel, Physics, CoSM **Stars!** A set of three Mira type variables, X Cen, RX Cen, and RS Lib, were

observed over a period of one week. These stars were chosen because their periodic magnitude was expected to maximize during the time of observation, making them ideal candidates. The magnitudes of the variable stars were determined using Astrometrica software and are compared to the known literature values. Any change in the magnitudes from night to night is also reported.

69. Amjad Aljagthmi, Natasha T Hill, Suraj Sakaram and Madhavi Kadakia
 Program: Biochemistry and Molecular Biology, CoSM Mentor: Madhavi Kadakia, Biochemistry & Molecular Biology, CoSM & BSoM **Δ Np63 α suppresses EMT by Targeting RAC1 through mi320a** Δ Np63 α , a member of the p53 family of transcription factors, is overexpressed in a number of cancers and known to play a role in proliferation, differentiation, migration and invasion. Δ Np63 α has been shown to regulate several miRNAs that play a role in both development and cancer, but to date there has not been a global analysis of p63-regulated miRNA. Our laboratory has identified a number of Δ Np63 α -regulated miRNAs using RNA-Seq analysis performed on RNA isolated from HaCaT cells transfected with non-silencing control siRNA or siRNA specific to p63. We identified a novel miRNA, miRNA-320a which is positively regulated by p63. Previous studies have shown that miRNA-320a is downregulated in colorectal cancer and targets Ras-related C3 botulinum toxin substrate 1 (RAC1), leading to a decrease in non-canonical WNT signaling and EMT and thereby a corresponding decrease in tumor metastasis and invasion. We hypothesize that Δ Np63 α decreases cell migration and invasion through down-regulation of RAC1 activity via miRNA-320a in colorectal cancer cells. We showed that knockdown of Δ Np63 α in HaCaT and A431 cell lines lead to a decrease in miRNA-320a levels and a corresponding increase in the phosphorylation of RAC1 at Ser71, while overexpression of Δ Np63 α in SW480 and Caco2 cells led to an increase in miRNA-320a message and a decrease in the phosphorylation of RAC1. Taken together, our data suggest that Δ Np63 α -mediated increase in miRNA-320a levels has potential implications for cancer migration and metastasis.

70. Remona Chamodi Saumya Heenkenda Mudiyansele, Chein Poon, Daniel Rohrbach, Jeremy Cress and Ulas Sunar Program: Physics, CoSM Mentor: Ulas Sunar, Biomedical, Industrial & Human Factors Engineering, CECS **Fast Characterization of Skin Disease with Snap-Shot Spatial Frequency Domain Imaging**

Spatial frequency domain Imaging (SFDI) is a non-invasive, non-contact wide field imaging modality that allows quantification of tissue optical and vascular contrasts. A single snapshot method is implemented for real time imaging at the clinical settings. Here we will show the system characterization and application on skin cancer detection and characterization. 3D profile correction is also implemented for correction for the cases of rough surfaces. Our results indicate that the system can quantify clinically-relevant parameters within 5% error.

71. Erin Berberich Taylor Haggy-West, Rebekah Bower and Scott Bruce Program: Athletic Training, CEHS Mentor: Scott Bruce, Kinesiology and Health, CEHS **Factors Contributing to the Work-Life Balance of Athletic Trainer-Mother Employed in the Secondary School Setting**
Context: Every year female athletic trainers leave the profession either temporarily or permanently when they become pregnant or when they desire to start a family. The hours and demands upon the young athletic trainer often creates an internal conflict. Research has explored the work-life imbalance collegiate athletic trainers, but this has not been studied in the secondary school level athletic trainer.
Objective: The purpose of this research project is to determine what factors and strategies contribute to the work-life balance of female athletic trainers who are mothers, working in the secondary school setting.
Design: Qualitative study, phenomenologic design
Setting: Female athletic trainers, from NATA District 4 working in the secondary school setting, and were mothers were surveyed. .
Participants: Inclusion criteria for this study were District 4, female athletic trainers, mothers, secondary school setting
Data Collection: A 16 item survey was sent to 1000 certified athletic trainers that fit our inclusion criteria through the NATA Research Survey Service. Both quantitative and qualitative data were gathered from this survey
Results: To be determined
Conclusions: To be determined
Key words: Female, athletic trainers, mother, work-life balance, secondary school setting, burnout

72. Brinna Price and Gary Burns Program: Psychology, CoSM Mentor: Gary Burns, Psychology, CoSM **Grit and Satisfaction in Elite Athletes: The Mediating Effects of Goal Attainment**
 Recent research has aimed to discover the differences between those who succeed and those who do not. Some researchers believe that the differences may be talent, intelligence, or situational circumstances.

Angela Duckworth (2007) believes that this difference lies in a construct called grit: a combination of passion and perseverance in the pursuit of long-term goals. Previous research has found support for this theory. Because grit has been linked to success when it is measured in objective terms, then grit should also be linked to success when measured subjectively. One study examines the progress made towards individual goals in order to measure success according to the one's unique goals (i.e., goal attainment). Based on current research which reports a relationship between success and satisfaction, goal attainment should also be correlated to satisfaction. With this relationship in mind, previous research has found that grit should also be related to satisfaction, though the relationship requires further investigation. Because grit is defined as the passion and perseverance of long-term goals, theoretically the relationship between grit and satisfaction should be higher when the individual feels as though their personal goals are being attained. Thus, this study will examine the relationships between grit, goal attainment, and satisfaction in the context of collegiate athletes. In order to collect data, a questionnaire will be distributed to all current Division 1 student-athletes at Wright State University via email. The questionnaire will measure grit, global life satisfaction, global sport satisfaction, and goal attainment. It is hypothesized that goal attainment will mediate the positive relationship found between grit and global life satisfaction and grit and global sport satisfaction.
Keywords: Grit, Goal Attainment, Satisfaction, Sport Satisfaction, Life Satisfaction

73. Zachary Sirois, Brett Meeks, Eric Kiskaddon, Andrew Froehle, Jessica Shroyer and Richard Laughlin Program: Medicine, BSoM Mentor: Richard Laughlin, Orthopaedic Surgery, BSoM **Investigating the Psychomotor Proficiency of Novice Subjects Using Fundamentals of Arthroscopic Surgery Training (FAST)**
 Orthopaedic surgery residency programs utilize simulation approaches to increase resident aptitude in technically demanding areas of orthopaedics such as arthroscopy. Although simulation use is becoming more common in resident education, relatively few studies in the literature have evaluated the efficacy of arthroscopic simulators. Moreover, little is known about how quickly these simulators can increase the arthroscopic proficiency of inexperienced subjects. The purpose of our study is to investigate the efficacy of the Fundamentals of Arthroscopic Surgery Training (FAST) workstation with respect to increasing psychomotor proficiency of novice first-year medical students. The FAST workstation consists of

interchangeable modules that correlate with different arthroscopic maneuvers. The specific modules utilized included “Simple Probing and Targeting”, “Resection Passage”, “Maze”, and “Vertical Ring Transfer.” Evaluated measures included: time to task completion for all individual modules, track deviation (Maze only), drops/peg losses (Vertical Ring Transfer only), and punctures outside the limit (Resection Passage only). Scores were analyzed using a one-way repeated measures ANOVA design that tested for overall trends in the amount of time and total errors that occurred during the study. Across the full 6-week period, average time to complete all modules at the workstation decreased significantly ($p < 0.001$), with a mean reduction in total workstation time of 21.9 min ($s = 8.12$ min). This overall reduction was built on significant reductions in the individual module times for Probing and Targeting (4.4 min, $p < 0.001$), Maze (5.2 min, $p < 0.001$), Peg Transfer (7.5 min, $p < 0.001$), and Resection Passage (4.8 min, $p < 0.001$). Error rates also decreased significantly over the full 6-week study period, including fewer peg losses ($p < 0.001$), and fewer instances of track deviation ($p = 0.011$). These results demonstrate that scheduled use of the FAST workstation significantly increases the task performance of novice participants over a 6-week period.

74. Donnie Peterson and Don Cipollini
Program: Environmental Sciences, CoSM Mentor: Don Cipollini, Biological Sciences, CoSM
Distribution, Impacts, and Adult Longevity of Emerald Ash Borer (*Agrilus planipennis*) on White Fingertree (*Chionanthus virginicus*)
Emerald ash borer (EAB), *Agrilus planipennis*, is an invasive pest of ash trees (*Fraxinus* spp.) in North America that was recently found infesting white fringetree (*Chionanthus virginicus*). Initial reports of the infestation of white fringetree by EAB occurred in southwestern Ohio and Chicago, IL. We examined white fringetrees at additional sites in Illinois, Indiana, Ohio, and Pennsylvania in Summer and Fall 2015 and Winter 2016 for EAB infestation. Our aim was to examine white fringetrees at a limited number of sites with EAB infestation and to relate tree size, crown dieback, epicormic sprouting, tree sex, and adjacency to ash or white fringetrees with the likelihood of beetle infestation. A higher proportion of infested trees exhibited epicormic sprouting and the likelihood that a tree was infested increased with increasing crown dieback, variables that may be both predictors and responses to attack. The proportion of trees infested with EAB increased with increasing tree size. Signs consistent with EAB infestation were found in 26% of 178 white fringetrees with at least one host infested at each site in all states. Infestation rates of

white fringetrees increased with the density of white fringetrees at each site. The Chicago Botanic Garden site had a significantly lower infestation (3.7%) than other sites, which may be due to proactive management of ash. Overall, these data indicate white fringetree has been utilized by EAB throughout their overlapping ranges in the United States in ornamental settings likely due to ecological fitting.

75. Timothy Williamson, James M Readler, Priyanka Sharma, Jeffrey B Travers and Katherine JDA Excoffon Program: Biological Sciences, CoSM Mentor: Katherine Excoffon, Biological Sciences, CoSM
Platelet Activating Factor Receptor Expression Correlates with Decreased Adenovirus Infection
Treatment for respiratory viruses is rooted in the understanding of the factors that increase and decrease the susceptibility of the patient to the pathogen. For most human adenoviruses, the primary receptor is the Coxsackievirus and adenovirus Receptor (CAR), a protein that regulates cell-cell adhesion of polarized epithelia. CAR is characterized into two transmembrane-containing isoforms, CAR^{Ex7} and CAR^{Ex8}, which differ by 13 amino acids at the extreme C-termini. CAR^{Ex7} is the more abundant isoform of CAR. CAR^{Ex7} resides at the basolateral membrane of cells where it can regulate cell-cell adhesion, but is hidden from airborne viruses. CAR^{Ex8}, while less abundant, resides at the apical surface of polarized epithelia where it can facilitate apical viral binding and infection of polarized epithelia. Platelet activating factor (PAF) is a lipid mediator that activates platelet aggregation and degranulation, inflammation, and IL-8 expression. Our group has previously found that interleukin 8 (IL-8), a proinflammatory cytokine and neutrophil chemoattractant, increases protein expression of CAR^{Ex8} via activation of AKT/S6K and inhibition of GSK3 β . We hypothesized that PAF may induce CAR^{Ex8} expression and increase adenovirus infection. Nasopharyngeal carcinoma cells that either were normal or deficient for the PAF receptor were infected with recombinant adenovirus encoding *LacZ* in a dose dependent manner and analyzed with a β -galactosidase assay to determine viral infection. CAR^{Ex8} expression was measured by Western blot and quantified relative to actin and total CAR. Contrary to our hypothesis, the cells expressing the PAF receptor had less CAR^{Ex8} and significantly lower adenovirus infection than cells without the receptor. Future studies will investigate how CAR^{Ex8} expression and adenovirus infection correlate with PAF receptor expression and activity after polarization into an epithelium.

