

4-2018

# Wright State University's Symposium of Student Research, Scholarship & Creative Activities from Friday April 13, 2017

Wright State University

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Symposium of Student  
Research, Scholarship &  
Creative Activities

13 April 2018

9:00 AM – 5:30 PM

Student Union

Apollo, Atlantis, Discovery &  
Endeavour Rooms

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**9:00-11:00 AM Parallel Oral Sessions**

	<b>Atlantis A</b>	<b>Atlantis B</b>	<b>Discovery A</b>	<b>Discovery B</b>	<b>Endeavour A</b>	<b>Endeavour B</b>	<b>Endeavour C</b>
9:00 AM	Ernest Mitchell	Andrew Dreling	Eric Glock	Gordon McKnight	Crystal Burns	Annabel Almazan	Isaiah Bausmith
9:15 AM	Fan Yang	Vibha Ravindra	Matthew Canter	Csongor Bajnoczki	Megan Reed	Townsend Smith	Katia Jordan
9:30 AM	Angela McCarthy	Ian Holloway	Joseph Gard	Nathan Monar	Michaela Woods	Amjad Aljagthmi	Nick Stalter
9:45 AM	Dylan Colvin	Bradley Schneider	break	break	break	break	Jaclyn Schmitz
10:00 AM	break	break	break	break	break	break	break
10:15 AM	Michele Miller	Joseph Sjoberg	Timothy Moss	Brendan Eltzroth	Aaron Onufrak	Robert Magley	
10:30 AM	Lauren Shafer	S M Sarif Rana	Nicholas Higgins	Justin Ronallo	Mauricio Vallejo	Hannah Shows	
10:45 AM	Amal Miranda	Jeffrey Hollon	Ylaaine Michaud	Chelsea Dross	Rutuja Mahajan		

**11:30 AM -1:00 PM Lunch**

**12:00-1:00 PM Panel Discussion**

**1:00-2:30 PM Plenary Session**

- 1:00 PM Marissa Coleman
- 1:15 PM Swaleh Ouma
- 1:30 PM Justina Fileccia
- 1:45 PM Brian Caprul
- 2:00 PM Michael Nalepka
- 2:15 PM

2:30 - 4:30 PM Posters

Apollo Room

5:00 PM GSA Reception

Atrium

**Panelists**

David Burke, Vice President & Division Manager, Leidos  
 Dr. Fottios Kokkotos, Partner, Head of Statistics and Advanced Analytics  
 Trinity Partners, Chief Data Officer, Muzit, Inc.  
 Chiquita Mullins Lee, Arts Learning Coordinator, Ohio Arts Council  
 Chrysa Theodore, Vice President, Cornerstone Research Group.

## Apollo Room

### **1:00 Bisexuality in Cinema** Marissa Coleman, Nicole Richter, Theater Arts, CoLA

As the current generation progresses into a society where there are several genders and sexual preferences, we still see discrimination amongst some members of the LGBTQIA+ community. We see a denial of, and standards for, particular members of this group, specifically those who identify as bisexuals. In contemporary cinema, we see an increase of bisexual representation, but in a standardized and almost stereotypical manner. What society perceives as bisexuality is often misinterpreted, and films such as *Kiss Me* (2011) and *A Perfect Ending* (2012) portray plausible experiences of a bisexual woman. However, each of these films brings about the definitive qualities of bisexuality in a comprehensive manner, but in such a way that poses issues of inaccurate depiction and discriminatory behaviors concerning acceptable bisexuality.

### **1:15 Neandertal Contributions to Modern Humans: Beneficial? Harmful? #YouDecide!** Justina Fileccia, Amelia Hubbard, Anthropology, CoLA

Modern human's DNA is a hybridization of multiple hominin species. DNA studies on ancient and modern hominins have enhanced our understanding of human phylogenetic relationships and genetic disorders and uncovered what makes humans human – down to our quirks. The ability to identify these ancient mutations in DNA may help scientists understand why modern humans suffer from autosomal, immune, and psychological illnesses. Specifically, we can learn more about the evolution of contemporary disorders in humans (i.e., why do they exist, and are they all “bad”). Scientists have only recently (within the last five years) been able to discover the association between human-Neanderthal admixture and genetic diseases. As these once weakly deleterious genes have become linked to beneficial genes, it is indeterminate whether this admixture has helped or hindered contemporary humans. On one hand, humans have experienced an increase in variation and a greater immune system. On the other, humans run the risk of their own bodies attacking them – both physically and mentally.

### **1:30 Recruitment of Child Soldiers** Sawaleh Ouma, December Green, Political Science, CoLA

According to various sources approximately 300,000 child soldiers are serving in armed conflicts around the world. Involuntary recruitment of child soldiers has been dominating the literature despite current research

pointing to increasing cases of voluntary recruitment. This study will thus examine the literature on the recruitment of child soldiers in conflict areas, with a focus on voluntary recruitment by both state and non-state actors. It will provide an assessment on how the desire for vengeance influences the voluntary recruitment of child soldiers using a comparative analysis of cases with high, middle and low levels of voluntary recruitment. This study may focus on literature on such recruitment in Sub-Saharan Africa, but it will be open to important scholarship that can be found on voluntary recruitment in other settings as well. The unique focus on the desire for vengeance as the only dependent variable will involve a qualitative analysis. This study will collect data through library research (NGO and IO reports, and databases) which will include the number of atrocities committed and children recruited by both non-state (recruiting agency) and state actors (opposing agency). This study hypothesizes that the number of atrocities committed by the recruiting agency will be lower compared to the opposing agency in a case of high level of voluntary recruitment and vice versa with the middle showing even numbers. This research will also involve both elite interviews of experts and leaders in conflict regions, and interviews of former child soldiers to strengthen its research findings. This policy driven study aims to offer research-based advice to state and international institutions that use force as a measure of addressing insurgency and conflict. It may also assist efforts to rehabilitate the nearly 115,000 child soldiers released worldwide since 2000.

### **1:45 miR-6087 is a Gene Target of ERK3 and a Novel Factor Promoting Cancer Cell Migration and Invasion** Brian Caprul, Lobna Elkhadrage, Weiwen Long, Biochemistry & Molecular Biology, CoSM & BSoM

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 posttranscriptional 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. Of note, we have found that expression level of RhoG is greatly decreased by miR-6087 mimic, but was greatly increased by ERK3 knockdown, suggesting RhoG is a target of ERK3/miR-6087 axis in regulating cancer cell invasiveness.

## **2:00 The Effects of Race in the Working Class**

Michael Nalepka, Sirisha Naidu, Economics, RSCoB

This paper examines the differential effects of employment and earnings by race among the United States working class in the period 2010-2016. Using data provided by the Bureau of Labor Statistics that details labor force characteristics by race and ethnicity, this paper investigates unemployment rates by race. It further looks into the overall median earnings by race and the impact educational attainment has on median earnings. Furthermore, it examines the median earnings by race in a few occupations in the United States. Lastly, this paper discusses whether the differences in specific occupations is due to occupational segregation. The data shows alarming trends among different races in terms of the unemployment rates and median earnings in the United States. It also appears that occupational segregation is still a problem in the United States. The paper suggests the need for policy measures to correct differential racial outcomes.

**Atlantis A****9:00 Transcranial Direct Current Stimulation**

Ernest Mitchell, Ulas Sunar, Biomedical Industrial and Human Factors Engineering, CECS

Transcranial direct current stimulation (tDCS) is a noninvasive brain stimulation technique that applies weak direct currents to the brain via electrodes placed on the scalp. These currents create minute electrical fields that can shift the trans-membrane potential of cortical neurons and modulate the brain activity. tDCS has achieved great attention recently because its effects have been demonstrated in a range of clinical conditions with therapeutic potential in stroke, depression, and epilepsy. Moreover, significant work has been done in AFRL, Dayton by Dr Andy McKinley and his coworkers for enhancing the cognitive capabilities of pilots. It has been shown that tDCS stimulation can persist for more than one hour provided that the stimulation is applied for 9 minutes or longer. tDCS uses low current delivered to the brain via electrodes placed on the scalp for neuro-stimulation. The tDCS device is relatively simple and numerous companies sell tDCS systems for personal home use. These techniques are currently being studied in a variety of clinical trials to treat depression, chronic and acute pain, stroke rehabilitation, drug addiction and other neurologic and psychiatric conditions. Researchers have also shown improvements in memory for Alzheimer patients and motor function for Parkinson's patients. There is a need to quantify the effects and ultimately optimize the time and dose level of tDCS for improved cognitive activity. For the said improvement to yield success, EEG has been proposed before, but it has limitations including low sensitivity and high variations and noise in the signal. Changes in cerebral activity lead to changes in cerebral metabolism and blood flow, which are coupled to changes in blood volume and oxygenation. Energy is required for cerebral functions, and its conversion into a useful form is facilitated by oxygen delivered to the brain through the cerebral vasculature. Vascular and metabolic changes in the brain influence a wide range of phenomena of clinical importance and of basic scientific interest. For example, it has been shown that local activation of the cerebral cortex triggers local changes in the cerebral blood flow and blood oxygenation. Diffuse optical imaging can quantify all these parameters. Thus, in this study we will measure these cerebral hemodynamics and metabolism parameters using diffuse optical imaging, thereby find the optimal parameters of tDCS.

**9:15 Predicting Pain Using a Mobile Application and Wearable Sensors of Patients with Sickle Cell Disease**

Fan Yang, Tanvi Banerjee, Computer Science, CECS

Sickle cell disease (SCD) is an inherited red blood cell disorders and associated with a common complication which is the occurrence of vaso-occlusive crisis. Pain due to the vaso-occlusive crisis is the major reason of hospitalization in patients with SCD. An effective pain management system can help patients better cope with pain. In this study, we first verified the feasibility of using physiological measurements from electronic health records (EHRs) to estimate pain scores with an accuracy of 0.429 in 11-point rating scale and 0.681 in 4-point rating scale (no, mild, moderate, severe). Next, we presented a hybrid pain management approach that combines a mobile application for active self-reporting and multiple wearable sensors for continuous passive monitoring. By training the regression model using objective physiological signals and activity measurements tracked by wearable sensors, we were able to predict subjective pain scores collected from the mobile application and the nurses' documentation with the root mean square error of 1.430, and the correlation between predictions and observations as 0.706. Furthermore, we verified the hypothesis that the regression model outperformed the classification model for the small and highly imbalanced dataset in this study by comparing the performances of the Support Vector Machines and the Support Vector Machines for Regression

**9:30 Informal Social Attachments and Desistance from Heroin**

Angela McCarthy, Karen Lahm, Sociology & Anthropology, CoLA

Heroin addiction is often described as a lifelong illness. This unique description of heroin addiction may affect how people desist from heroin and maintain sobriety. Using Sampson and Laub's life course theory framework, the purpose of this research was to see if informal social attachments, such as children and employment, influence the decision to quit using heroin. Qualitative interviews from five participants showed that social attachments played more of a role in maintaining desistance from heroin, rather than being the sole reason for quitting heroin initially. Theoretical implications as well as suggestions future research are discussed.

### 9:45 Opioid Crisis in Dayton: The Role of Facebook Comment Sections in Meaning-Making

Dylan Colvin, Julianne Weinzimmer, Sociology & Anthropology, CoLA

This work provides a foundational understanding of the ways in which Facebook is being used as a location for meaning making around the opioid epidemic in Dayton, Ohio. A content analysis of the Dayton Daily News Facebook will analyze four posts that were randomly selected from 2017 and their corresponding 1,336 comments. This work will identify and describe discursive civility and incivility. The concept of incivility has become a more popular topic, especially as it relates to political discourse. This work adds to the conversation by bringing the focus to the opioid epidemic and Facebook as a location where understandings of drug use and prevention are co-constructed. This construction, along with understandings of what is civil or uncivil, can both perpetuate and subvert power structures. The implications of this pilot study can provide a framework to continue to consider opportunities to create more civil and subversive locations on Facebook for meaning making.

### 10:15 Study to Analyze Positive, Negative and Neutral Public Sentiment Topics on Twitter Concerning the 2015/2016 Zika Epidemic

Michele Miller, William Romine, Biological Sciences, CoSM

**Background** In order to understand public sentiment regarding the Zika virus, social media can be leveraged to understand how positive, negative, and neutral sentiments are expressed in society. Specifically, understanding the characteristics of negative sentiment could help inform federal disease control agencies' efforts to disseminate relevant information to the public about Zika related issues.

**Objective** The purpose of this study was to analyze public sentiment concerning Zika using posts on Twitter and determine the qualitative characteristics of positive, negative and neutral sentiments expressed.

**Methods** Machine learning techniques and algorithms were used to analyze the sentiment of tweets concerning Zika. A supervised machine learning classifier was built to classify tweets into 3 sentiment categories: positive, neutral, and negative. Tweets in each category were then examined using a topic modeling approach in order to determine the main topics for each category, with focus on the negative category.

**Results** A total of 5,303 tweets were manually annotated and used to train multiple classifiers. These performed moderately well (F1 score = 0.69, 0.68) with text-based feature extraction. All 48,734 tweets were then categorized into the sentiment categories. Ten topics for

each sentiment category were identified using topic modeling with a focus on the negative sentiment category. **Conclusions** Our study demonstrates how sentiment expressed within discussions of epidemics on Twitter can be discovered. This allows public health officials to understand public sentiment regarding an epidemic and enables them to address specific elements of negative sentiment in real-time. Our negative sentiment classifier was able to identify tweets concerning Zika with three broad themes: neural defects, Zika abnormalities, and reports and findings. Since the majority of topics in the negative sentiment category concerned symptoms, officials should focus on spreading information about prevention and treatment research.

### 10:30 Low-Impact Yoga and Heart Rate

**Variability** Lauren Shafer, Lynn Hartzler, Biological Sciences, CoSM

Low-Impact Yoga has No Effect on Heart Rate Variability in Sedentary Adults Heart disease is the leading cause of death among adults in the United States and more than 600,000 people die each year when the condition goes untreated. Many cardiovascular maladies, such as high blood pressure and heart disease can be markedly improved with lifestyle changes including eating a healthy diet and regular exercise. The efficacy of this type of modification is negatively impacted by those who do not, for a variety of reasons, incorporate physical activity and proper diet into their lifestyle. In this study, 15 sedentary adult women (aged 19-63 years) participated in a prescribed 12-week yoga program. Electrocardiography was used to measure Heart Rate Variability, a tool that assesses autonomic tone on the heart. When assessing autonomic nervous system activity, three spectral components were considered: very low frequency ( $\approx 0-0.04$  Hz), low frequency ( $\approx 0.04-0.15$  Hz), and high frequency ( $\approx 0.15-0.45$  Hz and above). Low frequency spectra correlate to sympathetic activation and high frequency to parasympathetic activation. There were no significant changes in low frequency and high frequency spectra from baseline to the end of 12 weeks. Therefore, it is likely that a higher intensity exercise program is needed to increase heart rate variability.

