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36th GSARS, 2020 Edition

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KEYNOTE SPEAKER
ADAM M. MORGAN

Adam M. Morgan

Executive Creative Director, Adobe

Adam Morgan is an Executive Creative Director at Adobe, with experience in creativity, strategy, and storytelling for over 23 years. He's a keynote speaker at conferences and events, and was recently named an Adobe MAX Master speaker.

Before Adobe, he was a creative director at several international ad agencies, delivering award-winning advertising and campaigns.

He was named a 40 under 40 business leader by Utah Business Magazine, and Utah Ad Professional of the Year in 2014.

To read one of his articles on data-driven creativity or more about his new book, "Sorry Spock, Emotion Drives Business," that proves the value of creativity and design to your clients and stakeholders.

2020 Themes

Eye-opening Societal Interventions
Old Problem, New Solution
Myths and Mysteries Unraveled
New Educational Viewpoints
Small Structure with a Big Impact

2020 Program Co-Chairs & Director, Programs

Co-Chair: Keely Ledford, Master's Student in Instructional Design and Technology

Co-Chair: Callie Clayton, M.Ed. in Curriculum and Instruction

Director, Programs: Sharon Flynn Stidham, PhD Candidate in Instructional Design and Technology

Accepted Research Oral Presentations (15 minute)

Akshay Jain	Converting Waste Heat Using Thermoelectric Generator to Power Microbial Electrolysis Cell for Sustainable Wastewater Treatment
Ahsan Chowdhury	Why's This Useful?
Alison Cash	Insights Into a Novel Regulator of Blood Brain Barrier Dysfunction Following Traumatic Brain Injury
Alissa Hendricks	Establishing a Novel Porcine Model for Pre-Clinical Pancreatic Cancer Studies
Austin Bradley	Factors Affecting Perception of Random Events
Brigitte Sánchez Robayo	Why Do Teachers Change Their Teaching Practice? Answers From Literature.
Bronson Weston	A Novel Methodology to Extend Our Understanding of the Microbiome in Human Health and Disease
Caroline Taylor	Maternal Intrusiveness and Multisensory Integration Are Negatively Related in Older Infants
Chandani Shrestha	ThoughtSwap: Helping Evoke Conscientious Discussion among Students in Classroom
Chris McCullough	Ticks in the Pollinator Mix
Christina Devine	Development of a Standardized Scaling Test Protocol for Evaluation of Scale Reduction Devices and Technologies
Elisa Gagliano	A Bioinformatics Approach to Determining Enzyme Functions

Accepted Research Oral Presentations (15 minute)

Ernie Osburn	Forest Disturbance has Long-term Effects on Soil Bacterial and Fungal Communities in Appalachian Ecosystems
Esha Dwibedi	Trust and Economic Freedom: A Multi-country Study
Harsh Sanghavi	Measuring the Influence of Anger on Takeover Performance in Semi-automated Vehicles
Holly Morrison	Redness, Swelling, and Heat, Oh My! – Inflammation Results in Cancer Development
Houri Sharifnia	Cross Laminated Timber a Sustainable Envelope System
Jacqueline Sereno	Quantifying the Effects of Histotripsy Ablation on the Release of Immune Markers from Cancer Cells
Jeffrey Law	Accurate and Efficient Gene Function Prediction Using a Multi-Bacterial Network
Jenna Davis	An Invitation to Understand: An Alternative Approach to the Corporate Voice in Public Relations
Joelle Martin	Identifying Dynamic Regulators of Glutamate Transport in Glioblastoma Multiforme
Jonilda Bahja	Understanding Customer Trust in Hotel-Chatbot Interaction
Kasey Richardson	Plights of Rural Public Sex Education: No Funding, No Formal Assessment
Lauren Bochicchio	Understanding the Harmful Effects of STING-Mediated Neuroinflammation in TBI

Accepted Research Oral Presentations (15 minute)

Leila Abdelhamid	Toward a Better Understanding of the Effects of Vitamin A on Lupus Disease.
Madeline Bruce	Multisensory Integration in Social and Nonsocial Events and Emerging Language in Toddlers
Mehran Shams Kondori	Rubber Wear and Friction
Michael Holden	Investigating Changes in Population Size of Virginia Bog Turtles (Glyptemys muhlenbergii)
Muchin Bazan	Women in STEM: The Role of Role Models
Nicole Wynne	Mosquito Visual Avoidance Behavior Under Different Behavioral Contexts
Rachel Hargrave	You are Worthy of My Grace: Queer Erasure in Neon Genesis Evangelion
Rebecca Brock	Irreversible Electroporation Increases Antitumor Immunity and Therapy Options in Pancreatic Cancer
Sarah Kuchinsky	Assessing Susceptibility to Usutu Virus in Avian Models
Suman Lamichhane	Physiological and Molecular Dissection of Salinity Tolerance in Arabidopsis and Maize
Tamina Ahmed	Understanding the Mechanism of Juvenile Hormone Mimic Pyriproxyfen in Mosquito Reproduction
Yanhong He	Wet Fractionation Process to Recover Protein-Rich Product From Brewer's Spent Grain as a Replacement Feed Ingredient for Fishmeal in Shrimp Diet