76. Jenna Falldorf and Anna Lyon

Program: Early Childhood Education, CEHS Mentor: Anna Lyon, Teacher Education, CEHS

Service Dogs in Elementary Classrooms

The Americans with Disabilities Act (ADA) was signed into law in 1990 by President Bush. Although the ADA includes laws about public access rights for people with disabilities and their service animals, many schools are reluctant to have service animals (that are partnered with children with disabilities) included in early childhood classrooms. Teachers that have had experience with working animals in their elementary classrooms have reported many benefits, not only for the student with a disability, but for the other students in the classroom as well. Research on dogs in classrooms has shown potential social, behavioral, and academic improvements in students. However, many parents of children with service animals have reported facing significant challenges when attempting to integrate their child's service animal into their classroom environment. The purpose of this study is to examine the experiences of early childhood educators who have had or who may have service animals in their classrooms.

77. Nasser Ibrahim M Alhamdan and Courtney Sulentic

Program: Microbiology & Immunology, CoSM Mentor: Courtney Sulentic, Pharmacology & Toxicology, BSoM

Genomic vs Non-Genomic Role of the AhR in Human Immunoglobulin Expression

The immunoglobulin heavy chain (*Igh*) locus is expressed only in B-lymphocytes and encodes the heavy chain protein that is an essential component of antibodies. The *Igh* gene has a large transcriptional regulatory region (i.e. 3'*IghRR*) containing enhancers that assist the B cell to produce different Ig isotypes. In humans, there are two regulatory regions and each has three enhancers (hs3, hs1.2, and hs4) whereas mice (the primary model used to study *Igh* gene expression) have only one regulatory region but four enhancers (hs3A, hs1.2, hs3B, and hs4). The human hs1.2 enhancer is known to be polymorphic and is associated with multiple autoimmune disorders. The ligand-activated transcription factor, aryl hydrocarbon receptor (AhR), has been shown to inhibit mouse 3'*IghRR* activity when activated by the high affinity environmental contaminant 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). In animal models, inhibition of the 3'*IghRR* appears to mediate TCDD-induced inhibition of B-cell differentiation into antibody-secreting cell. In order to elucidate the role of the AhR in human Ig expression and isotype switching, we used an AhR antagonist (AhRA). Recent

studies in our lab using a mouse B-cell line demonstrated that AhRA inhibits AhR-mediated signaling and reverses the TCDD-induced inhibition of antibody secretion. In contrast, treatment of a human B-cell line with AhRA induced an unexpected increase in IgG secretion. Therefore, we hypothesized that the AhRA, which prevents the AhR from translocating to the nucleus and binding DNA, could influence interactions of the AhR with other cytosolic signaling proteins. The objective of the current study was to evaluate the effect of the AhRA on the activation (i.e. phosphorylation) of signaling proteins by Western blot analysis and by luciferase reporter plasmids. Our results to date suggest that the AhRA has no effect on the phosphorylation of STAT3, Src, or Erk proteins, and no effect on NFκB transcriptional activity. Ongoing studies are focused on analyzing more signaling proteins, such as other STAT proteins and AP-1 transcriptional activity. Determining the role of the AhR in human Ig expression could provide new insight into potential environmental triggers of immune disorders and provide new targets for drug development.

78. Sarah Tritle and Tony Somers

Program: Supply Chain Management, RSCoB Mentor: Tony Somers, PackH2O

PackH2O – Pure Water for the Thirsty

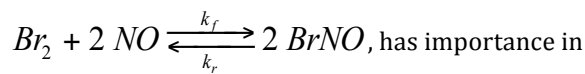
PackH2O is a non-profit organization that manufactures and distributes special water-carrying backpacks (called PackH2Os) to people in need of them around the world, namely women in Africa who travel long distances to acquire water. A case study was performed to determine the most economic and efficient ways to market and distribute PackH2Os among African countries.

A solution to this problem included distributing PackH2Os beside major watering holes. Women who would come to collect water for their families would bring the backpack back to their villages and market the product themselves. Another solution was to set up small, PackH2O manufacturing facilities in the countries in most need of the backpacks. This would provide both job opportunities and more backpacks to targeted peoples. These solutions were presented to the CEO of PackH2O, and he implemented them. Because of these solutions, hundreds of families now have access to large and long-lasting quantities of clean water.

79. Joel Schmitz and David Dolson

Program: Chemistry, CoSM Mentor: David Dolson, Chemistry, CoSM **An Equilibrium Kinetics Study of Nitrosyl Bromide (BrNO) Formation**

The gas phase reaction of bromine and nitric oxide to produce nitrosyl bromide,



has importance in atmospheric kinetic modeling and in the chemistry of an infrared NO ($v=2 \rightarrow 1$) laser that is excited by E-V energy transfer from spin-orbit excited $\text{Br}^*(^2P_{1/2})$ atoms arising from photolysis of Br_2 . Previous studies of this reaction have employed methods such as laser photolysis and pseudo first- or second-order kinetics. This present research investigation has used two experimental methods. One is to mix the two reactants and fit the early time reaction observations to a third-order integrated rate law for only the forward reaction. The second, relaxation kinetics method, imposes an “instantaneous” perturbation on the reaction initially at equilibrium, and then monitors the reaction system’s return to equilibrium. The time dependence of the equilibrium approach can yield the forward and reverse rate coefficients for the reaction. In this work a rapid volume expansion of the equilibrium gas mixture serves as the perturbation. In both methods, the equilibrium constant of the formation of BrNO is determined from equilibrium partial pressures. The forward rate coefficient determined from early time observations of the formation reaction, $k_f = 1.55(5) \times 10^{-5} \text{ torr}^{-2} \cdot \text{s}^{-1}$, combined with the equilibrium constant, $K = 0.26(3) \text{ torr}^{-1}$, yielded a reverse rate coefficient, $k_r = 6.4(6) \times 10^{-5} \text{ torr}^{-1} \cdot \text{s}^{-1}$. Agreement with literature is good ($k_f = 1.6(2) \times 10^{-5} \text{ torr}^{-2} \cdot \text{s}^{-1}$, $k_r = 7(1) \times 10^{-5} \text{ torr}^{-1} \cdot \text{s}^{-1}$, $K = 0.23(2) \text{ torr}^{-1}$), demonstrating the validity of this experimental method. Relaxation kinetics results are included in the poster.

80. Yiyun Dai, Todd Rapetti and David

Ladle Program: Biomedical Sciences, CoSM
Mentor: David Ladle, Neuroscience, Cell Biology & Physiology, CoSM & BSoM

Analysis of Proprioceptive Sensory Input on Renshaw Cells in Neonatal Mice

As computers, the function of the nervous system depends on neural circuits. Appropriately connected neural circuits allow neurons to receive specified input signal and generate correct output. How neurons could accurately select their targets from a spectrum of similar neurons remains largely unknown. Neural circuits between primary sensory neurons and spinal interneurons provide an attractive model system for such studies. Renshaw cells (RCs) are inhibitory interneurons in the ventral spinal cord that prevent motor neurons from over-firing. Recent studies have identified that RCs receive sensory input in developing animals, but the knowledge regarding the connectivity pattern and formation mechanism of this circuit is limited. This study aims to 1) determine the

connectivity pattern of sensory-RC circuits in the neonatal mice (P0/P1) by using immunohistochemistry and light confocal microscopy, and 2) determine if neural activity affects the development of sensory-RC circuits through blocking the synaptic transmission of sensory neuron in transgenic mice (PVCre:: Munc18 KO). By selectively labeling 2 sets of sensory neurons (Obturator and Quad) that innervate different muscle via retrograde tracing with fluorescent dextrans, we found RCs in the spinal cord selectively receive 2-fold more sensory input from obturator nerve than quadriceps nerve, even though the total amount of obturator neurons is less than quad neurons. We also found the sensory-RC circuits seems to be formed in an activity independent manner. We expect our results to provide a deeper understanding of sensory-interneuron circuit in the central nervous system, and help elucidate the different mechanisms of neural circuit formation.

81. Emily Warren, Audrey E McGowin, Rebecca E Teed and Scott Sanders

Program: Earth & Environmental Science, CoSM
Mentor: Audrey McGowin, Chemistry, CoSM

Source Determination of Arsenic, Lead, and Cadmium in the Yellow Spring Sediment in Glen Helen Nature Preserve, OH

Arsenic, lead, and cadmium have been found at elevated levels in the sediment of the “Yellow Spring” located in Glen Helen Nature Preserve in Yellow Springs, Ohio (A. McGowin, unpublished results). The Yellow Spring is named for the bright orange travertine deposits that are rich in iron. My research was to determine whether the arsenic, lead, and cadmium in the sediment were occurring naturally in the spring or coming from the pipes that are used in the construction of the man-made structure from which the artesian spring flows. I collected sediment samples from three surrounding sights for comparison. The first three sample sites were the Yellow Spring sediment, the “Grotto” sediment (a waterfall just downstream), and a second site further downstream site. Another site was soil from the root zone of a fallen tree that is also rich in iron, from which three samples were taken. A total of six samples, each sample split into four replicates for analysis. Samples were digested in acid following USEPA Method 3050B and analyzed for iron, arsenic, lead, and cadmium using inductively-coupled plasma-optical emission spectrometry (ICP-OES) following EPA Method 200.7. Statistical analysis of the results indicate that arsenic, lead, and cadmium occur naturally in minerals that are distributed throughout Glen Helen.