### 10:45 Radio Frequency (RF) Radiation and

**Human Cells** Amal Mirando, Elliot Brown, Physics, CoSM

Interactions between radio frequency (RF) radiation and human cells has been a much-debated topic amongst the scientific community. Yet, extensive studies have not been able to successfully prove any interactions between RF and human cells. We study the effects of RF radiation on

human cells consisting of platelet activating factor-receptor positive (KBP) keratinocytes. These KBP cells are exposed to two different continuous wave RF systems with frequencies of 12 GHz and 30 GHz at a power around 1 W. Cell viability and cell counts are analyzed after the KBP cells are exposed to the two RF systems and parallel experiments are carried out to distinguish the effect of RF radiation from thermal heating alone.

## Atlantis B

**9:00 Additive Manufacturing** Andrew Drieling, Joy Gockel, Mechanical & Materials Engineering, CECS

Additive Manufacturing (AM) provides a way to create parts that would be extremely difficult or even impossible with conventional manufacturing processes. However, AM also introduces defects, which are detrimental to the mechanical performance. These defects are potentially unknown until post-processing inspection and testing, wasting time and resources on an unusable part or initiating unexpected failure. Historically, spectroscopy has successfully been used for in situ monitoring of laser welding, using changing parameters in the generated plume to predict defects. In situ monitoring using a visible spectrometer for fabrication of Alloy 718 on a test bed laser powder bed fusion system is performed. AM defects, such as keyhole porosity and unfused powder, are detected in the sensor output and a physics-based modeling approach is used to predict defect occurrence. Spectroscopy can provide near real-time monitoring, allowing defects to be predicted, and potentially corrected before the completion of the part, saving time and resources.

**9:15 Autonomous Mobile Robots** Vibha Bellur Ravindra, Xiaodong Zhang, Electrical Engineering, CECS

Research activities on autonomous mobile robots have received increased attention due to their broad applications in numerous areas. Various path planning and obstacle avoidance algorithms have been developed for autonomous mobile robots. However, all these algorithms in the literature assume the absence of faults in the system components and actuators. Since such autonomous mobile robots need to operate reliably at all times, despite the possible occurrence of faulty behaviors in the control system components, the development of fault diagnosis and accommodation schemes is a crucial step in achieving reliable and safe operations. In this research, a fault-tolerant path planning and obstacle avoidance algorithm is developed and implemented for

mobile ground robots. The proposed fault-tolerant system architecture consists of the following three components: (1) an online fault diagnosis module for detecting, isolating, and estimating the faults in the mobile robot; (2) a localization and mapping module for dynamic terrain mapping and obstacle detection; (3) a path planning and obstacle avoidance module for generating way points from a given point to the desired destination, avoiding the detected obstacles and moving along these way points. The online fault diagnostic information is used by the path planning and obstacle avoidance module to compensate for the effect of faults, enabling the robot to automatically move to the destination even in the presence of faults. A Qbot2 robot with Kinect vision sensor from Quanser is used for real-time demonstration of the effectiveness of the algorithm in the presence of actuator faults in motors driving the wheels.

**9:30 Conical Flow around a Delta Wing** Ian Holloway, S.S. Sritharan, Air Force Institute of Technology, WPAFB

We look at the characteristics of conical, inviscid flow around a delta wing of elliptic cross-section at angle of attack. The study is to aid in the understanding and design of aircraft for which high-speed maneuverability is desired. This involves mitigating the formation of shock waves in the cross flow which cause the airflow to separate from the wing. Among the unique challenges encountered is that of solving a PDE which changes type multiple times in the domain necessitating a hybrid numerical scheme which can identify the character of the underlying equation.

**9:45 A Wearable Gait Analysis System** Bradley Schneider, Tanvi Banerjee, Computer Science, CECS

A study was conducted to investigate the feasibility of a wearable gait analysis system for classifying gait speed using only a single low-cost wearable camera in a semi-structured indoor setting. Data were collected from six participants who wore the system during indoor walk sequences at varying self-determined speeds (slow, medium, and fast). Participants also wore a commercially available vest comprising a single tri-axial accelerometer to provide comparison to a baseline system. Computer vision techniques and signal processing were used to generate gait frequency domain parameters from both sensor devices. The data were compared to the true speed category for each walk sequence and also compared across sensors to check for reliability and redundancy of the information being recorded by each sensor. An examination of the statistical effect sizes of collected features grouped by gait speed further revealed that the features from both devices significantly distinguish

between different gait speeds. This indicates that our low-cost, portable, vision-based system can be an effective solution for in-home gait analysis.

**10:15 Sequential Derivatives.** Joseph Sjoberg, Steen Pedersen, Mathematics & Statistics, CoSM

Consider a real valued function defined, but not differentiable at some point. We use sequences approaching the point of interest to define and study sequential concepts of secant and cord derivatives of the function at the point of interest. If the function is the celebrated Weierstrass function, it follows from some of our results that the set cord derivatives at any point coincides with the extended real line.

**10:30 Study of Specific Absorption Rate of Covetics** S M Sarif Rana, Gregory Kozlowski, Physics, CoSM

Covetics are carbon infused metals fabricated in an induction furnace. In this study we compare heat propagation among Cu covetics and pure Cu by measuring specific absorption rate (SAR) of the two sets of covetics. The first set of copper covetic (Cu cov) with nominal content of 36 at% carbon were prepared by Third Millennium Materials Company (TMMC), and the second set of Cu cov with nominal contents of 0 at%, 5 at%, and 10 at% carbon were prepared in the Air Force Research Laboratory (AFRL) facilities.

The experimental data show that covetics have different heating rates in comparison to the pure metals. In addition, our research has shown that Cu covetics provided by AFRL indicate gradual decrease in the average values of SAR and heating rate as we increase the nominal atomic percent of carbon from 0 to 10 at%. However, the TMMC samples, after annealing, show significant increase in the SAR value. These covetics of high and low SAR values can be used in microelectronics, renewable energy, and power cables for thermal managements.

**10:45 Doppler Tolerance** Jeffrey Hollon, K. T. Arasu, Mathematics & Statistics, CoSM

In the context of radar waveforms, there are many references to "Doppler Tolerance" in the literature, but a formal, complete, and precise definition has not been forthcoming. We attempt to fill this void. We evaluate existing definitions and demonstrate that they are either too restrictive, incomplete, or imprecise. Our definition uses the ambiguity function as its main ingredient from which we create the Doppler Tolerance as a 3D function of three parameters. The first parameter is a spatial variable which relates to the measures of connectedness of possible

disjoint ambiguity function peaks. The second parameter is the time delay at which the Doppler Tolerance is itself specified, and the third parameter is a threshold related to the height of the ambiguity function. Using our definition, we are capable of making comparisons on the performance between well-known and new waveform generation techniques.

## Discovery A

**9:00 Labor Unions in Mexico, Neoliberalism, NAFTA and Efficient Government** Eric Glock, Sirisha Naidu, Economics, RSCoB

This paper, utilizing third party research and case studies of labor unions in Mexico, examines reasons for the decline of labor unions in that country and further explores effective strategies that unions can undergo to ensure success, given individual will and governmental policy. The paper suggests that NAFTA itself has not been a primary reason for the decline of labor unions in Mexico. Further, while the success of labor unions is partially a function of government policy, ultimately, unions are a "veil" for said policy. Worker friendly regulation and guaranteed rights by government, including wage support and/or requirements replace the need for unions, and if government is against worker rights and protections, then it is likely that it is against unions in any case. Ultimately, this paper concludes with theoretical evidence showing that neoclassical efficiency is most closely attained when government supports the equitable and just Social Reproduction of the worker.

**9:15 Considering the Costs of Mortgages in Ohio** Matthew Canter, Sirisha Naidu, Economics, RSCoB

This paper examines the costs associated with home ownership in Ohio from 1984-2016. This is important to understanding the housing market, housing policies, and the true costs associated with the ability of households to fulfill the 'American Dream'. The increasing financialization of housing with rising property values strains the average American household more than necessary. Examining how rising property values potentially harms social reproduction processes within the household given a tightening budget, this paper attempts to show that without related increases in wages, home ownership is a diminishing attainable dream. Rising values and continually re-financing keeps costs of home ownership above a sustainable rate. This paper argues that home ownership may be desirable, but not viable to support households. Using median household income, property values, mortgage interest, and property taxes to evaluate costs of home ownership, I find that the costs of

home ownership is becoming more burdensome on the typical household. This paper suggests that consistent financialization of housing and property taxes are unhealthy strains on the household, increasing the costs of home ownership and making investing in other resources more challenging.

**9:30 The Possible Outcomes of the Trump Tax Cuts on the Labor Market** Joseph Gard, Sirisha Naidu, Economics, RSCoB

Recently passed into legislation was what is being called the Trump-GOP Tax cuts, which has now become the center of much debate since its passage. The focus of this research will examine what the possible effects of the Trump tax program could have on the job market. Trumps' plan is focused around tax cuts for businesses and therefore follows the logic that these businesses will reinvest into workers. The argument being made here is that this decrease in the amount of taxes will encourage firms to reinvest in domestic workers or other sectors of the production process. Due to the Bill being passed in December of 2017, inadequate data is available to better understand these possible effects. Therefore, analysis of the Reagan tax cuts of 1981 and 1986 as well as the Bush tax cuts will be analyzed to better understand the effects of social reproduction as it relates to the job market. It will be shown how in the end, the effects of the Trump tax cuts will have similar effects to the job market as those tax cuts before where long run inequality persists. This will be done through a combination of economic analysis as well as a historical comparison of the effects from similar tax bills

**10:15 The Dynamics of Mobilization in ethnic conflicts** Timothy Moss, Pramod Kantha, Political Sciences, CoLA

There are scores of literature on what causes ethnic conflict i.e., genetic predisposition: conflict is in our genes; economic competition: conflict is in our pursuit of opportunities; institutional integrity: conflict is in our societal processes. We've observed ethnic conflicts and civil wars erupt on different continents, under different conditions often with different catalysts. What causes some conflicts to be more violent and explosive than others? Are civilians being intentionally targeted, or are they unintended casualties? Are high death tolls the result of small groups of extreme insurgents, or is the chaos state-sponsored and facilitated? The goal of this project is to evaluate the dynamics of mobilization in ethnic conflicts, employing a comparative case study of two countries with distinct legacies of intrastate war: Rwanda and Sri Lanka. A former Belgian colony, Rwanda

experienced an ethnic civil war between the Hutu and the Tutsi, claiming 1 million lives in three months. This case is juxtaposed to Sri Lanka, a former British colony where ethnic conflict between the majority Sinhalese and minority Tamils resulted in more than 100,000 dead over the span of three decades. The dissimilarities between these two cases concerning the levels of violence and casualties presents a great opportunity to test the strengths of variables that may elucidate why no conflict is created equal.

**10:30 The Clash of Nationalisms: Avenue Towards State Repression** Nicholas Higgins, Pramod Kantha, Political Science, CoLA

After the collapse of the Soviet Union, there were countless minority groups found themselves living in a new country as a result of annexation, redefined territorial boundaries, migration, or by any other means, with some suffering repression from the states in which they resided. My research is about the interaction between such minority groups and states where they find themselves. My central objective is to answer why and how might a State, having just acquired an ethnic minority, repress the newly integrated ethnic minority, and how can such minority resist or respond to such repression. Through the combination of Benedict Anderson and Rogers Brubaker's conceptualizations of nationalism, and a focus on state repressions, both violent and nonviolent, as they are causally linked, I hypothesize that a State will repress an ethnic minority if both the State and the ethnic minority believe in strong, opposing nationalisms. This results in the State, having the greater mobilization capabilities and coercive instruments, repressing the ethnic minority, as the ethnic minority's nationalism is portrayed as threatening the State. The hypothesis will be tested through a single case study of the Crimean Tatars and their repression by the Russian Federation following the Crimean Annexation of 2014. The annexation of Crimea juxtaposed two opposing nationalisms, the Crimean Tatar and the Russian national identities, both have nationalistic claims to the Crimean Peninsula, and they oppose each other's claim over the territory. Obviously, the Crimean Tatars suffer a huge disadvantage, lacking any real hegemonic power, thus unable to defend themselves against the stronger nationalism of the Russian Federation. My research will follow qualitative analysis drawing on published primary and secondary sources

**10:45 GENDER AND HUMAN SECURITY IN POST-CONFLICT SETTINGS** Yolaine Michaud, December Green, Political Science, CoLA

Human security is concerned with human dignity, and freedom from fear and want. The purpose of the research is to take an in-depth look at the concept of Human Security, and the politics of gender in post conflict settings. These two areas affect women's ability to act as agents of change when rebuilding the nation and their communities. In times of conflict, women often assume what are traditionally considered men's roles and struggle to maintain society cohesion. However, upon the cessation of war, the preexisting inequality in gender relation resumes, and those who resist a return to the status quo are often the victims of a patriarchal backlash, and live in constant fear of physical and structural violence. This study will concentrate on three factors, namely, women in development, women as elites, and the practice of gender mainstreaming in policies and programs, all considered key elements contributing to human security. From those three factors, the research will analyze the literature on how countries emerging from conflict internalize Human Security, in particular its application to gender. The disparities between men and women often reach epic proportions, especially in post conflict situations. Economic and political expediencies tend to perpetuate the pre-conflict institutions and a return to the glaring gender gap. Focusing on the small window of opportunity in the post conflict transitional period, in the Asian and African regions, this study will assess women's capacity to take the lead in community advocacy activities, and consider what it takes to effectively mobilize and influence decision makers to articulate viable policies that secure women's dignity in the private sphere and ensure their active participation in the public sphere

## Discovery B

### **9:00 La clima social moderna de Los Estados Unidos (The Modern Social Climate of the United States)** Gordon McKnight, Damaris Serrano, Modern Languages, CoLA

Exploring issues that face the United States today results in a useful understanding of what unites and divides the nation. Introducing a new lens through which to examine these issues immensely enhances the exploration. This project employs the lens of English/Spanish bilingualism which combines knowledge of a second language with the cultures of those who speak it. The year 2017 was marked with political and cultural division highlighted by a new presidency, protests in the NFL, and changes in immigration legislation. These issues in particular have influenced the minority populations of the United States. For this reason, the ability to understand the viewpoints of those affected is of great importance in the process of resolution. Not only can bilingualism expand the audience of written work, but it can also significantly enhance

content. Due to the varying vocabulary and linguistic structure, communicating ideas in a second language has potential to be more effective than communicating in a native language. This concept is especially true in poetry, a powerful tool for persuasion and personal expression. This project utilizes the Spanish language in conjunction with opposing literary forms to present the research of current events in a unique manner

### **9:15 Europe's Parallel Media Universe: Cross-national analysis of populist media oppression in the EU** Csongor Bajnoczki, Liam Anderson, Political Science, CoLA

Media freedom has declined worldwide, including in Europe, but this decline is more pronounced wherever populists have gained power in the European Union (EU). Approaching the question deductively, I believe that populists want to tame the media not just to keep people ignorant, but also because the media is dominated by liberals as well as elites of the establishment who generally hate populism. Viewed inductively, both quantitative and qualitative research on media freedom demonstrate noticeable issues in press freedom worldwide in the recent years, but the most significant fallbacks have been happening in Europe where populists govern the country. In terms of the methodology, I use multiple regressions to test the hypothesis of a negative relationship between the political power of populist parties and degree of media freedom. To measure the power of populist parties, I rely on election results. Since elections can take place in different years and more frequently among the some EU member states than others, I use the closest domestic election results to the years of 1995, 2000, 2005, 2010, and 2015 for the independent variable in order to achieve consistency throughout the work. For the dependent variable, I use Freedom House's Freedom of Press reports of 1995, 2000, 2005, 2010, and 2015. Political rights and civil liberties country scores from Freedom House's Freedom in the World reports, GDP per capita from World Bank, corruption perception indexes from Transparency International, and Grigorii V. Golosov's formula of effective number of parties are included as control variables in order to assess and clarify the relationship between the level of media freedom and the power of populist parties. In order to maximize the number of cases for analysis, I code all 28 EU countries' media freedom scores and the political power of populist parties for the years of 1995, 2000, 2005, 2010, and 2015, yielding 140 data points (5 years of media freedom scores x 28 countries = 140). In terms of coding my dependent variable, I run models with three different coding schemes. First, a 4-value variable model to differentiate populist parties with no seat in the parliament (1), with some seats in the parliament (2), as a

minority coalition in the government (3), and being in power (4). Second, a 3-value variable model when populists have either no seat or some seats in the parliament (1), are a minority coalition in the government (2), and are in power (3). Lastly, a 2-value variable model to distinguish populists with either no seat, some seats, or as a minority coalition in the government (1) from being in power (2). The results indicate that populist parties, generally speaking, indeed attempt to oppress the media once they are in power, especially in Eastern Europe. On the other hand, media freedom is relatively stable and high, where populists have no seat in the parliament, have some seats in the parliament, or are a minority coalition in the government.

### **9:30 Why Do Weak States Attack Strong States?**

Nathan Molnar, Liam Anderson, Political Science, CoLA

My research seeks to answer a difficult question: why do weak states attack strong states? Since it is extremely difficult to predict when and if a weak state will attack a strong state, this article looks at cases across time, to narrow down the casual factors of weak states attacking strong states. This article analyzes the factors present when weak states have attacked strong states. The three cases analyzed are 1) Japan vs the US, 2) Iraq vs Iran, and 3) Georgia vs Russia. The cases occurred at different points in history, but in all three, similar factors appear to have influenced the decision of the weak state to attack the strong. I conclude by summarizing and arguing that all three factors (strategic interaction, miscalculations/misperceptions, and reciprocity) found in the aforementioned cases need to be present for a future conflict between a weak state and a strong state. Finally, I will assess if these variables are present with current tensions between North Korea and the U.S.

### **10:15 NAFTA: Is Helping the Whole Worth Hurting the Deprived?**

Brendan Eltzroth, Sirisha Naidu, Economics, RSCoB

Through NAFTA, the United States, Canada, and Mexico removed trade barriers, giving companies greater freedom to choose where to produce their goods. While this is good for firms, who can now choose to produce their goods wherever the cost is lowest and sell to each country without needing to consider trade barriers, there are questions about whether NAFTA has had a positive impact on workers in each country. The purpose of this paper is to uncover the impact NAFTA has had on low skill workers (defined as workers whose jobs do not require college or trade school education) ability to engage in social reproduction in the southwestern United States (Arizona,

New Mexico, Texas, & Oklahoma). In order to complete this objective, this paper will consider time series data to uncover the statistical impact of NAFTA on the availability of low skill jobs and the wages they pay. Additionally, descriptive research will be utilized to bring context and meaning to these statistical findings. This paper investigates the claim that while NAFTA has positively impacted firms, and arguably the US as a whole, low skill workers, concentrated in especially vulnerable geographic areas, were negatively impacted to an extraordinary degree. The end of this paper will briefly discuss solutions to this negative outcome.

### **10:30 The Changing Structure of Employment in the Rust Belt**

Justin Ronallo, Sirisha Naidu, Economics, RSCoB

During the neoliberal era, since the 1970's, the Rust Belt has experienced a sharp decrease in manufacturing employment. Expanding free-trade agreements have led to many manufacturers relocating production to lower cost locations. Metropolitan areas in the Rust Belt have seen a decrease in manufacturing jobs and a shrinking population. This paper investigates how the employment structure, wages, and unemployment has been impacted by the shrinking manufacturing industry in Rust Belt cities? Data from the Bureau of Labor Statistics will indicate jobs and industries that have replaced manufacturing in this region. The goal is to see if these jobs offer comparable means for the social reproduction of the employees. This change, in the structure of employment, will be shown using a descriptive analysis of the data. It will focus on the steel and automotive industries in Pittsburgh, PA, Cleveland, OH, and Detroit, MI. The data indicates that relatively high paying and secure manufacturing jobs, have been replaced with lower wage jobs. These manufacturing jobs historically had strong union membership, which shows a sharp decrease since the 1960's. Lower wages, less job security, and population migration in the region have affected the ability of workers to sustain themselves and thus has adversely impacted communities.

### **10:45 Maternal Mortality Rates and the healthcare System in the United States**

Chelsea Dross, Sirisha Naidu, Economics, RSCoB

Maternal mortality has been a major issue in the developing world, but recently it has been a growing concern in the United States. Since the United States implemented the Pregnancy Mortality Surveillance System in 1986 there has been a rising trend in pregnancy-related deaths, while in other developed countries the rates have been decreasing. This study investigates the relationship

between healthcare access and the maternal mortality ratio (MMR). I will give a descriptive analysis of data from the Centers for Disease Control and Prevention for the years 1987-2013. The analysis will focus on data concerning the MMR, access to health insurance, and growing health concerns. Data has shown that pregnancy-related deaths are concentrated around the poor. Not having access to prenatal care may be an important indicator in the MMR. There are new growing health concerns for mothers and without proper medical treatment the results can be life-threatening. Increasing maternal mortality rate could be prevented, if the necessary policies are implemented to address it.

## Endeavour A

### **9:00 Climate Change and Indigenous Peoples: A Human Rights Analysis** Crystal Burns, Vaughn Shannon, Political Sciences, CoLA

The purpose of this research is to examine the correlation between climate change and its direct effect on Indigenous Peoples human rights. Indigenous cultures are among the first to face the direct consequences of climate change due to their dependence and relationship with the environment and its resources. As the Earth's average temperature continues to increase at a rapid rate of 0.29° to 0.46° Fahrenheit per decade, indigenous communities are experiencing declines in health, loss of land and resources and disappearance of culture. As an already marginalized population who are dependent upon the environment and the resources it provides, and whose livelihood is based on the direct utilization of natural resources are most affected by climate change, then those living a modern lifestyle. At this time, I plan to focus on literature encompassing North American indigenous peoples' suffering from the effects of climate change with a possible comparison of other countries indigenous populations and the impact climate change has on their human rights. Native Alaskan tribes rely on sea currents and freezing ice for hunting purposes and climate change has reduced fishing and hunting within the community as well as increased sea levels which is forcing many communities to leave their land. Additionally, I'm interested in the role "dominant cultures" plays in addressing the effects of climate change as a human rights violation towards indigenous peoples.

### **9:15 Effects of filtration timing and pore size on measured nutrient concentrations in natural waters** Megan Reed, Silvia Newell, Earth & Environmental Sciences, CoSM

Eutrophication is a growing issue in many aquatic systems, primarily caused by nutrient loading, often leading to harmful algal blooms and hypoxia. Policies to mitigate these issues will rely on reported nutrient monitoring data, but consistent methods are not standard across the field. Many researchers use pore sizes which allow microorganisms into the sample and/or wait until return to the lab before filtering, which can alter nutrient dynamics within the sample and lead to inconsistent data. This study was conducted over 34 freshwater sites in Ohio, Wisconsin, and Florida. Three filter pore sizes—0.22 µm, 0.45 µm, and 0.70 µm (GF/F) - were used to filter water in the field, after 5 hours, and after 22 hours. These samples were analyzed colorimetrically for ammonium (NH<sub>4</sub><sup>+</sup>) and orthophosphate (OP). The concentration of both NH<sub>4</sub><sup>+</sup> and OP varied significantly with time from collection and with the use of different filter pore sizes. The samples filtered after 22 hours showed the largest range of change, with the concentration varying from -1000–1000% from the original sample. Samples filtered in the field with 0.70 µm filters showed over 4000% change compared to the 0.22 µm sample filtered in the field. Filtering with at least 0.45 µm filter immediate in the field showed the least change. Implementation of a standard filtering method will ensure that reported data represents the actual ambient nutrient concentration and is critical for data comparison across the field and for monitoring in situ nutrient concentrations in surface waters.

### **9:30 Effect of white-tailed deer and Amur honeysuckle on soil enzyme production in a Midwestern forest** Michaela Woods, Megan Rúa, Biological Sciences, CoSM

Soil health captures the ability of soil to sustain animal and plant productivity. Microorganisms found in the soil play a key role in maintaining soil health. In the Eastern US, white-tailed deer (*Odocoileus virginianus*) have skyrocketed in population size and opened a niche for invasive species through preferential grazing. One such invasive is the shrub Amur honeysuckle (*Lonicera maackii*), which is allelopathic and reduces the success of neighboring plants. To determine the influence that deer and honeysuckle have on microbial function, and therefore soil health, we quantified soil exoenzyme activities in paired deer enclosure and access plots each with areas with honeysuckle removed and intact. We measured three important soil enzymes as a proxy for microbial function: β-glucosidase (decays labile C), polyphenol oxidase (decays recalcitrant C), and peroxidase (decays recalcitrant C). We also measured soil pH and gravimetric soil moisture. We predicted that honeysuckle would decrease polyphenol oxidase and peroxidase activities and

increase  $\beta$ -glucosidase activity due to its input of labile litter to the system. In contrast, deer would have the opposite impact on activity because they preferentially graze labile plant material leaving behind recalcitrant litter. While honeysuckle did not have a direct influence on exoenzyme activity ( $p > 0.05$ ), deer increased polyphenol oxidase ( $p < 0.001$ ), peroxidase ( $p < 0.001$ ), and  $\beta$ -glucosidase ( $p < 0.05$ ) activities. Both deer and honeysuckle altered the soil environment which in turn impacted enzyme production. Deer decreased soil pH ( $p < 0.001$ ), and within deer treatments, honeysuckle increased soil pH ( $p < 0.001$ ). Polyphenol oxidase ( $p < 0.001$ ), peroxidase ( $p < 0.001$ ), and  $\beta$ -glucosidase ( $p < 0.05$ ) activities were higher where soil pH was lower, independent of deer and honeysuckle treatments. This implies that deer are indirectly increasing exoenzyme production while honeysuckle may be decreasing exoenzyme production through changes in soil pH. Deer also decreased soil moisture where honeysuckle was removed ( $p < 0.001$ ), but neither deer nor honeysuckle influenced soil moisture alone. Phenol oxidase ( $p < 0.001$ ) and peroxidase ( $p < 0.001$ ) activities increased with decreasing soil moisture overall, whereas  $\beta$ -glucosidase did not have a clear relationship with soil moisture ( $p > 0.05$ ). Under conditions of honeysuckle removal, deer may be increasing soil enzyme production by decreasing soil moisture. Altogether, in a forest invaded by both honeysuckle and large populations of white tailed deer, honeysuckle did not clearly change microbial function while deer stimulated exoenzyme production. Reduction in deer densities in invaded forests may contribute to forest sustainability by improving soil health.

**10:15 The Missing Metric: An Evaluation of Microorganism Important in Wetland Assessments Using Soil Fungi** Aaron Onufrak, Megan Rúa, Katie Hossler, Biological Sciences, CoSM

In the contiguous US, an estimated 50% of original wetland areas have been lost since the late 1700s. In growing recognition of the importance of preserving wetland ecosystem function, federal and state agencies have developed proxy-based functional-assessment procedures to manage and preserve remaining wetland areas. Ohio uses the Ohio Rapid Assessment Method (ORAM) to score wetland quality based on six metrics: wetland size, buffer width and surrounding land use, hydrology, habitat alteration and development, special wetland communities, and vegetation. Currently, the ORAM, and many other wetland scoring systems, do not consider microorganisms when determining wetland quality. This is particularly notable, because fungi are considered the primary decomposers of organic material in many wetlands and play an important role in nutrient cycling in all major

wetland types. We aim to (1) determine the extent to which ORAM scores describe soil fungal community composition, and (2) assess how soil physicochemical variables structure fungal communities in freshwater marshes. Our central hypothesis is that wetlands with higher quality ratings will have more diverse fungal communities that differ in composition from lower quality wetlands. In Summer 2017, we scored six freshwater depressional emergent marshes following the ORAM. In each wetland, two to three dominant strata were identified based on vegetation community. We established five sampling stations per strata using a stratified random design; three soil cores (11.5cm x 10 cm) were collected per station. Soil bulk density, pH, texture, and Carbon, Nitrogen, and Phosphorus were measured using two soil cores. DNA was extracted from the third core, amplified using the ITS1F and ITS2 PCR primers, and then sequenced on the Illumina MiSeq platform at the Ohio State University Molecular Cellular Imaging Center. Sequences were processed using the bioinformatics pipeline Quantitative Insights into Microbial Ecology. Our results indicate that bulk density and pH decrease with ORAM score and soil water content increases with ORAM score. We then use univariate and multivariate analyses to determine the extent to which ORAM score, soil physicochemical properties and vegetation structure fungal community composition. This information provides crucial support for developing a new assessment method or adjusting existing assessments so that microorganism communities are considered.