82. Goonmeet Kaur Bajaj, Air Hossein Yazdavar, Krishnaprasad Thirunarayan & Amit Sheth Program: Computer Science, CECS Mentor: Amit Sheth, Computer Science, CECS
Analysis of Geographical Distribution of Depression in the Twitter Population Depression is a highly prevalent global public health concern and challenge. According to the World Mental Health Survey conducted in 17 countries, on average, about 5% of people reported having an episode of depression in 2011. Depression is also affecting 15 million or about 6.7% American adults each year. Traditional survey-based methods conducted via questionnaires for monitoring depression, mainly suffer from underrepresentation as well as sampling bias (due to small group of respondents). Often teenagers and college students are poorly represented in these methods, even though a recent study conducted by the National Youth Mental Health Foundation revealed that 83% of the 2600 university and vocational school students surveyed claimed that they suffered from stress, 79% reported anxiety, and 76% experienced “low moods”. Millions of people express their moods, feelings, and daily struggles with mental health issues via social media platforms. Insights gleaned from social media such as Twitter can complement the current survey-based methods and assist both governmental and non-governmental organizations in policy development for managing clinical depression. For instance, the following Twitter profile @BeyondBrokenDep self-declares: “Trying to survive in this {f*****} up crazy world, Diagnosed with Social Anxiety, Severe Depression, ADHD, OCD, BPD, SH, Suicidal Tendencies”. Additionally, @suicidalfreak28 tweeted “I could just slit my throat and die from bleeding tonight”. In this study, we examine big (social) data for recognition and screening of depression in population. By incorporating geographical analysis of user-generated content on social media, we can capture depressive behavior in this population and study their access to and utilization of mental health services. Our geographical analysis findings in social media correlate with depression statistics reported by the Substance Abuse and Mental Health Services Administration (SAMHSA). Such crucial insights can assist policy designers investigate influence of location, socio-ecological and environmental factors on depressive behavior in populations, and help determine the nature and location of additional help centers.

83. Megan Reed, Erica Strobe, Justin Myers, Silvia Newell and Mark McCarthy Program: Biological Sciences, CoSM Mentor: Silvia Newell, Earth & Environmental Science, CoSM
Does Pore Size Really Matter? Impact of Filter Size on Nutrient Monitoring Methods Eutrophication is a major issue in aquatic systems and is largely caused by nutrient loadings such as nitrogen and phosphorus. Generally, nutrient concentrations in a water sample are determined by filtering to remove any microorganisms that may alter the nutrient concentration. The use of filter pore sizes larger than organisms present, and/or extended amounts of time between sample collection and filtration can lead to inaccuracies in nutrient concentrations, due to the biological activity occurring in the samples. An assessment of ammonium and orthophosphate concentrations at 28 freshwater sites was completed using three different filter sizes, 0.2 μm , 0.45 μm , and 0.7 μm , over a time period from immediate filtering in the field, filtering five hours after initial sample collection, and filtering 22 hours after initial sample collection with light and dark samples. Preliminary results show significant differences in ammonium and phosphate concentrations between using 0.2 μm filters and 0.7 μm filters. Additionally, filtering immediately in the field versus several hours later, both under light and dark conditions, resulted in significant differences in measured concentrations. Our data suggest that current sampling protocols, such as EPA methods, may require modifications to ensure that accurate nutrient concentration values are being reported.

84. Megan McMurry, Keturah Fulton and Scott Bruce Program: Athletic Training, CEHS Mentor: Scott Bruce, Kinesiology & Health
Does Therapeutic Taping Aid in Pain Control: A Meta-Analysis
Objective: The purpose of this study was to conduct a meta-analysis to assess the value of therapeutic taping for pain relief.
Data sources: PubMed, Google Scholar and the WSU Library databases were used to search for the studies used in this meta-analysis.
Study selection: The search terms used in this study were Kinesio Tape® , KT tape, therapeutic tape, therapeutic taping, pain, & visual analog scale (VAS). The inclusion criteria for this study were articles in English, from peer-reviewed journals, use of a visual analog scale (VAS) to quantify pain levels and full text available through the university library. The exclusion criteria were subjects < 18 y/o, or > 45 y/o, not using a VAS to quantify pain levels, or main outcome of the

study was something other than the subjects' pain levels.

Data extraction: From an initial search that yielded 4,537 articles. This was paired down to 21 articles that accurately met the search criteria. Researchers independently evaluated these articles and agreed on the final 8 articles used in the meta-analysis.

Data synthesis: To be determined

Conclusions: To be determined

Key Words: Therapeutic tape, Kinesio Tape, pain, visual analog scale

85. Victoria Jobe, Jadyn Barga, Jessica Martin, Tiphani Moss, Dragana Claflin & Psy 3930 Class Spring 2017 Program: Psychology, CoSM Mentor: Dragana Claflin, Psychology, CoSM **The Effects of Maternal Separation on Anxiety-Related Behaviors in Young Rats Using Elevated Zero Maze**

In altricial species, maternal separation creates an early life stressful experience in neonate rats, and has long-term effects on the development of anxiety-like behaviors in later life. The elevated zero maze (EZM) is a behavioral task commonly used in animal research, where time spent in the closed areas of the maze is correlated with higher anxiety. In the current experiment, we use the EZM to examine the presence of these behaviors. Animals were maternally separated during the pre-weaning period on postnatal days 15-17, and then subsequently tested on the EZM. Animals were separated into age groups and tested either on Day 24 or Day 32. Results showed no significant effects of maternal separation for either age group, though animals tested on Day 24 demonstrated more open arm entries than did animals tested on Day 32. The maternal separation paradigm used here was not sufficient to produce significant changes in anxiety-related behaviors, however older animals exhibited less exploratory behaviors.

86. Johana Barrientos, Samantha K Atkins & Philippe Sucusky Program: Mechanical & Materials Engineering, CECS Mentor: Philippe Sucusky, Mechanical & Materials Engineering, CECS **Does Abnormal Wall Shear Stress from the Bicuspid Aortic Valve Play a Role in Acute Calcific Aortic Valve Disease Pathogenesis?**

Purpose The bicuspid aortic valve (BAV) which consists of two leaflets instead of three in the normal tricuspid aortic valve (TAV), is a major risk factor for calcific aortic valve disease (CAVD). Abnormal BAV flow and wall shear stress (WSS) are presumed to play a role in the remodeling and inflammatory events leading to the onset and rapid progression of CAVD.

Objective The objective of this study was to assess potential changes in the expression of CAVD biomarkers in normal porcine valve tissue subjected in vitro to the WSS environments of the non-coronary (NC) and fused (F) BAV leaflets.

Methods WSS obtained from valvular flow simulations were replicated in vitro using a cone-and-plate bioreactor. Experimental groups consisted of a fresh tissue control group and normal tissue subjected to TAV, NC-BAV and F-BAV WSS. Immunohistochemistry, Western blotting and zymography were used to quantify enzymatic (MMP-2, MMP-9) and cytokine (BMP-4, TGF- β 1) expressions.

Preliminary Findings Tissue exposed to TAV WSS did not exhibit significant differences in expression from the fresh controls. Tissue subjected to NC-BAV and F-BAV WSS had significantly higher MMP-2 (4.3 and 1.8 fold, respectively) and MMP-9 (2.0 and 5.4 fold, respectively) expression versus controls after 24 hours. No significant differences were obtained in terms of cytokine expression across all groups at 24 hours. Results from the 48-hour time point have yet to be analyzed. Preliminary findings indicate the ability of NC-BAV and F-BAV WSS to trigger an acute remodeling response within 24 hours of exposure.

87. Nick Buckner, Nate Houck, Denver Huff, William Osborn & Darien Pooler, Dragana Claflin & Psy 3930 Class Spring 2017 Program: Psychology, CoSM Mentor: Dragana Claflin, Psychology, CoSM **Effect of Maternal Separation on Adolescent Rat Behavior Using and Illuminated Open Field**

Maternal separation (MS) during adolescence has previously been shown to elicit anxiety-like behaviors in human and non-human models, such as rodents. Studies show that rats in particular develop cognitive deficits, social impairments, increased levels of fear and anxiety-like behavior, as well as depressive-like behavior after periods of MS, when compared to control rats. Studies support the idea that bright light causes an increased fear response in rats, this may be in part due to evolutionary pressures whereby rats are more exposed to predators in well-lit, open environments. For this reason, the current study compared the behaviors of maternally separated rats and control rats in an illuminated open-field (IOF) apparatus, with a light/dark gradient marked into 4 zones, and time spent in an all-dark phase and a light-gradient phase. Locomotion, indicated by amount of crossovers between zones, was measured, as well as zone preference. A lack in locomotion and preference for dark was assumed to be more of a fear response. Results indicated that locomotion (or crossovers) did

not significantly differ between the MS group and the control group, and both MS and control rats showed a significant preference for zone 4, the darkest zone. Our research supports previous IOF testing in that both groups demonstrated typical bright light avoiding behavior, preferred zone 4, and had decreased latency to zone 4 during light phase. The mild maternal separation paradigm used here was not sufficient to produce behavioral differences in this study.

88. Benjamin Lewis, Ashan Mian, Raghavan Srinivasan, Jonah Leary, Amand Bucher, Cynthia Dickman, Walter Petroski, Abbie Morneault, Victoria Bellows and Diondra Copeland Program: Material Sciences & Engineering, CECS Mentor: Ahsan Mian, Mechanical & Materials Engineering

Energy Absorption Capability of 3D Printed Polymer Structures with Spherical and Octahedral Pores

The main goal of the research was to understand the energy absorption capabilities of 3D printed ABS and PLA thermoplastic polymer structures with varying pore geometries and differing degrees of porosity. Samples were rectangular prisms with dimensions of 25mm x 25mm x 20mm made up of 100 unit cells. Each unit cell comprised of a cube with side length 5mm. To make porous rectangular prisms each cubic unit cell had a void located at the center of the unit cell. The ABS samples had voids with an octahedral geometry while the PLA samples had voids with a spherical geometry. Three variations of pores were produced: pores completely contained within each unit cell, pores with their largest cross sectional length being 5mm, and pores that intersected one another. It was observed that the specific energy absorption increases nonlinearly as the porosity of the sample increases. The mechanical compression test data shows that as the voids intersected each other, the specific energy absorption increases at a much higher rate than when the voids are contained within the unit cells.

Supported by NSF REU Grant# EEC 1640528 and NSF RET Grant# EEC 1405950

89. Don Hoang, Selvakumar Jayaraman, & Kuppaswamy Arumugam Program: Biomedical Engineering, CECS Mentor: Kuppaswamy Arumugam, Chemistry, CoSM
Gold (I) Complexes Containing Alkylated Ferrocenes: The Beginning of a New Generation of Organometallic Anti-Cancer Compounds
Implementing redox-active organometallic compounds can increase intracellular reactive oxygen species (ROS) levels, leading to oxidative stress and

eventually apoptosis in neoplastic cells. It is hypothesized that reducing the redox potential of the compound would facilitate redox processes, increasing the overall potency of the compound. Accordingly, the goal of the project is to synthesize imidazolium salts that could allow for tuning of redox potential in ferrocenyl-N-heterocyclic carbene gold (I) complexes. Carbamoyl ferrocene seemed to provide the best route to the desired imidazolium salts. The next steps are lithiation of carbamoyl ferrocene followed by electrophilic substitution and Friedel-Crafts acylation of carbamoyl ferrocene. Once the imidazolium salts are prepared, they will be subjected to preparation of gold (I)-N-heterocyclic carbenes.