**10:30 Physiologic Mechanisms of Temperature-Sensitive Regulation of Ventilation** Mauricio Vallejo, Lynn Hartzler, Biological Science, CoSM

Animals match ventilation to metabolic and acid-base regulatory demands during changes in body temperature. Across vertebrates, ventilation increases at warmer temperatures and decreases at cooler temperatures. At the organismal level this is attributed to metabolic feedback and/or alpha-stat pH regulation; however, the cellular mechanisms that produce ventilatory output in response to brain temperature changes remain unclear. To identify mechanisms underlying temperature-sensitivity of the respiratory control network, we used brainstem-spinal cord preparations producing spontaneously active, rhythmic motor output similar to breathing in vivo of adult bullfrogs *Lithobates catesbeianus*. In vitro brainstem-spinal cords were superfused with artificial cerebrospinal fluid (aCSF) equilibrated at 90% O<sub>2</sub>, 1.3% CO<sub>2</sub>, and balance N<sub>2</sub>. Whole nerve recordings from the trigeminal (V) and vagus (X) nerves were used for measuring respiratory-related activity. We applied temperature ramps from 20°C to 15°C and then to 25°C; each step

lasted 15 minutes. Bursting frequency was analyzed for the last 5 minutes of each step and then normalized to percent of baseline (20°C). Consistent with in vivo and in vitro data (Bícego-Nahas and Branco, 1999; Morales and Hedrick, 2002), we demonstrate that the frequency of respiratory-related nerve activity is stable across high temperatures, but not lower temperatures (One-way ANOVA  $p=0.0013$ ; percent of baseline significantly lower at 15°C compared to 20°C and compared to 25°C, but no difference between 20°C and 25°C; Tukey's Multiple Comparison Test). The locus coeruleus (LC) is a nucleus of the respiratory network and is the main supplier of norepinephrine in the brain. LC neurons from bullfrogs are paradoxically activated by decreases in temperature (Santin et al., 2013) suggesting that firing frequencies inversely proportional to temperature may play a role in setting the respiratory frequency across temperatures. To identify the role of norepinephrine in generating the respiratory frequency, we applied the temperature protocol while blocking the main adrenergic receptors (AR). For blocking  $\alpha 1AR$ , preparations were superfused with aCSF containing Prazosin and for blocking  $\alpha 2AR$  we used RX821002. We found that bursting stability at high temperatures is disrupted when  $\alpha 1AR$  are blocked (One-way ANOVA  $p=0.0011$ ; percent of baseline significantly lower at 15°C compared to 20°C and 25°C, and percent of baseline significantly lower at 20°C compared to 25°C; Tukey's Multiple Comparison Test). In contrast, the inhibition of bursting frequency at 15°C was lost when  $\alpha 2AR$  were blocked (One-way ANOVA  $p=0.1649$ ; percent of baseline not different at 15°C, 20°C and 25°C). These results imply that norepinephrine tuning through different receptors, rather than simple Q10 effects, plays a major role in generating the breathing frequency across temperatures to match metabolic demands and acid-base regulation requirements at those temperatures.

**10;45 Accpetance of Evolution Among Science Teachers** Rutuja Mahajan, Computer Science, CECS, Will Romine, Biological Sciences, CoSM

Evolution, whether be in technology or society, is a constant change in characteristics over successive generations. Unfortunately, acceptance of evolution is still a major concern in the society. Resistance to this evolution by nonscientific ideologies dominate the culture and leads to the ceasing of the development of science. Numerous analysis has been undertaken by evolutionists and researchers throughout the time to investigate the acceptance of evolution by the society. In this study, we aim to explore how high school science teachers' response to the survey based on evolution education scenarios cluster together using different clustering techniques. We report the responses of 296 teachers to scrutinize how these emotions gather together to form a cluster, by

applying popular clustering methods as k-means. Unsupervised learning approach, Decision Tree is implemented to identify how teachers' responses on their religious, ethical and demographic variables predict their cluster membership. Our study reveals that teachers show three tendencies ; (1) Pro-evolution; (2) Anti-evolution and (3) Shame and guilt for not supporting evolution education more strongly. We found that there are distinct categories for how teachers express these tendencies and that these can be predicted based on their religious, ethical and demographic variables.

**Endeavour B**

**9:00 Characterization of Human Optic Atrophy Type 1 in Yeast** Annabel Almazan, Haley Curry, Shuzhen Chen, Shulin Ju, Quan Zhong, Biological Sciences, CoSM

Mitochondria are important organelles that serve as the cell's primary source of energy and play critical roles in the regulation of cell death and survival. An intricate balance between mitochondrial fusion and fission, the continuous joining and dividing of this tubular structured organelle, is essential to the cell and is tightly regulated by a number of genes. Among those genes, Optic atrophy type 1 (OPA1) has been genetically linked to the human Optic Neuropathy. Mutations in OPA1 were also found in patients with syndromic Parkinsonism and dementia, suggesting a more general role of OPA1 in neurodegeneration. OPA1 encodes a mitochondrial GTPase. Proteolytic processing of OPA1 by two proteases, OMA1 and YME1L, generates distinct long and short forms of OPA1, which have specific effects on mitochondrial fusion and fission, cristae remodeling, and cell death signaling. Here, we developed a cellular model to characterize the upstream regulators and downstream effectors of OPA1. We show that overexpression of OPA1 in the budding yeast, *Saccharomyces cerevisiae*, induces cell death and abnormal mitochondrial morphology. Under the same conditions, a similar phenotype was observed for OMA1. Given the many conserved genes in yeast that regulate mitochondrial dynamics and quality control, we designed a high-throughput platform to systematically measure the effect of other human genes on OPA1 function and to rapidly classify genetic interaction networks of OPA1 using yeast cells as the "mediator" host. Our data support the use of a yeast model system to study evolutionarily conserved human gene functions. Such inter-species genetic approaches may help characterize genetic modifiers of other diseases.

**9:15 Platelet-Activating Factor Receptors in Systemic Lupus Erythematosus** Townsend Smith, Jeffrey Travers, Pharmacology & Toxicology, BSoM

TLR7 is a member of the Toll-like receptor class of proteins which function as pattern recognition receptors (PRR) in the innate immune system and recognizes single-stranded RNA. The TLR7 agonist, imiquimod (IMQ), has been used in mouse models as an acute psoriasis model and chronic systemic lupus erythematosus (SLE) model. SLE is an autoimmune disease that affects multiple organ systems. Platelet-activating factor (PAF) is a potent phospholipid mediator of inflammation with diverse biological actions that acts through a single G-protein coupled receptor, (PAF-receptor; PAFR). Studies demonstrating elevated PAF levels in the serum of patients with active SLE compared to inactive SLE or healthy subjects suggests that PAF may play a role in SLE. In this study we aimed to investigate the role of PAFR in a chronic IMQ-induced SLE model. We hypothesized that mice lacking PAFR would have a less severe disease state than mice with PAFR. Previous IMQ-induced SLE models were unable to chronically treat the dorsum of mice and instead treated the ears due to the mice becoming severely ill after ingesting the IMQ on their dorsa. In this study we used Elizabethan collars to prevent this, allowing us to treat the dorsum and induce a more severe disease state. Following two months of treatment mice were sacrificed and harvested. PAFR<sup>-/-</sup> mice demonstrated a more severe disease state than WT IMQ treated mice as evidenced by enhanced splenomegaly and higher inflammatory cytokine and autoantibody levels in their serum. This evidence suggests that PAFR exerts anti-inflammatory effects in SLE.

**9:30 mir-320a and Metastasis** Amjad Aljagthmi, Madhavi Kadakia, Biochemistry and Molecular Biology, CoSM & BSoM

$\Delta$ Np63 $\alpha$  is overexpressed in a number of cancers and known to play a role in proliferation, differentiation, migration and invasion.  $\Delta$ Np63 $\alpha$  has been shown to regulate several microRNAs that play a role in both development and cancer. We identified a novel miRNA, miR-320a which is positively regulated by p63. Previous studies have shown that miR-320a is downregulated in colorectal cancer and targets RAC1, leading to a decrease in non-canonical WNT signaling and EMT and thereby a corresponding decrease in tumor metastasis and invasion. In this study we examined whether  $\Delta$ Np63 $\alpha$  decreases cell invasion through the down-regulation of PKC $\gamma$  levels and subsequently RAC1 phosphorylation via miR-320a. We showed that knockdown of  $\Delta$ Np63 $\alpha$  in HaCaT and A431 cell lines led to a decrease in miR-320a levels and a corresponding increase in the PKC $\gamma$  levels. We also showed

that knockdown of  $\Delta$ Np63 $\alpha$  induced RAC1 phosphorylation at Ser71, while overexpression of  $\Delta$ Np63 $\alpha$  in SW480 and Caco2 cells led to a decrease in the S71 phosphorylation of RAC1. Finally, we showed that the increase in PKC $\gamma$  levels and RAC1 phosphorylation and cell invasion observed upon knockdown of  $\Delta$ Np63 $\alpha$  is reversible by overexpressing miR-320a. Taken together, our data suggest that  $\Delta$ Np63 $\alpha$ -mediated increase in miR-320a levels has potential implications for cancer migration and metastasis.

**10:15 Analyses of Tau Tubulin Kinase Paralogs in *Schmidtea mediterranea*** Robert Magley, Labib Rouhana, Biological Sciences, CoSM

Tubulin comprises the structural element of microtubules and Tau is one of many microtubule-associated proteins in neuronal axons. Tau Tubulin Kinase (TTBK) phosphorylates both Tau and Tubulin, and is required for the initial steps of cilia formation. Due to the structural similarities between cilia and sperm flagella, as well as the enriched expression of TTBK1 and TTBK2 in human testes, we hypothesize that TTBK homologs may play a role in sperm maturation. We test this hypothesis in the planarian *Schmidtea mediterranea*, a lophotrochozoan model capable of whole-body regeneration and development a complete reproductive system post-embryonically. Six TTBK homologs were identified in the genome of *S. mediterranea*. Analysis by whole-mount in situ hybridization revealed that all six homologs (Smed-TTBK-a – f) are preferentially expressed in the testes of sexually mature planarians. Functional analyses by RNA-interference (RNAi) revealed that Smed-TTBK-d is required for sperm development. Smed-TTBK-d RNAi also results in behavioral movement defects, which appear to be caused by structural abnormalities in ciliated epidermal cells that power planarian gliding. Surprisingly, given the known association of human TTBK homologs with neurodegenerative disorders such as Alzheimer's disease and Spinocerebellar Ataxia Type 11, expression of *S. mediterranea* TTBK homologs was not detected in the planarian central nervous system or required for head regeneration. Altogether, these results demonstrate that TTBK function essential for development of ciliated structures in planarians, although contributions to neuronal development and function do not seem to be conserved in this flatworm.

**10:30 Determining the Instability of MAGI-1 PDZ1 Mutants Using the MuSiC Algorithm** Hannah Shows, Katherine Excoffon, Biological Sciences, CoSM

Every type of biological function depends either directly or indirectly on proteins, from enzymatic and immunological

reactions to co-ordination of nerve impulses. The folding of proteins depends upon the sequence of amino acids. Proteins are then folded into tertiary and quaternary structures that are maintained by non-covalent interactions, including hydrogen bonding and hydrophobic, electrostatic, and van der Waals forces. Mutations in the amino acid sequence may affect the structure, stability, and function of a protein depending on the changes in covalent and non-covalent interactions. Furthermore, proteins may lose or gain functions due to mutation. Understanding how a mutation may affect the structure and function of a protein is crucial to protein design and modification in all fields of protein research. The Coxsackievirus and adenovirus receptor (CAR), the primary receptor for adenovirus, is regulated by MAGI-1, a cellular scaffolding protein. MAGI-1 modulates 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. By destabilizing the PDZ1 domain, or stabilizing the PDZ3 domain, we can downregulate CAREx8 expression by preferentially upregulating the PDZ3/CAREx8 interaction. To understand the stability profile of MAGI-1 PDZ1, mutations in the amino acid sequence of PDZ1 were analyzed using the Prediction of Protein Mutant Stability Changes (PoPMuSiC) and Single Nucleotide Polymorphism Mutant Stability Changes (SNPMuSiC) algorithms to identify the Gibbs free energy change of each possible mutation. While the PoPMuSiC program provides information about stability changes in the protein domain, the SNPMuSiC program predicts whether each individual mutation will be deleterious or benign to the function of the protein domain. In total, 2451 mutations were made to MAGI-1 PDZ1. One of the most important findings of this study demonstrates that mutating residue L24 is expected to have extremely deleterious effects on the function of MAGI-1 PDZ1. L24 has been shown in modeling programs to directly interact with the two Phe residues found in the protein-binding domain of MAGI-1 PDZ1. Future work will confirm the effect of this mutation on protein interactions and viral infection in cells. Understanding the molecular basis of protein interactions is critical for predicting novel approaches for modifying cellular and potentially pathogenic behaviors.

### Endeavour C

**9:00 ¿Mezclados o separados? [Mixed or separated?]** Isaiah Bausmith, Demaris Serrano, Modern Languages, CoLA

The Connection Between the Spanish, Latinos, and Latin-Americans. Titled, «¿Mezclados o separados?», this essay

delves into the interconnectedness of today's world: globalized societies and their inherent or concealed identities. In other words, a reader of this essay will decide whether the idea of "here and there" is still a strong concept in a world featuring globalization, transportation, and communication. The essay was elaborated based on sources written with antiquated history as well as supported with history a year old. Between the information presented from these sources, the reader will explore concepts that attempt to offer judgement on the pretense of the expression «el aquí y el allí» (here and there). As well as utilizing a range of history to stress the information, there is also a presence of varying informative formats: books, movies, and films. The diversity in the information lends to the effectiveness in presenting the reader with enough data so that he or she may agree with the author's conclusion (a soft version of "here and there" is still pertinent) or postulate an alternative denouement.

**9:15 The Evolution of the Romanceros** Katia Jordan, Isaiah Bausmith, Damaris Serrano, Modern Languages, CoLA

The presentation La Evolución de Romanceros a Telenovelas (The Evolution from Romances to Soap Operas), explains the development of communication, expression of feelings, and the way to inform daily events from people who lived in certain regions of the American Continent and Spain. The concepts of "Jarchas", "Coplas", "Novelas", "Corridos", "Narco Corridos", and "Telenovelas" will be explained to have a better understanding on how the Spaniard influence also known as "Las Tres Carabelas" has shaped the way Latin-American people communicate. The presentation will work on different genres such as literature and music to make a connection since the Spaniard colonization until today. It concludes with "Las Tres Carabelas" which colonized regions of the American Continent, but after centuries a Spaniard writer was influenced by the culture of Latin-America. He transformed the Spaniard literature by giving a new twist in his last novel "La Reina del Sur", which was an inspiration to write a new type of soap opera in Mexico. As you can see, "Las Tres Carabelas" goes back and forth, so at the end of the presentation it is suggested to expose oneself to a variety of different cultures with the purpose of perceiving the marvelous of different novels, music, and people.

**9:30 Learning to paint and draw, Learning to See** Nick Stalter, Penny Park, Art & Art History, CoLA

Learning to paint and draw is learning to truly see. To the uninitiated it might seem like the drawing process is simply observing the subject understanding it fully and

then recording it. However the drawing and the seeing are inseparable. As you draw you see. So in that way the drawing becomes the mode of seeing. It can be concluded then, that drawing is not simply a recording of the subject but more accurately an artifact of seeing. When something is drawn or painted well it teaches the viewer something about the nature of the thing. To clarify, an illustration of an apple, the kind seen in an advertisement for example, does nothing more than remind the viewer of an apple. The illustration serves as a symbol for apples. However when looking at an apple painted by Paul Cezanne one can't help but learn something about the nature of color and the apple itself doesn't really matter at all. Cezanne paints with honesty in search of something greater than the apple itself. The pursuit of making a picture with truth and honesty has been a fixation of my studies.

### **9:45 Experiences of the “Great War”** Laclyn Schmitz, Kirsten Halling, Modern Languages, CoLA

Through a collective of famous and lesser-known WWI French poetry, the variety of experiences of the “Great War” are explored in the writings of individuals on the battlefield and home front alike. Rather than narrowly focusing on one angle of the war, the author seeks to gain a more holistic understanding of the poets’ personal war experience from their poetic writings. While the soldiers dealt with death and killing on the battlefield, the women on the home front managed the menial tasks of day-to-day life, feeling helpless as loved ones suffered in distant trenches. Both dealt with the disconnect between the two fronts caused by the war. These poems, written in French with an English translation by the author, allow access and insight into the more forgotten, raw experiences of those who lived during one of the deadliest wars of the twentieth century.

### College of Engineering & Computer Science

#### 1. Autonomous Intelligent Robot Wheelchairs

Iosif Papadakis Ktistakis, Nikolaos Bourbakis,  
Computer Science, CECS

People with disabilities and the elderly usually require assistance in their daily activities (ADL) that is provided by specialists (health providers), at a high cost. Even with the help from providers, problems still remain in their ADL needs like the assistance for moving, eating, standing etc. and they are associated to the loss of their independence. Moreover, there are not enough healthcare providers to cover the needs of these people, which lead unqualified people to be used in these services. A promising solution to the aforementioned problem will come from the assistive robotics research area. Thus, the profound impact of this research area will transform the healthcare in hospitals and other assistive environments in the near future. For those reasons, the development of an autonomous intelligent robotic wheelchair (AIRW) will significantly contribute to the daily lives of these people. An AIRW is being studied in the Center of Assistive Research Technologies (CART). In particular, in this study the Stochastic Petri-Net (SPN) modeling of the tasks performed by this wheelchair (Get-Up, Turn-Around and Sit-Down) is presented. Furthermore, the interaction between the wheelchair and the human-user will also be presented.

#### 2. High Speed Line following

Krutant Mehta, Luther Palmer, Electrical Engineering,  
CECS

Line following robots are a class of robotic vehicles that use infrared sensors to follow a line on a surface that has a contrasting color. This difference in color creates changes in the output of the infrared sensors, which the robot then uses to find and follow the line. Generally line following robots are used to follow lines with a large amount of curves with priority being given to accuracy, rather than speed. This project attempts at creating a sensor matrix and Arduino algorithm to allow a robot travelling at or above 30 miles per hour to follow a line with gradual curves. The intended application is to follow the lane separator line on a running track at speeds similar to that of a human sprinter.

#### 3. Anatomical and Biomechanical Aspect of Artificial Shoulder Joint

Alexis Muhumure, Farah Hamandi, Denish Gundapaneni, Tarun Goswami, Biomedical Engineering, CECS

*Background:* Total shoulder arthroplasty (TSA) is a very critical procedure, which is widely used to restore the function of the shoulder joint. For a successful total

shoulder replacement, implant design parameters are very critical. Primary parameters such as diameter of the humeral head size, inclination angle of the Morse taper, and liner thickness should to be taken into consideration to yield successful results. The purpose of this study is to determine the effect of humeral head diameter on total shoulder arthroplasty using a stemless prosthesis.

*Methods:* A three dimensional model was constructed by using patient's MRI data in Mimics. Based on the size of the model, a stemless shoulder prosthesis and liner component were designed in Solid work depending on the morphological parameters (imported as point cloud data). Three humeral head sizes were considered in this study with diameters (36, 39, 42 mm) and height of 3 mm. In all models the taper angle was kept constant at 8°. To investigate the effect of humeral head size on the stress distribution, finite element analysis (FEA) was conducted (shoulder model with the implant) using ANSYS workbench 17.2. A load of 5 MPa was applied to humerus in abduction position by constraining the glenoid component.

*Results:* Results have shown that the maximum stresses on the proximal area of the humerus bone for a diameter of 37 mm was 138.4 MPa, 195.37 MPa for diameter of 40mm and 393.94 MPa for a diameter of 42mm.

*Conclusion:* Based on the results of the study, the maximum stresses on the humerus bone were much higher for large diameters of the stemless prosthesis. This means that the stresses would significantly increase as the contact area between the humeral head and the implant increases. To avoid the premature failure of the prosthesis, it is recommended to implement a lesser prosthetic diameter in a given shoulder size range to achieve better outcomes.

### College of Liberal Arts

#### 4. Public Opinion & US Defense Acquisition

Teresa Burch, Liam Anderson, Political Science, CoLA  
In the last five years, the United States rose from 21% to 33% of global arms exports (SIPRI, 2017). About \$208 billion has been proposed for just modernization of weapon systems. The purpose of my research is to see if the mass public is aware of the increasing military strength of the United States. My research examines the relationship between public support and defense acquisition. Specifically, I examine how news media reports on capabilities of weapon systems vs. cost affect how defense acquisition is perceived by the public in the United States. I hypothesize that if there is more information about capabilities than cost, public support for defense acquisition will be high. If there is more information about cost than capabilities there will be less public support for

defense acquisition. I test this hypothesis using data drawn from public opinion polls and the coded content analysis of media reports on the acquisition of weapons systems.

### **5. Populism on the Rise: An Intersubjective Cultural Comparison of Xenophobic Manifestations**

RebaJane Stromberg, Liam Anderson, Political Science, CoLA

There has been a rise of Populist parties in the past decade around the world, especially in Europe. The rise of Populist parties could be the reaction to increase of Islamic terrorism and the migrant crisis. The purpose of this research is to examine the role culture plays in the momentum behind nationalist movements directly related to the election of Populist parties that encompass xenophobic beliefs. The research will focus on Poland and France through a comparative case study. France has had an increase in terrorist attacks and an influx of migrants, whereas Poland has not had terrorist attacks or an influx of migrants. Interestingly, Poland elected a Populist party in their recent election that uses xenophobic rhetoric towards immigrants and Muslims. However in France, despite the increase in terrorist attacks and influx of migrants, the French did not elect the anti-Muslim Populist party in their recent election, although the party did gain significant support during the campaign. Focusing on xenophobic rhetoric used against Muslims and Muslim immigrants by the populist parties in France and Poland, the study will examine the role culture played in the election of the Law and Justice party in Poland and the downfall of the National Front in France. The research will use an intersubjective approach when examining cultural explanations for the outcome of each election, which is expected to uncover the scope of cultural influence of the political culture in Poland and France.

### **6. US influence in the Arab Gulf, 1980-1991: A Force for Stability or Disarray?**

Allyson Clark, Vaughn Shannon, Political Science, CoLA

Many of the world's major powers have influenced stability in regions throughout history to further said country's foreign policy goals. The effects of decades long influence from major powers has left some regions prospering and others in a state of disarray. While there are numerous major powers within the world sphere, this paper will focus on the United States influence in the Middle East during the time period of 1980 to 1991. Understanding the external influences of the United States, through prioritizing number of weapons sales and military budgets per capita of Iraq, Kuwait and Saudi Arabia, will be analyzing the Iran-Iraq War and Gulf War of 1990 to the 2003 invasion of Iraq. Examining the breakdown of the

United States foreign policy and conflicts during this time period include defense build-up, United States partnerships in the Middle East and expanded military bases. Important trends throughout through the comparison will provide a context for analyzing current challenges and opportunities on how major powers play are a driving force and play a central role in determining the stability of a country and region as a whole.

### **7. Types of Counterterrorism and Their Effect on the Rate of Successful Terrorist Attacks**

Daniel Thomas, Vaughn Shannon, Political Sciences, CoLA

Since September 11, 2001, Western governments have grappled with how to best manage the issue of international terrorism. This research is focused on international terrorism and its interaction with counterterrorism strategy. First, terrorism is discussed in terms of its most common definitions, the political and social motivations of terrorists, the root causes of terrorism, and the strategies of counterterrorism. Second, a theory is introduced that attempts to explain how offensive counterterrorist strategies can negatively affect a state's ability to curb terrorism. In effect, certain offensive counter-terror strategies like drone strikes and military occupation entail high levels of collateral damage that can upset local populations. Third, there is an exploration into five distinct categories of counterterrorism, as well as the categorical differences between offensive and defensive terrorism. The role of collateral damage and its effect on civilian populations susceptible to terrorist activity is also discussed. Finally, I propose measuring the effectiveness of counterterrorism strategies across the five categories by examining the number of terrorist attacks recorded during their use in the United States and several European countries.

## **Boonshoft School of Medicine**

### **8. Neutrophil- Adenovirus Interactions Influence Epithelial Infection**

James Readler, BSoM, Meghan Jenkins, Timothy L. Williamson, Katherine Excoffon, Biological Sciences, CoSM

Neutrophils, or polymorphonuclear leukocytes (PMN), are the first responders of the innate immune system. PMN respond to and neutralize a variety of threats including a large number of invading microorganisms. PMN utilize many well-characterized tactics for combating microbes, including: reactive oxygen species production, phagocytosis, release of digestive enzymes, and the formation of neutrophil extracellular traps (NETs). NETs are large strings of PMN DNA that contain digestive enzymes and proinflammatory mediators. NETs effectively

trap bacteria and fungi and aid in their clearance, however overproduction of NETs can damage host cells. By contrast, virus-NET interactions are less well understood. We have previously shown that neutrophils increase human adenovirus type 5 (AdV5) entry and infection of polarized epithelia. We hypothesized that AdV5 activates NET production to increase viral infection. Using primary human neutrophils, we found that AdV5 can activate NET production in a donor-dependent manner. Furthermore, we demonstrate that, similar to intact PMN, the presence of NETs at the apical surface of polarized epithelia increases AdV5 infection of the epithelium. While increased epithelial susceptibility to AdV5 is not due to disruption of epithelial tight junctions or global changes in fluid phase endocytosis, pharmacologic inhibition of epithelial actin dynamics and certain steps of epithelial autophagy alter the effect. Current work is focused on identifying the exact mechanism by which neutrophils influence the infectivity of AdV infection. Understanding the mechanisms by which AdV coopts our innate immune system to improve infection may lead to novel antimicrobial therapeutic strategies as well as methods to improve AdV-mediated gene therapy.

### **9. Getting Old is Hell: Exploring Gender Differences and Regulatory Protein Concentrations Within Aging Rat Brains**

Christopher Evola, Debra Mayes, Neuroscience, Cell Biology & Physiology, BoSM

Aging is a natural component of life, but in recent years it has begun to be extensively analyzed and investigated. According to the Center for Disease Control, the average life expectancy for an individual within the United States of America is 78.8 years. With a population that continues to live longer, this exploration into what changes occur and why is important in order to improve and extend ones' lifespan. While aging effects everyone, there are significant differences within the aging process based on gender. One of these differences and perhaps the most profound, is menopause in women. This emphasized the importance of evaluating how the brain changes with age in both men and women. In this study, we chose to investigate the cerebral cortex, hippocampus, amygdala, corpus callosum, and cerebellum due to previous research findings linking these brain regions to physical symptoms that can manifest throughout the aging process. For each brain region the concentration of several signaling proteins (PKC, ERK, Estrogen receptor-beta, Complex I, and Connexin-43) was evaluated within whole cell and isolated mitochondria. Mitochondrial signaling has been directly linked to aging; however, the mechanisms for this have not been identified. Therefore, this study provided insight into how mitochondrial signaling proteins change with age and gender. As hypothesized, protein concentrations change

dependent upon age, gender, and brain region. In addition, many of these changes occurred within mitochondrial fractions but not within whole cell lysates indicating that these are epigenetic alterations. Although numerous changes were observed, some protein concentrations remained relatively consistent across these groupings. These findings accentuate the complexity of the aging process and provides a foundation of the cellular processes that occur as a part of aging.

### **10. Modulating Glioblastoma Multiforma Cell Proliferation using Multi-Walled Carbon Nanotube Scaffolds**

Soham Parikh, BSoM Debra Mayes, Sharmila Mukhopadhyay, Mechanical & Materials Engineering, CECS

Glioblastoma Multiforma (GBM) is an aggressive brain tumor that arises from astrocytes. Once diagnosed, patients with GBM have a 6-month survival rate. Current therapies for this stage IV cancer include a combination of surgical resection, chemotherapy, and radiation; however, these treatments have not proven to be effective at decreasing mortality rates. Because surgical resection is commonly performed in these patients, we hypothesized that chemotherapy targeted at the resection site post-surgery may prove to be more efficacious than intravenous, systemic therapies that are common practice today. In this study, we engineered external carbon nanotube (CNT) scaffolds to determine whether this technology could be effective as a scaffold to grow astrocytes and/or affect the growth capacity of GBM cells in culture. Carbon nanotube (CNT) scaffolds have been shown to be very efficient in bone and cardiac tissue generation; however, how brain glia would respond to these structures is unknown. Astrocytes become activated in response to a multitude of environmental factors – including foreign substances; therefore, this cell type is appropriate both as the control for GBM tumorigenesis and to determine whether the CNT structures cause morphological changes that are associated with activated astrocytosis. As a scaffold, the nano-roughness, wettability, and potential chemotherapeutic attachment on CNTs can be engineered. In this study, we created unique CNT scaffold where the nanotubes were covalently bonded on carbon fibers and carbon foam structures. We hypothesize that utilizing these bound CNTs will prevent the carbon nano-toxicity which has been shown to occur in loose CNTs in-vivo. Data from this study confirmed the non-toxicity of CNT scaffolds and recognized them as a potential bio-mimetic scaffold for astrocytic tissue engineering. Moreover, a surprising finding from these experiments showed that U87 GBM cells reacted to the CNT scaffold in a bi-phasic fashion. CNTs were capable of preventing GBM cell growth initially; however, long-term

exposure significantly increased cell proliferation. This data may provide future insights into the aggressiveness of this tumor and sheds light upon the importance of environmental factors in GBM tumor growth.