90. Munjed Milhem, Abigail E Schmidt, Noah A Koraym & Dragana Claflin Program: Biomedical Engineering, CECS Mentor: Dragana Claflin, Psychology, CoSM

Context Fear Conditioning Using Periorbital Shock Instead of Foot Shock

The purpose of the current study is to establish optimal parameters for context fear conditioning using peri-orbital shock in juvenile rat pups. Rats were placed in a conditioning chamber for 3 minutes and then received one -100 ms shock at one of the three intensities of 1.5, 2, or 3 mA. The rats were removed from the chamber 30 seconds after the shock delivery. This process was repeated for 6 days and the 3 minutes before each shock delivery was coded for freezing behavior. The highest levels of freezing was observed in the 3 mA group, with them exceeding 60% freezing after the third shock. Half the animals in the 2 mA group exceeded 60% freezing after the fourth shock but the data was highly variable. The least variability between subjects was observed in the 1.5 mA group. The 1.5 mA shock intensity yielded the cleanest set of curves with the majority of animals exceeding 60% freezing after four shocks. These data demonstrate that contextual fear conditioning can be achieved using peri-orbital shock and that this paradigm may be a useful tool in future studies.

91. Michael Wadham and Jennifer Hughes Program: Social Work, CoLA Mentor: Jennifer Hughes, Social Work, CoLA
Social Worker's Salaries vs. Educational Debt Burden: A Losing Battle College tuitions rise at disparate rates with starting salaries and inflation, causing student debt to weigh on social work graduates. Data was collected from 701 social workers in an NASW - Ohio Chapter survey to investigate this disparity and its consequences. The purpose of this study was to analyze the qualitative data set, 174 written comments, for themes and perceptions. The following themes, echoed in current research on the topics of

social work salary and student debt burden, were identified: unmanageable debt and financial burden, varying lengths of time and repayment methods, social workers feeling undervalued and underpaid, loan forgiveness programs, and the need for greater advocacy for social workers' educational debt relief. The demand for social work is projected to grow; this research is important to help maintain the needed workforce so social workers do not leave the profession to pursue a living wage, or choose another path entirely.

92. Matthew Thomas, Melanie Morscher, Suneet Saghal & Mark Adamczyk Program: Medicine, BSoM Mentor: Mark Adamczyk, Pediatric Orthopaedics, Akron Childrens Hosp. **Onabotulinum Toxin A Injections to Triceps Unmasks Elbow Flexion in Infant Brachial Plexus Birth Palsy: A Case Series** Brachial plexus birth palsy (BPBP) is a neurologic injury to the upper extremity that occurs in 1/1000 live births.¹⁻³ BPBP varies in severity from mild to full paralysis; most severe cases require nerve surgery prior to 1 years of age.² Current literature suggests onabotulinum toxin A (BTX) as a treatment to regain elbow flexion, however, use in infants is not widely reported.^{1,3}

The purpose of this case series study was to assess using BTX injections to triceps of infants with BPBP in an attempt to unmask full elbow flexion.

Eight of the 21 patients received BTX injections to the triceps prior to 6 months of age. Four groups were compared: BTX only group (n=4), BTX with nerve surgery (n=4), nerve surgery only (n=2), or conservative treatment only (n=11). Indications for BTX injections included a Toronto score of < 1.3 at 3 months of age. Success was defined as regaining full elbow flexion without nerve surgery.

Success occurred in 50% of the 8 patients that received BTX injections < 6 month age. Once gained, full elbow flexion was maintained in all cases. The average age of BTX injections occurred at 4 months. All groups had the same average initial starting score (0.2), but quickly separated in terms of improvement, thus indicating appropriate intervention. No adverse reactions occurred from the BTX injections.

This case series study showed that BTX injections to infants with BPBP helped unmask elbow flexion and aided surgical decision making. BTX injections to infants with limited elbow flexion may reduce the need for nerve surgery; however, further studies are necessary.

93. Meghan Jenkins, Timothy L Williamson, Ibrahim A M Alkhoms, James M

Readler, Priyanka Sharma & Katherine Excoffon Program: Biological Sciences, CoSM Mentor: Katherine Excoffon, Biological Sciences, CoSM **Development of novel cell-penetrating PDZ Domains to Control Adenovirus Infection** Developing methods to regulate the protein levels and localization of the Coxsackievirus and Adenovirus Receptor (CAR) within the cell would be useful to both prevent opportunistic adenovirus infections, and increase the chance of infection for the purposes of adenovirus-based gene therapy. One isoform of CAR, encoded by all 8 exons of the *CXADR* gene, CAR^{Ex8}, is tightly regulated by the PDZ1 and PDZ3 domains found within the cellular scaffolding protein, Membrane Associated Guanylate Kinase, WW And PDZ Domain Containing 1 (MAGI-1). Whereas the PDZ3 domain is able to sequester CAR^{Ex8} within the cell to decrease levels of infection, the PDZ1 domain prevents this effect and allows CAR^{Ex8} to exist on the apical surface of polarized epithelial cells, where it can bind to adenovirus and increase levels of infection. We hypothesized that decoy PDZ1 or 3 domains would allow the up- or downregulation of CAR^{Ex8}, respectively. PDZ domains, connected to the HIV cell-permeable TAT sequence and a myc-tag for detection, were cloned into a prokaryotic expression vector. Domains were purified from Rosetta *E. coli*. MDCK epithelial cells were treated with purified TAT-myc-PDZ1 or TAT-myc-PDZ3 domains. Western blots were used to detect TAT-myc-PDZ domain entry into to the cell and CAR^{Ex8} levels. Entry was achieved, and a clear relationship was shown between increasing amounts of applied PDZ1 and PDZ3 domains and CAR^{Ex8} levels. Altogether, conjugation to the cell-permeating TAT peptide is an effective way to deliver PDZ1 and PDZ3 domains into cells for CAR^{Ex8} regulation. Future work will confirm the effect of PDZ domain activity on adenovirus infection.

94. Sarah Jindra, Angela L Bertagni & Steven Higgins Program: Chemistry, CoSM Mentor: Steven Higgins, Chemistry, CoSM **Hydrothermal Atomic Force Microscopy Investigation of Barite Growth: The Role of Spectator Ions** Mineralization of barite (BaSO₄) occurs in various geologic settings where barite scale formation can be problematic. To better understand the role of spectator ions in the aqueous solution growth of barite, the kinetics of elementary step edge growth on barite (001) surfaces have been studied under a wide variety of solution conditions. The results of these studies have been used to determine the effects of various electrolytes on elementary step kinetics. Hydrothermal Atomic Force Microscopy (HAFM) was used to investigate the effect

of background electrolytes (NaCl, NaBr and NaNO₃) as a function of saturation index, and ionic strength (*I*) on barite growth sourced at dislocations at 108 °C. Initial results show that hillock morphology is affected by *I*. The effect of increasing *I* on hillock morphology was observed in 0.05 M NaCl, but the effect was absent in 0.05 M NaNO₃, suggesting a specific interaction of Cl⁻ with the polar [010] step edge in contrast to NO₃⁻. The step rate coefficient increased when *I* was increased in NaCl solutions. Initial results for NaNO₃ further indicate an ionic strength effect on rate coefficients, however, the coefficients for NaCl tended to be larger than the NaNO₃ coefficient, possibly indicating an inhibitory role of nitrate towards the advancement of the non-polar <120> steps. These results indicate that *I* is a driver of hillock morphology in the instances where NaCl is the electrolyte. However, in the case of NaNO₃ there is no clear driver for the morphology.

95. **Grace Steingass** Jestin Bretz & Scott Bruce

Program Athletic Training, CEHS Mentor: Scott Bruce, Kinesiology and Health, CEHS **The Fencing Response in Concussions to NCAA FCS Football Players** **Context:**

The fencing response occurs when the affected individual receives a blow to the head or body, causing the person to lose consciousness. The body's response is to thrust the arms away from the body assuming an "en garde" position as seen in fencing. The only time this occurs is when an individual suffers a loss of consciousness (LOC). Other posturing presentations such as decorticate or decerebrate are usual indications of severe brain trauma. The literature reports loss of consciousness to occur in about 10% of all concussions. However, reporting of LOC is often subjective, especially in unwitnessed blows to the head or body leading to the neurometabolic phenomenon in the brain known as a concussion.

Objective: The purpose of this study was to observe video evidence of concussions sustained in NCAA Division I, FBS, college football to determine the presence or absence of a posturing mechanism.

Data Sources: Internet video of NCAA Division I, (FBS) football games. "YouTube" provided most of the video evidence used in this study.

Video Selection: Inclusion criteria for this study were NCAA Division I (FBS) intercollegiate football players with a reported concussion during the 2014-2016 football seasons, and video evidence of the blow that possibly caused the concussion. Concussion reports were gathered from media reports. To be included in the final assessment, videos must have clear evidence of the hit or blow experienced by the player sustaining the concussion and be of sufficient length to determine

if the player displayed one of the three postures: fencing, decorticate or decerebrate. Exclusion criteria included video of any other sport-related concussions or of football-related concussions from any other league or level other than FBS football games.

Data Extraction: Research team members searched the internet for all reported concussions and the related videos for the 2014 through 2016 football seasons. Video evidence was independently assessed by researchers to determine if the video met the inclusion criteria and whether or not a posturing response occurred. Video evidence was then evaluated by another research team member. In cases where disagreements between the researchers occurred on the presence or absence of posturing, the researchers discussed the video and reassessed. Further disagreement were settled by an expert in intercollegiate football.

Analysis: There were 329 concussions were reported in NCAA Division I (FBS) football for the 2014-2016 seasons Only 11.85% of the videos of reported concussions were found, and only 10.63% met the inclusion criteria. Of the 35 videos that were located and identified, 11 players were determined to have postured (31.43%)

Conclusion: The results of this study seem to indicate that posturing, an indication of LOC, occurs about 1/3 of the time. Health care practitioners involved in football, may need to focus more upon their athletes' possible posturing mechanisms as an indication of possible LOC.

Key Words: Concussion, Fencing Response, Football, NCAA Division I, Posture, Unconscious

96. **Amira Alsenbel**, Taylor Stuckert, Lori Williams, Harry McVey & Audrey McGowin

Program: Chemistry, CoSM Mentor: Audrey McGowin, Chemistry, CoSM **Heavy Metals in Lytle Creek and Indian Run** Limited macroinvertebrate biodiversity in Lytle Creek that runs through downtown Wilmington, OH has been documented over decades with the lowest in Lytle Creek at Sugar Grove Cemetery. Lytle Creek, a tributary of the Little Miami River, is a conduit for storm water and wastewater from an airport, downtown storm water with input from local businesses, and a wastewater treatment plant. This study was conducted to see if heavy metal pollution in the sediment could be a contributing factor in reduced macroinvertebrate populations. Five sites were sampled in Lytle Creek from the headwaters at Wilmington College to the landfill discharge. A tributary to Lytle Creek, which runs through downtown at Xidas Park, was added when dead fish

were discovered. Two sites were selected in Indian Run, one upstream and one downstream of the airport's wastewater treatment facility. Sediments were analyzed for mercury (Hg) using cold vapor atomic fluorescence spectrometry. Aluminum (Al), arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), iron (Fe), manganese (Mn), nickel (Ni), lead (Pb), strontium (Sr), and zinc (Zn) were determined by inductively-coupled optical emission spectrometry (EPA method 200.7). Mercury concentrations ranged from 0.013-0.163 mg/kg dry wt. The highest levels of mercury were found in Xidas Park and in Sugar Grove Cemetery (0.124 and 0.163 mg/kg dry wt., respectively). Total heavy metals ranged from 0.014-340 mg/kg dry wt. The downtown tributary to Lytle Creek, Xidas Park site, empties into Lytle Creek at Sugar Grove Cemetery indicating lack of biodiversity in Lytle Creek may be caused by runoff into storm drains in downtown Wilmington.

97. Meredith Miles & Kuppaswamy

Arumugam Program: Chemistry, CoSM Mentor:

Kuppaswamy Arumugam, Chemistry, CoSM

Development of N-Heterocyclic Carbene-Gold(I) Complexes for Therapeutic Applications

The tunable steric and electronic properties of N-heterocyclic carbenes (NHCs) coupled with their σ -donating abilities allow for excellent coordination to transition metal complexes. NHC-gold(I) complexes have shown promise as cancer treatment drugs because of their ability to target thiol-functional groups found in the Thioredoxin Reductase (TrxR) system. Our previous work has proven that generating reactive oxygen species (ROS) and inhibiting the TrxR system simultaneously induces apoptosis. Hence, modifying the N-substituents and fusing the NHC-gold(I) complex with naphthoquinone further enhanced this oxidative-stress pathway to kill the tumor cells. Three naphthoquinone fused NHC-gold(I) complexes were synthesized and confirmed structurally with ^1H and ^{13}C NMR, UV-Vis spectroscopy, IR spectroscopy, and X-ray crystallography. The redox properties of the complexes were confirmed with various electrochemical techniques. Cell proliferation studies were also performed to determine the efficacy of the complexes.

98. Ethar Arkan Debra Mayes, Salim El-

Amouri & Adrian M Corbett Program:

Neuroscience & Physiology, CoSM Mentor: Adrian M Corbett Neuroscience, Cell Biology & Physiology, CoSM & BSoM **The Effect of Fluoxetine (Prozac) and its Enantiomers (S-fluoxetine, R-fluoxetine) on Blood**

Brain Barrier Permeability in Rats The basic hypothesis was that young and old animals had different blood brain barrier permeability and that different drugs may be able to either reduce this permeability or enhance the permeability. We tested the effect of the fluoxetine enantiomers (S-fluoxetine and R-fluoxetine) versus Prozac (50:50 ratio of R- and S-fluoxetine enantiomers) and/or control on blood brain barrier permeability in different brain regions (1. Cortex, 2. Striatum, Caudate Putamen and Hypothalamus (Brain), 3. Hippocampus, and 4. Cerebellum) in both male and female rats. The rats consumed orally the drug (5 mg/kg) or vehicle for a total of three days, then were injected with sterile Evans blue dye ip, at least 12 hours before euthanasia and cardioperfusion with ice-cold phosphate buffered saline. In male rats, we were able to compare the response of young rats (100 grams) versus old rats (~500 grams, 10-12 months old) and in females we compared the drugs only in old rats. One of the most surprising results was that the young males had significantly higher permeability (ng Evans blue/mg protein) in the caudate putamen and hypothalamus region (brain) than either the old males or the old females, and the fluoxetine enantiomers had little effect on this permeability. In the cerebellum, however, the female old rats showed significantly higher permeability in the presence of the S-fluoxetine enantiomer compared to the R-fluoxetine, and the R-fluoxetine permeability was significantly less than control. In other data presented we mostly show regional differences in permeability in the brain, although we also see significant differences in the group treatments for the Control old Females versus the R-fluoxetine old Females. We also see significant differences in the interaction between groups and regions for both the Control old males versus Control young males as well as the S-fluoxetine old males versus S-fluoxetine young males.

99. Devipriyanka Nagarajan, Ali

Nughman & Adrian M Corbett Program:

Microbiology & Immunology, CoSM Mentor: Adrian M Corbett Neuroscience, Cell Biology & Physiology, CoSM & BSoM **Examining Differences in Microglial**

Morphology in Different Regions of Middle-Aged

Female Rat Brains with Fluoxetine, or Simvast

The hypothesis we are testing is that drugs that impact either microglial subtype or gene expression may have morphological differences in appearance when stained with Iba1 antibody. We have previously presented evidence that gene expression changes related to microglial subtype (M1 versus M2) are occurring in the presence of fluoxetine (5 mg/kg), simvastatin (1 mg/kg) and ascorbic acid (20 mg/kg) drug

combination. We wanted to compare the effects of fluoxetine (5 mg/kg) alone and simvastatin (1 mg/kg) alone on microglial morphology compared to both control (no drugs) and the drug combination group. We have compared microglial morphology in the cortex, the subventricular zone, and the corpus callosum of middle aged female rats who had received the drugs daily for 30 days. In the corpus callosum, the microglial were rod-shaped, with an increased diameter at the longest length of the soma compared to microglia in either the cortex (ramified and hypertrophic) or subventricular zone (dystrophic). We see that Simvastatin increases the total area of the microglia (strong trend) in the subventricular zone compared to either the cortex or the corpus callosum, which suggests that these microglial may have different markers or function. When we closely examined the branches, we found that the drug combination significantly increased the branch diameter of microglia in the cortex, but not in the corpus callosum or the subventricular zone. Simvastatin appears to decrease the branch diameter in both the subventricular zone and the cortex, but not in the corpus callosum. Very little work has been done examining morphological changes of microglial in older rats and their response to drugs, and we hope to eventually correlate these morphological changes with gene expression changes in microglia isolated from these regions.

100. Shannon Hennelly & Eric Fossum
 Program: Interdisciplinary Applied Science & Mathematics, CoSM Mentor: Eric Fossum, Chemistry, CoSM **Effects of Cross-Link Density and Spacing on the Properties of High Temperature Sulfonamide-Based Elastomers** Elastomers have applications in the automotive, construction, energy and manufacturing industry. Elastomers consist of polymer chains that are crosslinked together and they tend to have low glass transition temperatures, T_g 's, and a low shear modulus. In this research poly(arylene ether)s, PAE's, based on *N,N*-dialkylbenzene sulfonamides, were employed because of their good thermal properties. All of the monomers are designed for conversion to polymeric form using standard nucleophilic aromatic substitution, NAS, polycondensation reactions. The length of the alkyl chains provides the opportunity to tailor the glass transition temperature, T_g , of the final material. Sites for crosslinking can be incorporated with diallyl monomers and various cross-link densities can be achieved. By utilizing monomers with different levels of reactivity toward NAS reactions, it should be possible to piece the components together using a modular approach, thus controlling the placement and

number of crosslinks. The resulting polymers will be fully characterized and then crosslinked to form the desired elastomers, at which point their shear moduli will be determined and thorough structure-property relationships will be developed. The initial data will then be used as a guide for development of the next generation of high temperature elastomers.

ACKNOWLEDGEMENTS: Wright State University College of Math and Science, Wright State University Chemistry Department

101. Alan Cone & Shulin Ju Program: Biomedical Sciences, CoSM Mentor: Shulin Ju, Biological Sciences, CoSM **Fission Yeast as a Model Organism for FUS-Dependent Cytotoxicity in Amyotrophic Lateral Sclerosis** Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative motor neuron disease that causes progressive paralysis and death by asphyxiation. There is no cure or effective treatment. Previous research has identified several genes that appear related to the pathology of ALS. When mutated, these genes result in proteins that gain toxicity and/or lose normal cellular functions. One of the genes, FUS, normally encodes a nuclear DNA/RNA binding protein. When mutated, it mislocalizes to the cytosol, interacts with stress granules, and forms aggregates. This mislocalization and aggregation, proposed to be pathological, has been studied in several model organisms, including budding yeast *Saccharomyces cerevisiae* (*S. cerevisiae*). Compared with *S. cerevisiae*, *Schizosachromyces pombe* (*S. pombe*) has several advantages such as 43% of genes containing introns and possessing the same alternative splicing enzymes that mammalian cells have. In addition, *S. pombe* also has microRNA and cell cycle regulation similar to mammalian cells. Here we report to establish a *S. pombe* model of ALS associated protein FUS. Our preliminary study indicates that fission yeast is a good complementary system to study cytotoxicity of FUS, and potentially that of other human disease associated proteins as well.

102. David Taylor, Timothy J Tillman, Scott L Bruce, Margaret L Bertso, Adrianna E DiMasso & Donovan L Marshall Program: Athletic Training, CEHS Mentor: Scott Bruce, Kinesiology & Health, CEHS **The Use of Wearable Technologies for Injury Prediction**
Context: Prevention of injuries is the first domain of Athletic Training. Clinical prediction models can identify areas that place an individual for high-risk for musculoskeletal injury. Identifying potential deficits early and implementing remedial exercises to address those deficits is theorized to be a key to preventing injury. Recent advances in technology has led to small

wearable devices to monitor any number of physiological variables. The Zephyr BioHarnes is one such lightweight movement sensor.

Objective: The purpose of this study was to determine if the variables generated from Zephyr movement sensors during Army ROTC activity are able to predict high-risk individuals for multiple musculoskeletal injuries

Design: Cohort study

Setting: University gymnasium and campus grounds

Participants: 55 Army ROTC cadets: 39 males, 16 females

Interventions: 10 Zephyr units were randomly assigned to cadets to wear as part of an elastic belt fitted to the chest. The cadets wore the sensors during the ROTC physical training, 3 days per week, for 7 weeks. Data analysis conducted on 3 groups: males, females & all cadets; prediction model for males was most logical.

Main Outcome Measures: Sensitivity, specificity, odds ratio (OR), relative risk (RR)

Results: There were 32 cadets who consented to wearing the Zephyr sensors. A total of 16 subjects suffered multiple injuries over the 7 weeks of data acquisition; 51.6% injury incidence (16/31). Bayesian analysis found BMI and mechanical load to be the best predictors of high-risk for multiple injuries. For the 2-factor model, the OR = 11.67; RR = 2.33.

Conclusions: Zephyr movement sensor appear to provide another method to determine individuals at high-risk for multiple injuries.

Key Words: ROTC, clinical prediction models, Zephyr, wearable technologies

103. Joshua Smithers, Alec Heffner,

Ryne Davis & Scott Bruce Program: Athletic Training, CEHS Mentor: Scott Bruce, Kinesiology & Health, CEHS **Analysis of the Impact Policies Implemented by the NCAA has on Football Fatalities**

Context: Football has the highest frequency of fatalities, many of which are related to heat illness, head trauma. The NCAA implemented heat illness guidelines in 2003 and “unintentional spearing” rules to prevent head injuries in 2005; however, the effectiveness of these policies has not been established.