### **11. Soleus Muscle Fatigue and ACL Risk**

Michael Ciesa, BSoM Andrew Froehle, Kinesiology and Health, CEHS

*Background:* The soleus muscle is a monoarticular plantarflexor composed slow-twitch fatigue-resistant muscle fibers. Through its attachment to the proximal tibia, it produces a posterior pulling force that extends the knee and may reduce strain on the ACL.

*Objective:* To determine if fatigue of the soleus muscle increases ACL rupture risk.

*Methods:* Thirteen female subjects underwent a submaximal fatigue protocol targeting the soleus muscle. Biomechanical data during sidestep cutting tasks were gathered for pre-/post-soleus fatigue conditions. Pre-/post-fatigue and dominant/nondominant limb differences were analyzed.

*Results:* Submaximal soleus fatigue protocol significantly increased peak knee extension moment during sidestep cutting task. Peak abduction moments were significantly increased in the dominant leg during sidestep cutting task.

*Conclusion:* Fatigue or excessive stretch of the soleus puts the ACL at an increased risk for rupture. Females show limb asymmetries during sidestep cutting task.

## **School of Professional Psychiatry**

### **12. Mental health outcomes of children and adolescents following mass shootings in schools: Effective treatments and the role of mental health professionals**

Joshua Sensenbaugh, Courtney Young, Brandt Ling, Gokce Ergun, Professional Psychology, SoPP

Following the recent events surrounding the shooting at Stoneman Douglas High School in Parkland, Florida, there have been many discussions on the experiences of the surviving victims. Children and adolescents exposed to mass shooting episodes, specifically in schools, have been found to report posttraumatic stress, depressive, and anxious symptoms which often are mediated by their demographic characteristics, incident exposure, and psychosocial resources (Lowe & Galea, 2017; Suomalainen et al., 2011). If these symptoms are left untreated, they can lead to negative mental health outcomes and reduced school performance and attendance (Beland & Kim, 2016; Brener et al., 2002). Given the negative outcomes associated with mass shooting episodes in schools, it is important for psychologists and other mental health providers to understand which treatments are effective. This poster will provide a comprehensive review of the

mental health problems in children and adolescents following mass shooting episodes in schools, an exploration of the effective treatments for children and adolescents who develop mental health disorders, and recommendations for the role of mental health professionals following these events.

## **College of Nursing & Health**

### **13. Wellness Within the 12-Hour Shift**

Erin O'Reilly, Sherrill Smith, CoNH

New practicing nurses often are working 12-hour shifts several days a week. Unfortunately, working these long shifts leaves little room for nurses to take care of themselves. Research indicates that working these long shifts are at risk for multitude chronic illnesses and life stressors. With a nursing shortage affecting staffing of health care agencies, it is imperative that new nurses maintain their health to be able to support the need for nurses. Based on Nola Pender's Health Promotion Model, a means for addressing this problem is to provide an educational intervention to inform new graduating nurses how to stay healthy despite the barriers of working 12-hour shifts. This project will assess the impact of an informational teaching intervention on wellness within the 12-hour shift for senior nursing students in their final semester before graduation. The educational intervention will be presented during a regularly scheduled class time. The 20-minute presentation will include evidence-based information related to promoting wellness for nurses. Impact will be measured based on cognitive knowledge gained using a 10-question quiz developed based on objectives of the educational intervention. Evaluation will also include participant evaluation of the speaker and presentation. Quiz and speaker evaluation results will be analyzed using descriptive statistics (range; mean scores). Results will be used to inform future presentations for these students in future classes as well as provide pilot data for future research in the area of promoting wellness for new nurses.

## **College of Science & Mathematics**

### **14. Snow Leopard Population Genetics**

Safia Janjua, Tom Rooney, Biological Sciences, CoSM

Despite having high profile of a charismatic carnivore, information on snow leopard biology, population structure, and genetics is scarce. This is because of its cryptic nature and remote habitat. As a result, we lack sufficient data to identify population numbers, locations of peripheral and core populations, and areas where they are in decline. Such information is needed for the conservation of this apex predator. Molecular tools can provide important insights into conservation in ways traditional

field research cannot. Genomic analysis of DNA extracted from non-invasively collected snow leopard samples can benefit conservation efforts. Previously, genotyping errors were common due to the low DNA yield and quality obtained from such non-invasive sources. These errors lead to incorrect inferences, such as misidentification of individuals. Next generation technologies have revolutionized the depth of information we can have from species genome. Here we use ddRAD-seq, a well-established technique for studying non-model organisms, to develop reference sequence library of snow leopard. Genetic data from ddRAD-seq is proving useful for identifying snow leopard population conservation strategies.

### **15. Engineered Microbes to Sense and Respond to Enterotoxigenic *Escherichia coli***

Andrea Poole, AFRL, Christina Davis, Martha Carter, Carroll High School

Every year, Enterotoxigenic *Escherichia coli* (ETEC), the most common form of traveler's diarrhea, affects thousands of deployed personnel. The goal of this research is to engineer non-pathogenic *E. coli* to sense ETEC, respond to its presence, and package it in a cellulose matrix to enable environmental detection of ETEC. Two plasmids were created: 'sense-respond'; and 'packaging'. The sense-respond plasmid detected autoinducer 2 (AI-2), a quorum sensing molecule created by most ETEC strains, by expressing LsrR which switches on the Lsr promoter. Activation of the Lsr promoter expresses superfolder green fluorescent protein (sfGFP), indicating the presence of ETEC. The packaging plasmid expresses a fusion protein consisting of curli fibers and cellulose binding domains. These modified surface proteins permit the bacteria to bind to cellulose, encapsulating the sense-response module. This genetically engineered machine could be deployed in both the internal and external environment to detect ETEC.

### **16. The effect of plant invasion on decomposition: exploring species differences in leaf litter breakdown**

Adam Reed, Megan Rúa, Biological Sciences, CoSM  
Midwestern forests have recently undergone two major structural changes: the loss of a pivotal overstory species - Ash (*Fraxinus* spp.) coupled with the gain of a prominent understory invasive species - Amur honeysuckle (*Lonicera maackii*). Such changes to the vegetative structure of the forest are likely to have important implications for nutrient cycling. One mechanism by which nutrient cycling is likely to be altered is via changes to decomposition, which is the process by which organic substances are broken down into simpler matter. Specifically, the absence of Ash which possess non-labile leaves and replacement of

these species with leaves that more are labile such as seen with invasive species is likely to increase rates of nutrient cycling; however, research examining how decomposition will be altered due to this change in vegetative structure is lacking. Much of decomposition is facilitated by fungi, so to elucidate how changes in plant composition of the litter community will change decomposition we will utilize a culture-based approach factorially manipulating fungal function via fungal guild and plant species. We will use three different fungal functional guilds: white rot, which breaks down lignin and cellulose (*Schizophyllum commune*), brown rot, which breaks down hemicelluloses and cellulose (*Mycena galericulata*) and mycorrhizal fungi, which forms symbiotic relationships between the fungi and the root system (*Amanita spreta*). Leaf litter from four different species of Ash, maple (*Acer* spp.), oak (*Quercus* spp.), spicebush (*Lindera benzoin*) and honeysuckle will be inoculated to quantify differences in decomposition rates based on leaf litter type and fungal guild. We will measure enzymatic activity among the treatments using enzymes associated with phosphorus (acid phosphatase), nitrogen (leucine-amino peptidase) and carbon ( $\beta$ -glucosidase, peroxidase,  $\beta$ -N-acetyl-glucosaminidase, polyphenol oxidase) cycling. Since honeysuckle has the most labile leaves, we expect it decompose the fastest compared to the others native species. Due to ash leaves being non-labile, we expect it to decompose the slowest followed by oak and maple. We further expect to see differences in decomposition rate based on fungal function. Specifically, *S. commune* and *M. galericulata* will have highest enzymatic activity associated with decomposition such as higher levels of acid phosphatase (which releases inorganic phosphate from organic matter) and polyphenol oxidase (which oxidizes phenols) and *A. spreta* will have higher peroxidase activity (which degrades lignin). Data generated from this study will provide insight into how the presence of honeysuckle will influence the overall decomposition rates in invaded ecosystems. This research represents an important first step in quantifying the change in nutrient cycling due to shifts in the vegetative community in Midwestern forests.

### **17. Redox-active Silver N-Heterocyclic Carbene Complexes: A Dual Acting Anti-bacterial Drug**

Kotiba Malek, Jared Metzger, Kuppuswamy Arumugam, Chemistry, CoSM

Bacterial resistance to current antibiotics necessitates new therapeutic approaches. While silver-based drugs offer a promising alternative in this regard, their current forms exhibit limited bioavailability due to their rapid release of silver ions. Recently, N-heterocyclic carbenes containing silver complexes have become a popular subject of research due to the slow release of silver ions they enable. To further augment the efficacy of silver as an antibacterial

agent, this research sought to introduce redox active Ferrocene. Four new potential antibacterial silver-NHC complexes with redox activity were synthesized and confirmed via analytical techniques, including  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectroscopy and x-ray crystallography.

### **18. Development of a Redox Switchable Catalyst Containing Tetrathiafulvalene**

Meredith Miles, Clark Jarnagin, Kuppuswamy Arumugam, Chemistry, CoSM

N-heterocyclic carbene metal complexes have proven to be very successful catalysts due to their tunable properties, stability, and electron donating properties. These unique characteristics coupled with the redox active nature of tetrathiafulvalene (TTF) makes it possible to alter the metal's selectivity towards a variety of monomers. In addition, TTF possesses the ability to undergo multiple one electron reversible redox transformations. By changing the oxidation state of TTF, the catalyst will be capable of accessing three or more catalytic species. Hence, the synthesis of a TTF-NHC-Iridium complex is currently being explored. Structurally, the complex will be analyzed by Nuclear Magnetic Resonance Spectroscopy (NMR) and single crystal X-ray diffraction crystallography. Various electrochemical tests will also be employed to test the complex's redox properties.

### **19. PharmaFlights: a vehicle for experiential learning in academic drug discovery.**

Christine Kinstedt, Daniel Ketcha, Chemistry, CoSM  
Within the context of developing therapeutic/diagnostic agents for use the concept of PharmaFlights was developed so as to facilitate the achievement of this goal while providing a vehicle for experiential learning for undergraduate research students. Focusing mainly on the chalcones scaffold, a system of two aromatic rings linked by a three carbon  $\alpha,\beta$ -unsaturated carbonyl moiety, each student is assigned his/her PharmaFlight comprised of a particular pharmacophore or structural motif on either ring with its own unique characteristics as for example in the arena of cancer therapeutics, antimetabolic, anticancer, anti-inflammatory, and anti-metastatic properties. Using the chosen structural motif as a static element, the student is challenged to research the literature on the range of biological activities attributable to this pharmacophore and then provide suggestions for alterations on the alternate ring in a rational manner in order to optimize the desired pharmacological activities of molecules in a so-called 'flight' of 6-10 molecules. Along with enhancing the student's skills in literature searches, additional research skills such as notebook keeping, compound characterization and informatics are developed in the iterative process of drug development from initial design, synthesis, biological evaluation and subsequent

modifications based on the assay results. The scope of this concept and the expected learning outcomes within the aforementioned therapeutic arenas will be detailed as well as challenges to be overcome will be detailed in this presentation.

### **20. Mitochondrial Autophagy**

Abdullah Alshudukhi, Hongmei Ren, Biochemistry and Molecular Biology, CoSM

Mitochondrial autophagy (mitophagy) is essential for skeletal muscle homeostasis. Lipin1 is a phosphatidic acid phosphatase and transcriptional coregulator of PPARs. Patients with heritable lipin1 null mutations present with severe rhabdomyolysis and muscle atrophy in glycolytic muscle fibers accompanied with mitochondrial aggregates and reduced mitochondrial cytochrome c oxidase activity. However, the underlying mechanism leading to muscle atrophy is still not clear. In this study, we found that lipin1 deficiency in mice is associated with a marked accumulation of abnormal mitochondria and autophagic vacuoles in glycolytic muscle fibers. Studies using lipin1 deficient myoblasts and lipin1 deficient EGFP-LC3 transgenic mice (lipin1<sup>-/-</sup>-GFP-LC3) suggest that lipin1 participates in Bnip3-regulated mitophagy by affecting its interaction with LC3 which is an important step in the recruitment of nascent autophagosomes to mitochondria. Lipin1 deficiency resulted in mitophagy defect associated with defective mitochondrial adaptation to metabolic stress and impaired contractile muscle force in glycolytic muscle fibers. In summary, our study suggests that deregulated mitophagy arising from lipin1 deficiency may be associated with impaired muscle function and contributes to our understanding of the link between lipin1 deficiency and muscle rhabdomyolysis in humans.

### **21. Lipin1 stimulates the transdifferentiation of Myf5-expressing progenitors into myoblasts versus brown pre-adipocytes**

Dengtong Huang, Hongmei Ren, Biochemistry and Molecular Biology, CoSM

Brown adipose tissue (BAT) and skeletal muscle (SM) originate from common myogenic factor 5-expressing (Myf5) progenitors. Depletion of lipin1 in Myf5<sup>+</sup> progenitors in our newly generated Lipin1Myf5cKO mice promotes brown adipose tissue conversion indicated by expanded BAT formation in the dorsal cervical region but inhibition of skeletal muscle development compared to control littermates. This study aimed to understand the role of lipin1 in regulating Myf5-expressing progenitor fate switch between brown fat and myocyte differentiation. We found that LipinMyf5cKO mice were characterized by reduced myogenic enhancer factor (MEF2c) and MyoD in SM and brown adipose tissue. In contrast, the expression levels of brown adipogenic genes including PRDM16,

C/EBP $\beta$ , and PPAR $\gamma$  were significantly increased in Lipin1Myf5cKO BAT, suggesting an increased cell fate conversion of Myf5 progenitor cells towards BAT. Knockdown of lipin1 in C2C12 myoblasts and primary preadipocytes promoted brown adipogenesis by activating C/EBP $\beta$  and PPAR $\gamma$ . Although lipin1 deficiency in Lipin1Myf5cKO mice induced expanded BAT, Lipin1Myf5cKO BAT exhibited enlarged lipid droplet formation, and decreased UCP1 expression suggesting that lipin1 deficiency affected their thermogenic capability. Our study have identified a novel role of lipin1 in directing Myf5+ progenitor cell lineage commitment to the brown adipocytes both in vivo and in vitro, and these findings provide insights into molecular circuits that regulate SM and BAT specification, development and metabolism.