Purpose: To determine if these guidelines have had a statistically significant impact on fatalities related to these conditions in collegiate football.

Design: Descriptive epidemiology study.

Setting: College and high school football teams in the United States from 1990 to 2015.

Main Outcome Measure(s): Heat related fatalities per 100,000 participants and head/cervical related fatalities per 100,000 participants.

Results: It was found that in heat related fatalities the percentage before the guideline implementation per 100,000 was 40.9% and percentage after per 100,000 was 59.1% ($p = .233$). Furthermore, there was a 44.7% increase in heat related fatalities per 100,000. In head and cervical related fatalities the percentage before rule implementation per 100,000 was 55.1% and percentage after per 100,000 was 44.9% ($p = 0.03$). Resulting in an 18.6% decrease in fatalities per 100,000.

Conclusion: Implementation of policies banning “unintentional spearing” decreased head and cervical related fatalities. While the implementation of the heat illness prevention policies is related to ($p = 0.233$) an increase in heat illness related fatalities, most likely due to better education on heat illness.

Key Words: football fatalities, heat illness fatalities, head and cervical fatalities

104. Kimberly Joo & Tracy L Brewer

program: Nursing Practice, CoNH Mentor: Tracy L Brewer, CoNH **Text Message Follow-Up Reminders in the Pediatric Urgent Care** Follow-up care by a primary care provider (PCP) following a visit to the pediatric urgent care is recommended by the American Academy of Pediatrics. Unfortunately, studies indicate that between 26-56% of patients do not complete the recommended follow-up appointment with PCPs. Communication of reminders to parents, guardians, and patients may have the potential to increase rates of follow-up appointments after an urgent care visit. Short Message Service (SMS) text messages have been shown to be an effective means of communication between providers and patients in many healthcare settings. The purpose of this Evidenced-Based Practice (EBP) project was to improve patient attendance at follow-up PCP appointments after discharge from a pediatric urgent care for patients with diagnoses of wheezing, bronchospasm, and/or asthma exacerbation. Findings from the literature suggest attending follow-up appointments with the PCP can improve patient outcomes through quicker recovery, decreased need for subsequent visits to the urgent care and/or emergency department, and increased provider and patient satisfaction. This project implemented SMS text message reminders to parents, guardians, and patients over the age of 18, to make follow-up appointments with their PCP after discharge from the urgent care. The project was implemented with patients in the pediatric urgent care with discharge diagnoses of wheezing, bronchospasm, and/or asthma

exacerbation. Data collection included demographic data such as age, gender, race, ethnicity, PCP, and insurance type, SMS text message data such as message failure and reply rates, and follow-up appointment attendance. Baseline data showed a follow-up rate of 53% for these patients during the fiscal year 2015-2016. Pilot data showed a 58.7% follow-up rate for similar patients. The 5.7% increase in follow-up rate during the pilot was not statistically significant. An argument could be made that these findings are clinically significant.

105. Nooralhuda Arkan, Ali Nughman, Tahir Sulehria, Ethar Arkan & Adrian M Corbett Program: Biomedical Engineering, CECS Mentor: Mentor: Adrian M Corbett Neuroscience, Cell Biology & Physiology, CoSM & BSoM **Examining Changes in Microglial Density in Middle Aged Female Rats in Response to Different Drugs** Our hypothesis is that different drugs that can impact microglia would typically cause some morphological changes in the microglia, which could be detected through quantification of the density of Iba1 antibody (microglial marker) staining in different regions of the brain. We have seen evidence in previous work from our lab that our drug combination of fluoxetine, simvastatin and ascorbic acid is causing subtype changes in microglia and resultant gene expression changes that reduce inflammatory cytokines and increase growth factor secretion. We fed our middle aged (10-12 month) female rats drugs (1. Vehicle control, 2) 5 mg/kg fluoxetine, 3) 1 mg/kg simvastatin, or 4) 5 mg/kg fluoxetine, 1 mg/kg simvastatin, and 20 mg/kg ascorbic acid (FSA) in sugar cookie dough vehicle daily for a period of 30 days. We then cardioperfused the rats, fixed the brain, cryosectioned it and stained for microglial cells. We captured 10X digital images of the microglia in three regions of the brain: 1) cortex, 2) corpus callosum, and 3) subventricular zone (SVZ). We then determined microglial density using the NIH Image J program. We were able to see significant differences in microglial density between different brain regions (cortex, corpus callosum, SVZ) when the animals were fed fluoxetine ($P=0.001$), or simvastatin ($P=0.0006$), or the drug combination (FSA; $P=0.0307$), but we were not able to see significant differences in the control animals. If we examined the different drugs in one region of the brain, looking for differences between the drug groups, we did not see statistical differences at this simplified level of analysis. In an adjacent poster, which looks at microglial morphology at higher power (100X) and in for more detail, we did begin to see some differences in morphology in response to the drug treatments.

106. Rachel Roche & Sarah M Jackson Program: Psychology, CoSM Mentor: Sarah M Jackson, Psychology, CoSM **Religious Affiliation and Religiosity as Predictors of Prejudice Toward Sexual Minorities** Previous research has found that religious affiliation and religiosity predict prejudicial attitudes toward sexual minorities. Prejudice has also been found to differ by demographic variables such as race, with Blacks reporting higher average levels of homophobia. Contact theory posits that contact with minorities will decrease prejudice and increase feelings of warmth. This study examined the relationships among religiosity, religious affiliation, contact, and emotional response as predictors of prejudice and acceptance toward sexual minorities. Participants were university students ($N = 237$) who completed an online survey. Prejudice was predicted to differ by religious affiliation, with Christian participants reporting higher prejudice than non-religiously affiliated participants. Contact with sexual minorities was expected to decrease prejudice and increase acceptance. Religiosity and emotional response were expected to explain variance in prejudice and religiosity was predicted to moderate the relationships between: religious affiliation and prejudice; and between race and prejudice. We created a scale measuring attitudes toward sexual minorities, with two subscales: Prejudice and Acceptance. Prejudice toward sexual minorities differed significantly by religious affiliation, with Christians demonstrating higher prejudice than non-religious participants. However, after controlling for religiosity, there were no significant differences by religious affiliation. Similarly, race no longer predicted prejudice after controlling for religiosity. Emotional responses also differed by religious affiliation, with Christians expressing colder feelings toward sexual minorities than Agnostics and Atheists. Finally, contact was significantly different between only Protestant Christians and Agnostics, and contact did not buffer the relationship between religiosity and prejudice. Religiosity was the strongest predictor of attitudes and feelings toward sexual minorities. Consistently, Christians (higher religiosity) reported more prejudice and less acceptance compared to non-religious participants (lower religiosity). These results highlight the importance of investigating the impact of religiosity on prejudice. Future initiatives aimed at increasing acceptance should account for religiosity, and messages should be tailored depending on religious affiliation.

Keywords: sexual prejudice, sexual acceptance, religiosity, religious affiliation, race sexism, racism, race, contact theory, sexual minorities

107. Robert Magley & Labib Rouhana
 Program: Biological Sciences, CoSM Mentor: Labib Rouhana, Biological Sciences, CoSM **Characterization of Tau Tubulin Kinase Homologs in the Planarian *Schmidtea Mediterranea*** Tau Tubulin Kinase (TTBK) is a protein that phosphorylates both Tau and Tubulin. Tubulin comprises the structural element of microtubules, and Tau is one of many microtubule-associated proteins. *Ttbk2* function is required to initiate primary cilia formation in mice, and mutations on this gene are associated with spinocerebellar ataxia type 11 in humans. Primary cilia are structurally similar to sperm flagella, and expression of human *TTBK* homologs is enriched in the brain and testes, suggesting that TTBK kinases may also play a role in sperm maturation. We test this hypothesis in the planarian *Schmidtea mediterranea*, a lophotrochozoan model capable of developing a complete reproductive system post-embryonically. *S. mediterranea* has six TTBK homologs, all of which are more highly expressed in sexual planarians when compared to their asexual counterparts. Detailed expression analysis by whole-mount in situ hybridization, revealed that each of the six planarian TTBK homologs are expressed in the testes of sexually mature animals. Functional analyses by RNA-interference (RNAi), which can be used to reduce systemic gene expression in planarians, are currently underway to look for abnormalities in testes and sperm development. Additionally, combinatorial knockdown of TTBK paralogs by RNAi revealed movement defects, which may be due to functional abnormalities in the cilia that power planarian gliding or defects in neuronal development.

108. Ishita Haider, Shuzhen Chen, Elliott Hayden, Shulin Ju & Quan Zhong Program: Biomedical Sciences, CoSM Mentor: Quan Zhong, Biological Sciences, CoSM **An Inter-Species Platform to Systematically Identify Human Genetic Modifiers of Neurodegenerative Disease-Associated Proteins** The molecular basis of neurodegenerative disease is gradually emerging following biochemical characterization of protein aggregates in disease tissues, and the identifications of causal genes in certain familial forms of neurodegenerative disorders. With the vast majority of disease cases being sporadic and causes unknown, however, our understanding of neurodegeneration remains vastly incomplete. Becoming increasingly appreciated is also the difficulty to evaluate the extent to which a given risk factor identified in human genomes may alter susceptibility of any individual to a specific type of neurodegenerative disorder. This is

largely due to a critically missing aspect of our understanding of neurodegenerative disease from the perspective of complex networks of gene-gene interactions. Such networks may consist of genes with causal or modifier effects and interactions that can be specifically targeted by gene mutations. Here we present proof-of-principle studies using yeast as a model system to map and characterize biochemical and genetic interactions of neurodegenerative disease-associated proteins. Our long-term goal is to interpret phenotypic consequences of genetic variations associated with neurodegenerative disease from the integrated global network perspective.

109. Emily Sheridan, Scott L Bruce & Abigail Robinson Program: Athletic Training, CEHS Mentor: Scott Bruce, Kinesiology & Health, CEHS **Differences Between 2 Neurocognitive Test Batteries: Concussion Vital Signs and XLNT Brain**

110. Julia Hitchcock & David Ladle
 Program: Biological Sciences, CoSM Mentor: David Ladle, Neuroscience, Cell Biology & Physiology, CoSM & BSoM **Using Transgenic Mice to Quantify Proprioceptive Receptors in Hindlimb Skeletal Muscle Groups**
Objective: Quantify the number of muscle spindles (MS) and Golgi tendon organs (GTO) and the total number of proprioceptive afferents in muscle groups supplied by the obturator and quadriceps nerves.
Background: Proprioception is the perception of body position in space and is critical for coordinated movements. Two types of sensory neurons generate the first neural signals used in proprioception: Golgi tendon (GTO) afferents (perceive force) and muscle spindles (MS) afferents (perceive muscle stretch). These microscopic nerve endings are found in skeletal muscles. Quantifying the proprioceptors in various muscle groups will increase our understanding of the importance of each muscle group in coordinated movement.
Methods: Transgenic mice were used in which sensory axons expressed a genetically- encoded fluorescent protein (tdTomato). Animals were euthanized at three weeks of age and the muscles of interest were dissected out, sectioned, and analyzed using fluorescence microscopy.
Results: The quadriceps muscle group had an average of 39 ± 5.6 MS and 44 ± 5.3 GTO (n=4). A majority of the proprioceptors of this muscle group were found in the rectus femoris. Fewer proprioceptive endings were found in the adductor muscle group (26.7 ± 3.35 MS and 6.4 ± 0.88 GTO, n=6).

Conclusions: Studies have been conducted on the distribution of proprioceptors in muscles based on functionality. The quadriceps group has an antigravity role. The importance of these muscles in maintaining posture may require them to contain a greater amount of proprioceptors compared to the quantity found in muscles not directly involved with posture (adductor muscles). Studies in other animal models (including humans) have reported variability in the ratio of MS to GTO in various muscles. Our analysis provides further evidence that proprioceptive feedback may be functionally balanced in muscle groups.

111. Md Moydul Islam, Shuzen Chen, Shulin Ju & Quan Zhong Program: Biological Sciences, CoSM Mentor: Quan Zhong, Biological Sciences, CoSM **An Inter-Species Approach to Study Human Proteins in Yeast** The advancement of genome sequencing technologies has revolutionized our ability to detect genetic variations among individuals. Interpretation of the phenotypic consequences of such variants remains to be a daunting challenge. This is largely due to our limited understanding of how genetic variations affect gene functions and how such allele-specific functional changes are buffered by other genes. We recently discovered that, despite vast evolutionary separation, human and yeast proteins still widely retain the ability to mediate inter-species protein-protein interactions. Given this, we designed an inter-species experimental platform using yeast cells as the mediator host to classify allele-specific effect of human genes on cellular functions and to rapidly identify modifier genes. As a proof-of-principle example, we focused on optineurin, a human autophagy adaptor protein genetically linked to two neurodegenerative disease, Normal Tension Glaucoma and Amyotrophic Lateral Sclerosis. Our data support the use of such an interspecies strategy to characterize human genes in yeast cells. Implementation of this approach may help identifying factors that modulate complex disease phenotypes.

112. Kotiba Malek, Krushangi Shah, Alexander Castillo Guel & Kuppaswamy Arumugam Program: Chemistry, CoSM Mentor: Arumugam Kuppaswamy **Redox-Active Silver N-Heterocyclic Carbene Complexes: A Dual Targeting Anti-Bacterial Drug** Bacterial resistance to current antibiotics necessitates new alternative therapeutic drugs. Silver based drugs are promising in this realm. However, current silver-based antibacterial drugs are limited in their bioavailability due to their rapid release of silver ions. Recently, *N*-heterocyclic carbene containing silver complexes have gained popularity

due to slow release of silver ions under biological conditions. As a result, two new potential antibacterial silver-NHC complexes were synthesized and confirmed via analytical techniques, including ^1H and ^{13}C NMR spectroscopy and x-ray crystallography.

113. Christine Kinstedt & Daniel Ketcha Program: Chemistry, CoSM Mentor: Daniel Ketcha, Chemistry, CoSM **Extended Conjugated Chalcones as Theranostic Agents in Alzheimer's Research** The term "*theranostics*" has been coined to describe certain classes of molecules which have the potential to serve as therapeutic as well as diagnostic agents. One such class of substrates includes chalcones, which due to their ability to cross the blood brain barrier (BBB), have demonstrated efficacy in a number of neurodegenerative diseases and constitute a convenient starting point for the development of multi-target agents for Alzheimer's disease (AD) (e.g., amyloid aggregation and acetylcholinesterase inhibitors). Additionally, previous research has indicated that the extending the conjugation in molecules that bind to amyloid-beta (Ab) plaques (e.g., Pittsburgh B, benzylidene oxindoles, etc) results in enhanced selectivity towards the more diagnostically relevant tau aggregates. Since simple chalcones have been demonstrated to serve as positron emission tomography (PET) imaging agents for detecting Ab plaques, we are now investigating the use of "*extended conjugation*" analogues in the expectation that such substrates should prove valuable for targeting tau and/or alpha-synuclein aggregates of significance in Parkinson's disease (PD), while retaining the aforementioned therapeutic effects. Moreover, these extended analogues exhibit enhanced fluorescent properties which make them candidates for the detection of the aforementioned plaques by less costly Near Infrared (NIR) methods. This research details explorations of novel structural modifications of the chalcone scaffold which result in Ab aggregation inhibition and differential binding to the plaques of relevance to AD and PD, allowing for the detection of such biomarkers by PET or NIR approaches.

114. Savannah Rossetti, Mary Huber & Emily Surico Program: Public Health Education, CEHS Mentor: Mary Huber, Human Services, CEHS **Conversation for Change: Partners Helping Those Addicted to Opiates** **Conversation for Change (C4C)** is a community partner initiative to reduce opiate overdose deaths, related crime, and the stigma associated with addiction. The purpose of the C4C is to provide a supportive, safe place (Linden Ave Baptist Church) for individuals struggling with addiction to gather with family and friends to learn about the

variety of treatment and survival options available but not always visible to them. C4C was historically piloted by the Dayton Police Department and community leadership partners in 2014. As a leadership partner, WSU translated research based evidence into practice; preparing and training of WSU counseling students. Through demonstrated outcome successes, the objective would be to replicate the C4C model in other local communities requesting the program.

115. Melissa Ward & Paula Bubulya
 Program: Biomedical Sciences, CoSM Mentor: Paula Bubulya, Biological Sciences, CoSM **Optimizing Procedures to Isolate and Identify Son Binding Partners** Pre-mRNA processing requires many factors for accurate splice site detection, including serine-arginine rich (SR) splicing factors as well as snRNPs. SON is the largest known SR splicing factor, containing several functional domains including an RS domain, a glycine-rich patch (G-patch) and double stranded RNA binding domain (DSRBD), as well as novel repetitive sequence motifs of unknown function. In the case of SR proteins among which include SON, serines in the arginine-serine-rich (RS) domains are phosphorylated, releasing SR proteins from interactions with other SR proteins within the speckles and promoting assembly into splicing complexes on nascent pre-mRNAs. We have previously shown that SON is essential for nuclear speckle organization and cell cycle regulation through high-resolution fluorescence microscopy, though the specific mechanisms and binding partners of SON are unknown. Our focus is on understanding novel binding partners for SON. Through optimization of HeLa extraction and SON-specific antibody concentrations, we devised a successful protocol for detecting SON in both immunoblotting and immunoprecipitation analysis. SON's insoluble nature has proved a difficult obstacle in confirming SON presence during experimentation, and here we used sonication and specialized reagents to successfully extract SON protein in HeLa cells, as confirmed through western blot analysis. The creation of a SON immunoprecipitation protocol will allow further detailed work in purifying and identifying SON binding partners. SON protein has been linked to acute myeloid leukemia and pancreatic cancer, and successfully identifying Son's function holds promise for the development of diagnostic tools in recognizing these diseases. Through high-resolution microscopy, we seek to identify the subnuclear localization of SON and interacting chromatin regions with binding partners. Our goal is to identify the role of SON in pre-

mRNA processing and construct a comprehensive model of spliceosome complexes in human cells.

116. Alexandra Oliver and Noah Schroeder Program: Computer Science, CECS Mentor: Noah Schroeder, Leadership Studies, CEHS **The Influence of Educational Game Design Features on Players' Experiences** This usability study examined the effects of various gameplay elements on players' experiences using different versions of an educational game-based environment known as the Student-centered Interactive Modular Performance-based Learning Environment (SIMPLE). Specifically, we added elements of interactivity and challenge to different variations of SIMPLE. To evaluate the players' experiences while playing the game, we collected think-aloud data, gameplay recordings, as well as written feedback. This poster focuses on the qualitative results from the open-ended questions the players answered upon completion of the game. Themes extracted from the data suggest that the game elements tested did not considerably influence players' experiences with the software.

117. Amy McNeely & Eric Fossum
 Program: Chemistry, CoSM Mentor: Eric Fossum, Chemistry, CoSM **Structure-Property Relationships of Polymerizable Blue-Emitting, pi-Donor Chromophores for OLED Applications** An organic light emitting diode (OLED) is a self-emitter that does not require the use of rare earth metals, as is the case with inorganic light emitting diodes (LEDs). Currently, red and green emitters have achieved longer lifetimes and efficiency than blue emitters. In order to enhance the long-term stability our approach utilizes a benzoxazole core to which can be added a variety of donors. The choice of benzoxazole is based, in part, on its successful application in a number of thermally and oxidatively stable polymeric systems. The approach provides a unique opportunity to tune the band gap between the highest occupied molecular orbital (HOMO) and the lowest unoccupied molecular orbital (LUMO), and, in turn, the emission wavelength, without substantially altering the core structure. The chromophores are designed to undergo efficient thermally activated delayed fluorescence (TADF), which allows harvesting of both the singlet, via fluorescence, and triplet states, by fluorescence after reverse intersystem crossing (RISC). In addition, the modular approach also provides an avenue to covalently incorporate the chromophores into polymeric systems via nucleophilic aromatic substitution (NAS). As such, our initial chromophores were chosen with 2,4-difluorinated rings, attached at the 2-position of the benzoxazole system, which are

capable of undergoing NAS polycondensation reactions. This presentation will focus on the synthesis, characterization, and polymerization behavior of benzoxazole-based, blue emitting chromophores.

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118. Md Ali Akbar, Sessa Paluri & Ioana Sizemore Program: Chemistry, CoSM Mentor: Ioana Sizemore, Chemistry, CoSM **Cloud Point Extraction in Combination with Tangential Flow Filtration for the Isolation of Silver Nanoparticles and Ionic Silver**

The increased use of silver nanoparticles (AgNPs) in a variety of consumer products has amplified their potential release into the environment. Furthermore, AgNPs were found to exert harmful effects on living organisms mostly by producing Ag⁺ ions and causing oxidative stress. Therefore, it is imperative to develop methods for isolating the two silver species (AgNPs and Ag⁺) from various matrices. In this study, cloud point extraction (CPE) and tangential flow filtration (TFF) were combined to increase the extraction efficiencies of AgNPs and Ag⁺ from colloidal and biological matrices. Briefly, a non-ionic surfactant (Triton X-114) and sodium thiosulfate were added to the samples containing AgNPs and incubated over the cloud point temperature of the surfactant to allow for the micelle formation with AgNPs (surfactant phase) and the chelation of Ag⁺ with thiosulfate (aqueous phase). The two CPE phases were then separated by centrifugation, and the aqueous phase containing mainly Ag⁺ ions and some AgNPs was further processed through a 1-kD filter to further recover AgNPs. The total concentration of Ag in the two CPE phases and the resulting TFF products, namely permeate (containing Ag⁺) and retentate (containing AgNPs), were quantified by inductively coupled plasma optical emission spectroscopy (ICP-OES). The versatility of the CPE-TFF method was demonstrated on three different colloids (Creighton, Citrate-capped, PVP-capped) and one cellular matrix (animal kidney cells). The extraction efficiency of AgNPs and Ag⁺ ranged from ~65%-88% and 15-28% respectively, while the total Ag recoveries were from 81% to 96.43%.