### **22. Discovery of Small Molecules Blocking Oncogenic K-Ras Activity**

Sarah Kovar, Kwang-Jin Cho, Biochemistry & Molecular Biology, CoSM

Ras proteins are the first human oncogene discovered. Although oncogenic mutant Ras proteins are found in ~25% of cancers, there are still no anti-Ras-specific drugs available in the clinic. Ras is responsible for initiating cellular pathways that include proliferation, survival, and migration. There are three ubiquitously expressed Ras isoforms in mammalian cells: H-, N-, and K-Ras, which are highly conserved except the C-terminal hyper-variable region (HVR). The HVR allows Ras to interact with the plasma membrane for its biological activity. When Ras interaction with the plasma membrane is blocked, Ras activity is inhibited, which is a feasible target for developing anti-Ras drugs. Recently, we received a group of small molecules from the Ketcha lab (WSU Chemistry Department) to identify compounds that dissociate K-Ras from the plasma membrane. We discovered that two of these small molecules dissociate K-Ras, but not H-Ras from the plasma membrane, and that the molecular mechanism is through phosphorylation of K-Ras Ser181. Furthermore, these small molecules block signal output of K-Ras, but not H-Ras, and inhibit growth of K-Ras-driven non-small cell lung cancer cells. Further characterization of these small molecules could lead to developing anti-K-Ras drugs.

### **23. Skeletal Muscle Development**

Rebecca Reese, Hongmei Ren, Biochemistry & Molecular Biology, CoSM & BSoM

Our previous characterization of global lipin1-deficient (fld) mice demonstrated that lipin1 played a novel role in skeletal muscle (SM) regeneration. This study using cell type-specific Myf5-cre;Lipin1fl/fl conditional knockout mice (Lipin1Myf5cKO) shows that lipin1 is a major determinant of SM development. Lipin1 deficiency induced

reduced muscle mass. Our results from lipin1-deficient myoblasts suggested that lipin1 regulates myoblast differentiation through the protein kinase C (PKC)/histone deacetylase 5 (HDAC5)/myocyte-specific enhancer factor 2C (MEF2c): MyoD-mediated pathway. Lipin1 deficiency leads to the suppression of PKC isoform activities, as well as the inhibition of their downstream target, class II deacetylase HDAC5 nuclear export, and consequently, the inhibition of MEF2c and MyoD expression in the SM of Lipin1Myf5cKO mice. Inhibition of MyoD induced Pax7 accumulation, which may lead to an increased propensity for satellite cell self-renewal rather than progression through myogenic differentiation. Our findings provide insights into the signaling circuitry that regulates skeletal muscle development, and have important implications for developing intervention aimed at treating muscular dystrophy.

### **24. Regression and Regeneration of the planarian reproductive system occurs upon head or tail amputations.**

Kendal Hanson, Sydney Lesko, Labib Rouhana, Biological Sciences, CoSM

Planarian flatworms possess the ability to regenerate their entire body from amputated fragments from a population of pluripotent stem cells known as neoblasts. Past research has shown that planarian head amputation causes regression of testes in the posterior fragment, which led to the hypothesis that an intact brain is required for the maintenance of the reproductive system. Here, we challenge this hypothesis by testing whether amputations elsewhere in the planarian anatomy also lead to regression of the reproductive system. The distribution of mature testes (actively producing sperm) was visualized by confocal microscopy and quantified throughout the antero-posterior axis at different time points following amputation of the head or tail. Preliminary results show that regression of testes occurs in animals in which the tail was amputated but the brain remained intact. The majority of testes regress within 3 to 9 days post amputation in fragments without a head, but it takes 16 days for a majority of the testes to regress in fragments subjected to tail amputation. In addition, we analyzed the presence of ovaries, yolk glands, and copulatory anatomies following anterior and posterior amputations. These analyses show that regression of yolk cells occurs in both head and tail fragments post-amputation. These results demonstrate that the act of amputation itself is sufficient to induce testes and yolk cell regression. It is known that a wave of apoptosis follows amputation in asexual animals, and it is hypothesized that similar apoptotic activity may play a role in regression of reproductive structures in amputated fragments of sexual animals. Testing this hypothesis will shed light on the mechanisms that inhibit

maintenance of the reproductive system during regeneration of essential somatic structures.

### **25. Transmission and spectral information of two opioids, oxycodone and hydrocodone.**

Jordan Lewis, Jason Deibel, Physics, CoSM

Opioid abuse is an epidemic that has spread throughout the entire country, and Dayton, Ohio is among the cities impacted the most. As a result, Wright State University has been given the task of joining the fight to learn more about opioids and opioid abuse. The Terahertz Research Group examines transmission and spectral information of two opioids, oxycodone and hydrocodone, as well as samples of similarly behaving substances.

### **26. Mechanistic Determination for di(ferrocenylmethyl)imidazole-2-ylidene)-gold(I)**

Catherine Evers Smith, Kuppaswamy Arumugam, Chemistry, CoSM

Gold(I) based compounds are known to inhibit thioredoxin reductase (TrxR) by targeting the thiol functional groups found within the Trx system. Our group previously synthesized and tested [Bis-(1,3-di(ferrocenylmethyl)imidazole-2-ylidene)-gold(I)] [chloride]. Cells treated with this compound increased reactive oxygen species by 14-fold compared to the control cells. These results indicate that ferrocenylated-gold(I) complexes are effective in killing cancer cells, but the mechanism is desired to be understood. The key concern in ascertaining the mechanism is whether the oxidation occurs at the ferrocene unit or at a different part of the molecule. To determine if the oxidation occurs at the ferrocene unit, di(ferrocenylmethyl)imidazole-2-ylidene)-gold(I)] [tetrafluoroborate] will be synthesized and then oxidized to determine the mechanism.

### **27. SOCIAL BUFFERING REDUCES PLASMA CORTICOSTERONE LEVELS AND AMYGDALA ACTIVITY FOLLOWING STRESS EXPOSURE IN JUVENILE RATS.**

Allison Costello, Ambika Shoemaker, A. A. Koraym, Cardiologists of Greene Co., D. M. Gallimore, M. B. Hennessy, Dragana Clafin, Psychology, CoSM

Stress exposure results in elevated plasma corticosterone (CORT) in 17-day-old pre-weanling rats. Rats who received social support (social buffering) by being returned to their cage mates and mother following the stress exposure had significantly lower levels of CORT relative to rats who are deprived of social support (e.g. social isolation) by being placed in a novel environment (Gallimore et al., 2015). Because the amygdala plays a crucial role in mother-infant attachment, and fear processing, the present study examined activation of

amygdala in response to a stress exposure followed by either social support or social isolation. The stress exposure consisted of repeated unilateral stimulation delivered to the left side of the face using periorbital shock. Activation in the central nucleus of amygdala was measured using immunohistochemical analysis of brain tissue for production of the immediate early gene, zif-268. Rats placed in isolation following stress exposure showed significantly higher activation of both the left and right amygdala relative to home cage controls, though activation on the non-stimulated right side was considerably less. Social buffering immediately after the stress exposure resulted in significantly lower amygdala activation on the left side compared to isolated animals. Amygdala activation following social buffering was not significantly different from that of home cage controls. These data contribute to the literature on social buffering as a powerful psychological and physiological method of reducing stress in young mammals. [Supported by NIH/NIGMS R25GM090122, IMSB BioSTAR]

### **28. Terminal Phenotypes in *C. briggsae* - *C. nigoni* F1 hybrids**

Anthony Wade, Scott Baird, Biological Sciences, CoSM  
When *C. briggsae* females are mated to *C. nigoni* males fertile F1 females are obtained. However, all of the F1 males arrest during embryogenesis. In the reciprocal cross of *C. nigoni* females mated to *C. briggsae* males, fertile F1 females and some sterile F1 male adult hybrids are obtained. The goal of this study was to determine the terminal phenotypes of the arrested embryos in these crosses. From these terminal phenotypes, tissue-specific defects in the development of hybrid embryos were inferred. Hybrid crosses were set and allowed to mate overnight. The following day gravid females were dissected to release hybrid embryos. These embryos were allowed to incubate overnight so that any viable nematodes would hatch. The arrested embryos were scored for terminal phenotypes by microscopic observation at a magnification of 1,000x. From *C. briggsae* mothers, 9 of 28 hybrid embryos failed to hatch. All nine of these failed to gastrulate. Failure to gastrulate is associated with defects in intestinal cell development. Finally, the reciprocal cross is currently being conducted with results pending.

### **29. PharmaFlights: Fragment based drug discovery based on chalcones with 3,4,5-trimethoxy substitution on ring B.**

Cody Fourman, Christine Kinstedt, Christopher Morris, Adam Petry, Daniel Ketcha, Chemistry, CoSM  
The 3,4,5-trimethoxyphenyl motif is a common structural feature of a number of natural occurring antimetabolic agents, especially those capable interacting with

microtubules such as the cis-stilbene, combrestatin A-4. Chalcones possessing this pharmacophore have likewise been demonstrated to exhibit a diverse range of biological actions including anticancer, anti-invasive as well as antioxidant and anti-inflammatory activities. As part of an experiential learning experience in academic drug discovery termed WSU PharmaFlights, so-called flights of 6-10 molecules based on a particular biologically relevant structural pattern on the privileged chalcone scaffold are to be designed, synthesized, and spectroscopically characterized as a starting point for lead-development with potential biological collaborators. In this paradigm, students are assigned a specific pharmacophore group on either ring A or B of the chalcone nucleus, assess the scope of activities associated with that fragment and propose fragments on the alternate ring likely to produce enhanced or dual function activity against certain therapeutic or diagnostic targets. This specific project involves the rational design of a flight of chalcones displaying the 3,4,5-trimethoxyphenyl moiety on ring B, and a discussion of the potential applications of this lead discovery library.

### **30. Content Analysis of Instructor Tools for Building a Learning Community**

Carissa Myers, Adrienne Traxler, Physics, CoSM  
This work presents a content analysis of an online discussion forum between introductory physics students. Content analysis is a quantitative method for analyzing text by using a coding scheme and checking inter-rater reliability. Currently, we are in the middle of exploratory data analysis. The research questions are whether a particular “anchor” task provokes different distributions of codes in the related posts, how the instructor’s posts are coded, and how students respond to the instructor. This research is significant because it is drawing connections between how the instructor designed and facilitated the forum, and the student conversations that result. Online discussions are becoming more popular tools for education, so research is needed to see what makes online discussions effective for learning. Part of doing research on forums is analyzing the posts between students, instructors, and other members of the community. This project explores “anchor” tasks as instructor tools for building a learning community.

### **31. Sheet Conductivity Measurements of Graphene Samples with Terahertz Spectroscopic Imaging**

Fenton Clawson, Jason Deibel, Physics, CoSM  
Broadband terahertz time-domain spectroscopy allows for non-contact non-destructive determination of a material’s frequency-dependent optoelectronic parameters, such as thickness, index of refraction, permittivity, and conductivity. 2-D time-domain imaging scans are

performed on conducting thin films and subsequent data analysis can extract the surface conductivity. Research can then be done on graphene thin films grown under different conditions, with varied patterning, and on various substrates so as to assess the affected change in conductivity. A time-domain terahertz spectroscopy system is used in reflection and transmission modes to retrieve data from the samples, with the corresponding sample data analysis performed in the frequency domain. Fresnel equations are then used to extract surface conductivity from the data, and an image based on the conductivity of the graphene films is created.

### **32. A Raman-Based Imaging Method for Characterizing the Molecular Adsorption and Spatial Distribution of Silver Nanoparticles on Hydrated Mineral Surfaces**

Janice Sikon, Seth W. Brittle, Daniel P. Foose, Kevin A. O’Neil, Jasmine K. Johnson, Adam C. Stahler, John Ryan, Chemistry, Steven R. Higgins, Ioana Sizemore, Chemistry, CoSM

Silver nanoparticles (AgNPs) currently represent over 54% of the total number of consumer products containing nanomaterials, mostly exploiting their unique antimicrobial properties. However, little is known about AgNPs released into the environment through irrigation and rainfall and their interactions with one of the major components of soil (~45%), minerals. The main goal of this study was to develop a label-free or label-enhanced micro-Raman-based mapping method for imaging the distribution of AgNPs on various mineral surfaces and their potential molecular interaction mechanisms. This new methodology was successfully tested on a) two macro- and micro-sized mineral models, muscovite [KAl<sub>2</sub>(AlSi<sub>3</sub>O<sub>10</sub>)-(OH)<sub>2</sub>] and corundum ( $\alpha$ -Al<sub>2</sub>O<sub>3</sub>), and b) two positively and negatively charged AgNPs models, under key environmental conditions (ionic strength and pH). Collected Raman maps (n = 625-961 spectra each) were rapidly analyzed using well-established chemometric methods in Vespucci, a free open-source software developed by our group, and the Raman results were confirmed by ICP-OES, AFM, and SEM-EDX. Covalent interactions through the formation of Ag-O-Al- bonds were detected in a label-free manner for both AgNPs<sup>+</sup> and AgNPs<sup>-</sup>, when exposed to corundum minerals (pHpzc = 9.1), thereby potentially reducing the environmental mobility of these AgNPs. No molecular interactions were identified in between AgNPs<sup>-</sup> and muscovite in the label-free Raman approach; thus, label-free Raman imaging was developed for mapping the scarce spatial distribution of AgNPs<sup>-</sup> on such mineral surfaces. The proposed Raman-based imaging requires minimum to no sample preparation; is sensitive, noninvasive, cost-effective; and

might be extended to other environmentally relevant systems or other metallic nanoparticles.