119. Catherine Evers Smith & Kuppaswamy Arumugam Program: Chemistry, CoSM Mentor: Kuppaswamy Arumugam, Chemistry, CoSM **Development of Synthesis Strategy for [Bis-(1,3-diferrocenylmethyl-imidazole-2-ylidene)-gold] [tetrafluoroborate]** The group previously synthesized [Bis(1,3-diferrocenylmethyl-imidazol-2-ylidene)-gold(II)] [chloride]. This compound was

observed to kill cancer cells in the body through dual mechanistic pathways, i.e., suppression of anti-oxidative enzyme and non-specific generation of reaction oxygen species. Ferrocene is believed to be involved in catalytic generation of reactive oxygen species. This aim of this project include isolation of oxidized version of [bis(1,3-diferrocenylmethyl-imidazol-2-ylidene)-gold] [tetrafluoroborate] to prove that oxidation occurs at ferrocene center. Therefore a strategy for the synthesis of [bis(1,3-diferrocenylmethyl-imidazol-2-ylidene)-gold(II)] [tetrafluoroborate]₅ was developed.

120. Adam Koraym, Ambika Shoemaker, Jordan Young, Allison Costello, M Dodd, T Kidd, M B Hennessy, Rael Sammerhoff, Melinda Meering, Jamie Dowling, Abigail Schmit, Munjed Milhem, NA Koraym & Dragana Claflin Program: Psychology, CoSM Mentor: Dragana Claflin, Psychology, CoSM **Amygdala Activity Parallels Corticosterone Levels Associated with Maternal Separation and Social Buffering Following Periorbital Shock Exposure in Juvenile Rats** Previous research from our lab has shown that following stress exposure (1 session of 90 randomly delivered periorbital shocks,) 17-day-old pre-weanling rats had increased levels of blood corticosterone (CORT). Rats who received social support (social buffering) following the stress exposure by being returned to their cage mates and mother had significantly decreased levels of CORT relative to rats who were deprived of social support (e.g. maternal separation) by being placed in a novel environment following stress exposure (Gallimore 2015). The amygdala has long been known to play a crucial role in emotions, emotional behavior, and motivation. Although consisting of several subdivisions, the central nucleus of the amygdala is especially important in this study, due to its role in fear responses and the release of stress hormones, specifically the central nucleus of amygdala (Maren 2004).

The present study was designed to evaluate the combined effects of a stress exposure (repeated periorbital shock) and social support on subsequent activation in the central nucleus of amygdala as measured by decreases in the production of the immediate early gene, zif-268 using immunohistochemical analysis of brain tissue. It was found that rats who received social support had significantly lower levels of amygdalar activation relative to the rats who were deprived of social support following the session of periorbital shocks. In addition, rats who underwent social buffering had

similar activation levels compared to home cage control animals.

Supported by: NIH/NIGMS, R25GM090122, IMSB BioSTAR and the Department of Psychology, Wright state University.

121. Tracey Watkins, Matthew Ommert, Morgan McArthur, Ryan Schultz & Scott Bruce Program: Athletic Training, CEHS Mentor: Scott Bruce, Kinesiology & Health, CEHS **Effect of Concussion History Upon Dynavision™ Reaction Time**

Context: Concussion is a brain injury that affects all aspects of the sufferer's life, one of which is reaction time. To what degree reaction time is affected and for how long it is affected is just now being explored.

Objectives: The purpose of this study was to determine if a history of multiple concussions had an effect on Dynavision™ RT

Design: Record review

Setting: Athletic Training Clinical Laboratory

Patients or other participants: The records of 41 college-age, non-student-athletes were reviewed for concussion history and Dynavision™ baseline testing performance.

Intervention(s): The Dynavision™ is a visual-motor and neurocognitive rehabilitation training device to improve and develop reaction time, central and peripheral vision, and it is used by medical, athletic & tactical patients. A baseline test consists of a warm-up activity, three reaction time tests, (testing each arm separately), and three concussion related tests which increase the cognitive and physical challenge with each progressive test.

Main Outcome Measure(s): Comparing reaction time performance on the Dynavision™ between those with and those without a history of multiple concussions.

Results: TBD

Conclusion: TBD

Key Words: concussions, reaction time, Dynavision™

122. Shawn McTaggart, Jordan Lewis, Mitchell Schneider & Jason Deibel Program: Physics, CoSM Mentor: Jason Deibel, Physics, CoSM **Terahertz Time-Domain Imaging** Terahertz Time-Domain Imaging is a growing field for research, with many applications in (but not related to) materials science, spectroscopy and nondestructive imaging. Using the Terahertz region of the EM spectrum allows transmission through materials opaque at visible wavelengths, while controlled and monitored terahertz pulses allow the depth of reflected and

transmitted radiation to be known so that images can be seen through opaque materials. The ASK program's undergraduate Terahertz Research group teaches students the basics of capturing and processing the data needed for Terahertz imaging. Students were tasked with using this knowledge to discover the objects hidden in an opaque envelope to demonstrate proficiency with these methods and current instrumentation.

123. Abigail Schmit, Munjed Milhem, Noah Koraym, Michael Hennessy & Dragana Clafin Program: Psychology, CoSM Mentor: Dragana Clafin, Psychology, CoSM **Context Fear Using Periorbital Shock Instead of Footshock** Contextual fear conditioning involves placing an animal into a novel context and administering an aversive unconditioned stimulus. Memory for the context is represented by measures of fear such as time spent freezing (immobile) when placed into the same environment at a later time. In rodent contextual fear conditioning, the aversive unconditioned stimulus is traditionally administered via foot shock. Based on studies in our lab that use periorbital shock in eyeblink classical conditioning, this study attempted to determine whether periorbital shock could be a reliable alternative stimulus for contextual fear conditioning in juvenile rat pups. Each fear conditioning session consisted of an initial three-minute observation period followed by a 100-ms periorbital shock at either 1.5, 2.0, or 3.0 mA. This process was repeated once a day until five shocks are administered. The highest levels of freezing were observed in the 3 mA group after 5 shocks, although there was considerable variability in the learning rate. The least amount of variability between subjects and most reliable results was observed in the 1.5 mA group, with the majority of animals exceeding 60% freezing after four shocks. The 2 mA group exhibited the greatest amount of variability and the least predictable learning curves. This alternative stimulus paradigm may be a useful tool in future studies of associative learning using contextual fear conditioning. It will enable the continued characterization of both distinct and overlapping neural substrates between fear and eyeblink classical conditioning.

124. Reilly Clark, Jin Zhang, Sangeeta Agrawal, Michael Craig, Madhavi Kadakia Program: Biomedical Sciences, CoSM Mentor: Madhavi Kadakia, Biochemistry & Molecular Biology, CoSM & BSoM **Differential MicroRNA Signatures in Esophageal Cancer** Barrett's Esophagus (BE) occurs in 15% of patients with Gastroesophageal Reflux

Disease (GERD) in the United States. BE is considered a precursor lesion to Esophageal Adenocarcinoma (EAC), an aggressive and deadly cancer. The prevalence of all three conditions has been on the rise in the United States. There is no current method to prevent BE or its progression to EAC, instead patients must be monitored regularly through endoscopy with biopsies, an invasive and costly procedure. Here, we seek to improve diagnosis of dysplasia and EAC in BE patients through development of a sensitive, accurate yet minimally invasive methodology. Our focus is a serum biomarker panel composed of microRNAs. microRNAs are stable in serum, accurately reflect the tissue phenotype, and have been shown to be dysregulated in BE and EAC. We propose to identify unique microRNA signatures in the serum and tissue of BE, dysplastic BE, and EAC patients. The serum microRNA signatures will reflect tissue progression from BE to dysplasia to EAC. Next Generation Sequencing is currently being utilized to produce the microRNA signatures from a training set of patients, to subsequently be confirmed in a validation set of additional patients.

125. Akole K. Menash & Joon Shim

Program: Industrial & Human Factors Engr, CECS
 Mentor: Joon Shim, Surgery, BSoM **Fundamentals of Laparoscopic Surgery Skills After Proficiency Training in Medical Students** Laparoscopic surgery (LS) is a modern technique in which surgery is performed via small incisions with the use of surgical instruments and a laparoscope. As LS is becoming the standard approach to perform most abdominal surgeries, surgical residents, fellows and attending surgeons are expected to acquire the hands-on skills training required to succeed in laparoscopic operations. Due to the importance of this modern technique, FLS (Fundamentals of Laparoscopic Surgery) has been designed as a comprehensive web-based educational set that allows surgical residents, fellows and attending surgeons to be trained and to be tested on the various technical skill sets that FLS offers. Also, FLS will aid in the advancement of the principles and basic skills of laparoscopic surgery. The goal of our study is to expose medical students, from Wright State Boonshoft School of Medicine, at a very early stage of their medical/surgical careers, to the FLS and to measure their technical skills set and retention levels after practicing certain tasks required for the FLS exam. Eleven students performed three tasks including peg transfer, precision cutting and suturing as pretest. A training session was offered prior the performance of each task by an attending. Each student performed each task within a set time limit. A posttest is given two months after with the

goal of measuring the students' technical skills and to measure their retention levels of the principles of laparoscopic surgery. Preliminary analysis shows that participants are able to recollect their technical skills especially for peg transfer (pretest time score ~2:12s, posttest time score~ 1:37s).

FLS is an important educational technical skill set for all current and/or future surgical residents, fellows and attending surgeons. Therefore, exposure and proper learning of these technical skills will allow to better train current and future surgeons and to effectively and safely perform surgery.

126. Allison Costello, Jamie Downey, Ambika Shoemaker, PSY 3930 & Dragana

Clafin Program: Psychology, CoSM Mentor: Dragana Clafin, Psychology, CoSM Effects of Maternal Separation on Marble Burying Behavior in Rats Pups Digging is a species-typical behavior for rats; it creates a safe environment, and allows the rat to search for resources such as food and nesting materials. This behavior is also displayed during predator evasion and birth. This study aimed to clarify whether marble burying within a laboratory environment can be used to assess anxiety-like behaviors in rats following early-life stress. Previous research is not conclusive as to whether or not this behavior is an exploratory or escape response. Fifteen-day-old rat pups in the experimental group were maternally separated during a 3 day period for 90 minutes a day while the control pups remained with their mother. Pups were weaned at 21 days and placed in the marble burying chamber at either 24 days or 32 days. Cages contained deep bedding, with an array of marbles organized on the surface. The number of marbles buried after a 30 minute period was recorded. The findings suggest that maternal separation did not affect anxiety-like behavior in these rats, but that digging behavior changes with age.

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