### 33. N-Heterocyclic carbene adducts of redox non-innocent Cobalt-bis(dithiolene) complexes

Clara Leedy, Kuppaswamy Arumugam, Chemistry, CoSM

Cobalt-bis(dithiolene)-N-heterocyclic carbene adducts [Co(S<sub>2</sub>C<sub>2</sub>Ar<sub>2</sub>)NHC] with Phenyl and p-anisyl substituted on dithiolene fragments and 1,3-bis(mesityl)-imidazole (IMes) and 1,3-bis(mesityl)-imidazolium (SIMes) N-heterocyclic carbene were planned to be synthesized. After synthesis and characterization, all four adducts will be evaluated for electrochemical two electron reduction and concomitant N-heterocyclic carbene release from the adducts [Co(S<sub>2</sub>C<sub>2</sub>Ar<sub>2</sub>)NHC]. At present we have synthesized [Co(S<sub>2</sub>C<sub>2</sub>-p-anisyl)IMes]; synthesis of the other three complexes is under way.

### 34. Assessment of novel cell-permeable PDZ domains to regulate adenovirus infection

Meghan Jenkins, Timothy L. Williamson, Ibrahim A.M.

Alkhomsi, James M. Readler, Priyanka Sharma, Katherine Excoffon, Biological Sciences, CoSM  
Producing a means of regulating the expression and localization of the Coxsackievirus and Adenovirus Receptor (CAR) within the cell would be useful, as downregulation could prevent opportunistic adenovirus infections, while upregulation could increase the chance of transduction for the purposes of adenovirus-based gene therapy. CAREx8, a transmembrane isoform of CAR encoded by all 8 exons of the CXADR gene, is tightly regulated by the PDZ1 and PDZ3 domains found within the cellular scaffolding protein, Membrane Associated Guanylate Kinase, WW And PDZ Domain-Containing Protein 1 (MAGI-1). MAGI-1 PDZ3 can sequester CAREx8 within the cell, preventing adenovirus binding and subsequent infection. MAGI-1 PDZ1 prevents this sequestration, allowing CAREx8 to localize to the apical surface of polarized epithelial cells, where adenovirus can bind it and infect epithelial cells. Preliminary data has shown that decoy PDZ1 or 3 domains, connected to the HIV cell-permeable TAT sequence and a myc-tag for detection, allow the up- or downregulation of CAREx8, respectively. We hypothesized that PDZ1 or 3 domain regulation of CAREx8 would, in turn, increase or decrease adenovirus infection. PDZ domains were cloned into a prokaryotic expression vector and purified from Rosetta E. coli. MDCK epithelial cells were treated with purified TAT-myc-PDZ1 or TAT-myc-PDZ3 domains. Recombinant adenovirus carrying a β-galactosidase reporter gene was used to infect treated cells, and adenoviral transduction was determined using a β-galactosidase assay. Results indicate that conjugation to the cell-permeating TAT

peptide is an effective way to deliver PDZ1 and PDZ3 domains into cells for CAREx8 regulation. Surprisingly, treatment with PDZ domains did not affect adenovirus infection. Future work will explore the effect of PDZ1 and 3 domains on cell surface CAREx8 expression as well as each domain contextualized by adjacent MAGI-1 domains on CAREx8 regulation and adenovirus infection.

### 35. Nuclear localization mechanism identification of the C-terminal domain of the apical Coxsackievirus and adenovirus receptor (CAREx8)

Tim Williamson, Priyanka Sharma, Jananie Rockwood, James Readler, Katherine Excoffon, Biological Sciences, CoSM

Human adenovirus (AdV) is both a serious pathogen as well as a potential gene therapy vector. We have discovered that the apical isoform of the Coxsackievirus and adenovirus receptor (CAREx8) is tightly regulated by the cellular scaffolding protein MAGI-1. We have recently found that novel peptides that increase the interaction between CAREx8 and the third PDZ domain of MAGI-1 (PDZ3) increase degradation of CAREx8 and protect polarized epithelia from AdV infection. Moreover, we have found that MAGI-1-mediated degradation of CAREx8 occurs by sequential degradation by ADAM17 and γ-secretase. Once cleaved, the C-terminal domain localizes to the nucleus of the epithelial cells. Since localization of proteins to the nucleus generally requires a nuclear localization sequence (NLS), we hypothesized that the C-terminus of CAREx8 contains at least 1 NLS. To study this, we performed a bioinformatic examination of the amino acid sequence of the C-terminal domain of CAREx8 and found that there are three putative NLS that may allow the domain to enter the nucleus. Currently we have designed primers to mutate each of these sites individually and together and are performing site-directed mutagenesis by In-Fusion cloning. Future studies will examine what effect each sequence is having on the translocation of the C-terminal domain of CAREx8 to the nucleus and whether translocation is associated with changes in gene expression that may influence the efficiency of AdV replication.

### 36. PharmaFlights: "Scaffold Hopping" from chalcones to benzylidene oxindoles. Proof of concept studies.

Milton van Putten, Christine Kinstedt, Daniel Ketcha, Chemistry, CoSM

PharmaFlights is a WSU Chemistry Department approach to experiential learning in the field of academic drug discovery. Due to the low cost, ready availability and diversity of the requisite acetophenones and aromatic aldehydes utilized to construct molecules of the privileged

chalcones class, most efforts in this nascent program have focused on the design and synthesis of 'flights' of 6-10 molecules as a starting point for lead discovery. Although chalcones exhibit a wide range of biological activities and hence represent an excellent starting point for lead discovery, such molecular promiscuity can represent a roadblock on the lead-to-drug pathway unless molecules with high selectivity to a particular target can be discovered. So as to possibly circumvent that limitation, the concept of scaffold-hopping is being concurrently being explored wherein the relevant structural features (pharmacophores) of biologically active chalcones can be potentially translated to another privileged scaffold, namely benzylidene oxindoles (2-indolinones). In this proof of concept approach, oxindole analogs of chalcones with demonstrated activity will be prepared and subjected to the same biological assays to ascertain if the same activity/selectivity patterns can be achieved or amplified, utilizing a scaffold with enhanced drug-likeness. Especially important in this regard is the study of amino (-NH<sub>2</sub>) and nitro (-NO<sub>2</sub>) structural motifs on various rings and/or positions. Moreover, since the amino functionality can be prepared by reduction of an extant -nitro group, this approach allows for the advantages of a libraries from libraries strategy wherein one set is initially prepared and screened, and subsequent conversion of the initial function to another provides for the assay of a second library. Similar to the synthesis of chalcones, the benzylidene oxindoles can be prepared via the simple Claisen-Schmidt Condensation reaction, and their purity easily accessed through TLC, GC-MS, melting point, and H<sup>1</sup>-NMR and C<sup>13</sup>-NMR.

### **37. PharmaFlights: Fragment based drug discovery based on chalcones with 4'-nitro and 4'-amino functionalities on ring A.**

Christopher Morris, Christine Kinstedt, Meelaud Moazampour, Adam Petry, Cody Fourman, Mentor: Daniel Ketcha, Chemistry CoSM  
Chalcones are a class of molecules with a relatively simple structure, but a wide array of biological activity. They have attracted the attention of medicinal chemists, primarily due to the relative ease of their synthesis, cost effectiveness and polypharmacology including properties such as anti-oxidant, anti-inflammatory, and general anti-cancer effects (inter alia). Due to the ability of chalcones to serve as ligands to a number of unrelated biological targets they are recognized as a 'privileged scaffold,' as represent an attractive point of entry for academic drug discovery efforts. Both the 4'-nitro and 4-amino moieties are common structural features in chalcones exhibiting pharmacologic properties relevant to cancer (cytotoxic, anti-proliferative, pro-apoptotic) as well as anti-oxidant, anti-microbial, anti-tyrosinase, and anti-inflammatory

effects. Due to the aforementioned properties, this scaffold is being utilized at WSU as a vehicle for experiential learning in academic drug discovery, deemed WSU PharmaFlights. In this model, flights of 6-10 molecules used as a foundation for drug lead-development programs with potential biological collaborators. In following this model, student researchers work specifically with a biologically relevant functional grouping (pharmacophore) on either ring 'A' or 'B' of the chalcone skeleton, and propose potential functionalities on the opposite ring, in hopes of engendering specific biological activity, either by specifying a target, or by creating a dual-functioning therapeutic or diagnostic molecule. Herein is described rational design, preparation and characterization of a small 'library' of potential drug entities based upon the 4'-nitro and 4-amino fragments, along with a discussion of their anticipated therapeutic value.

### **38. PharmaFlights: Fragment based drug discovery based on chalcones with 3',4',5'-trimethoxy substitution on ring A.**

Brandon Williams, Christopher Morris, Christine Kinstedt, Graduate, Daniel Ketcha, Chemistry, CoSM  
Chalcones (1,3-diaryl-2-propen-1-ones) in which two aromatic rings are linked by an  $\alpha$ - $\beta$ -unsaturated carbonyl system are an important class of natural products exhibiting a diverse and potent pharmacological effects. As such, synthetic analogues can serve as attractive entry point for lead discovery efforts, since their ease of synthesis from inexpensive and readily available building blocks facilitates the furtherance of rationally designed entities in the lead-to-drug iterative process. The 3,4,5-trimethoxy combination on the A-ring of chalcones is an especially attractive starting point as chalcones possessing this pharmacophore display a variety of activities, such as anti-mitotic, anti-inflammatory, anti-proliferation, anti-multi-drug resistance, and anti-metastatic capabilities. Having this potent pharmacophore on the A ring as a static element, a fragment-based approach to rational drug design was employed to construct appropriately substituted B rings variants so as to amplify known activities, or create molecules with dual function capabilities. The design, synthesis and potential pharmacological application of such a 'flight' of molecules will be detailed herein.

### **39. Effects of Corticosterone Administration on Contextual Fear Conditioning Using Periorbital Shock**

Melinda Meiring, Dragana Clafin, Psychology, CoSM  
Early-life stress produces lasting effects on cognitive and emotional functions into adulthood. Such effects are likely mediated by glucocorticoids released during the physiological response to stress, which may be an acute

event or a longer-lasting chronic situation. One important glucocorticoid is corticosterone (cortisol in humans). Past studies from our lab have shown that corticosterone (CORT) can impair or facilitate hippocampal-dependent learning in young rats using trace eye-blink conditioning, depending on the method of administration. Specifically, chronic administration through osmotic mini-pumps *impaired* acquisition of the conditioned eye-blink response, whereas acute elevations of CORT produced by injections *improved* acquisition (Clafin, Schmidt, Vallandingham, Kraszpuski, and Hennessy, 2017). This study uses an alternative hippocampal-dependent paradigm, contextual fear conditioning, to try to replicate these findings. We administered CORT by either mini-pump or injection and observed contextual fear conditioning using a periorbital shock stimulus.

#### **40. PharmaFlights: Fragment based drug discovery based on chalcones with 4-trifluoromethyl on Ring A.**

Shola Bello, Christine Kinstedt, Daniel Ketcha, Chemistry, CoSM

The 4-trifluoromethylphenyl motif is a common structural feature of several natural occurring antimetabolic agents, especially playing a key role in inhibition of nitric oxide production. The several chalcone derivatives are potential anti-inflammatory agents that can be able to control the production of free radicals like NO. Chalcones possessing this pharmacophore have likewise been demonstrated to exhibit a diverse range of biological actions including anticancer, anti-invasive as well as antioxidant and anti-inflammatory activities. As part of an experiential learning experience in academic drug discovery termed WSU PharmaFlights, so-called flights of 6-10 molecules based on a particular biologically relevant structural pattern on the privileged chalcone scaffold are to be designed, synthesized, and spectroscopically characterized as a starting point for lead-development with potential biological collaborators. In this paradigm, students are assigned a specific pharmacophore group on either ring A or B of the chalcone nucleus, assess the scope of activities associated with that fragment and propose fragments on the alternate ring likely to produce enhanced or dual function activity against certain therapeutic or diagnostic targets. This specific project involves the rational design of a flight of chalcones displaying the 4-trifluoromethylphenyl moiety on ring B, and a discussion of the potential applications of this lead discovery library.

#### **41. Electrochemistry Detection of Heavy Metals Without Prior Separation by SWASV**

Kai Muran, Matthew Neick, Suzanne Lunsford, Chemistry, CoSM

The development of environmental sensors to detect harmful heavy metals such as Pb and Cd in water have been an increased concern in the last few years. Our interdisciplinary approach to the use of bare versus modified electrode sensors to detect heavy metals simultaneously without the need for prior separation has built a stronger tie to real world issues. The problem-based approach of how to develop an electrochemical sensor for heavy metal detection has gained momentum due to increased exposure to Lead (Pb) and Cadmium (Cd). Pb and Cd are neurotoxins in children with chronic exposure and there is a need for a reliable method to analyze heavy metals (Lead and Cadmium) in environmental and biological samples. Thus electrochemical techniques such as Square Wave Anodic Stripping Voltammetry (SWASV) were integrated with the development of Carbon Nanotubes with selective polymers modified on to electrode surfaces with nanoparticles such as silver to enhance the detection of heavy metals by electrochemical technique SWASV. The Scanning Electron Microscopy (SEM) has provided verification of successful modification of electrode surfaces accordingly which will be displayed.

#### **42. mir-320a and Metastasis** Amjad Aljagthmi, Madhavi Kadakia, Biochemistry and Molecular Biology, CoSM & BSoM

$\Delta$ Np63 $\alpha$  is overexpressed in a number of cancers and known to play a role in proliferation, differentiation, migration and invasion.  $\Delta$ Np63 $\alpha$  has been shown to regulate several microRNAs that play a role in both development and cancer. We identified a novel miRNA, miR-320a which is positively regulated by p63. Previous studies have shown that miR-320a is downregulated in colorectal cancer and targets RAC1, leading to a decrease in non-canonical WNT signaling and EMT and thereby a corresponding decrease in tumor metastasis and invasion. In this study we examined whether  $\Delta$ Np63 $\alpha$  decreases cell invasion through the down-regulation of PKC $\gamma$  levels and subsequently RAC1 phosphorylation via miR-320a. We showed that knockdown of  $\Delta$ Np63 $\alpha$  in HaCaT and A431 cell lines led to a decrease in miR-320a levels and a corresponding increase in the PKC $\gamma$  levels. We also showed that knockdown of  $\Delta$ Np63 $\alpha$  induced RAC1 phosphorylation at Ser71, while overexpression of  $\Delta$ Np63 $\alpha$  in SW480 and Caco2 cells led to a decrease in the S71 phosphorylation of RAC1. Finally, we showed that the increase in PKC $\gamma$  levels and RAC1 phosphorylation and cell invasion observed upon knockdown of  $\Delta$ Np63 $\alpha$  is reversible by overexpressing miR-320a. Taken together, our data suggest that  $\Delta$ Np63 $\alpha$ -mediated increase in miR-320a levels has potential implications for cancer migration and metastasis.