Accepted Flash Talks (5 minute presentations)

Abdelaziz Alsharawy	Risk Aversion: Arousal, Attention and Incentive Effects
Alan Smith	Convolution Based Component Segmentation of 3D Point Clouds for Use in Finite Element Modeling of Steel Buildings
Alex Faunce	Heart Rate Variability Predicts the Ability to Inhibit Classically Conditioned Fear Responses
Bela Haifa Khairunisa	Microbial Transformation Reactions Causing Nitrogen and Carbon Loss from Dairy Manure Storage
Boya Zhang	Batch-sequential Design and Heteroskedastic Surrogate Modeling for Delta Smelt Conservation
Chloe Moore	Does Commonness Confer Connectivity? A Genomics Case Study of a Backyard Frog
Christian Heryakusuma	Thioredoxin-based Stabilization of Methyl Coenzyme-M Reductase (Mcr), a Tool for Bioconversion of Methane to Liquid Fuel
Christina Mounzer	From Stem Cell to Mini Organ: Cultivating Organoids to Better Understand Cancer Development
Coogan Thompson	Single Atom Catalysis: Iridium on Titania
Damien Williams	How Wrong Are We? A Quantitative and Critical Exploration of the Roots of Error in Self-Reporting of Online Behavior
Danny Fritsch	Breaking the Sound Barrier: Understanding the Physics of Aerodynamic Noise
David Sherr	Characterizing Algae using Raman Spectroscopy and the Generating Reducing Equivalents Using Photosynthetically Active Algal Extracts
Hannah Valentino	I Clove you, AsFMO: The Characterization of an Enzyme in Garlic Flavor production
Hazem Sharaf	Organic Fertilizers Improve Apple Orchards' Soil Microbial Health and Tree Biomass
Jessica Resor	Parents and Children Negotiating Family Interactions with Alexa

Accepted Flash Talks (5 minute presentations)

Joanna Reinhold	Mosquitoes and Frogs: Discovering the Factors Underlying this Unusual Relationship
Jocelyn Hotter	Digital Media and Screen Time in Parents Magazine: A Thematic Analysis
Juselyn Tupik	The Deadly Bacterium Brucella Abortus Is Recognized and Targeted with Inflammation by the Inflammasome of the Immune System
Kisha Pradhan	Very Low Doses of Endotoxins Induce Non-resolving Chronic Inflammation in Immune Cells
Margaret Nagai-Singer	Destination Mitochondria: The Roadmap to Understanding NLRX1 as a Tumor Suppressor
Martina Syvantek	Going Beyond "No Search Results"
Mohommad Aljamal	Developing a Neural–Kalman Filtering Approach for Estimating Traffic Stream Density Using Connected Vehicle Data
Nick Brown	Can Panopticon Prevent a Pandemic? The Impact of Surveillance and Monitoring of Citizens on the Containment of COVID-19
Parul Sharma	Strain-level Identification of Tomato Pathogens from Metagenomic Sequences Obtained with the ONT MinION
Renata Carneiro	Sensory Evaluation Supports Selection of Edamame Varieties for U.S. Production
Rui-Chi Lin	Mechanisms of Neutrophil Exhaustion Relevant to Sepsis
Sakshi Upadhyay	To Join or Not to Join: Coalition Formation in Public Good Games
Sydney Johnson	Performing Challenging Reactions with Enzymes: The Formation of Diazo Groups by CreE
Tawni Paradise	Understanding Habits of Engagement in Engineering Thinking Among Parent-Child Dyads
Yirui Chen	Mathematical Modelling Gliding Motility Control and Coordination in Myxococcus Xanthus

Accepted Poster Presentations

Alexandra Kaloss	Improving Blood Flow through EphA4 Inhibition as a Novel Stroke Therapy
Alexandra Russell	Physical and Chemical Characterization of Rare Earth Elements in Coal Refuse
Alice Fox	GAIA is a Cyborg? Exploring Ecological Personhood in Horizon Zero Dawn
Allison Zeher	Investigating Changes in Immune Cell Populations in Pancreatic Tumors After Novel Treatments
Anastasia Conyers	Creation and Assessment of Population-Specific Opioid Abuse Education in Southwest Virginia
Angie De Soto	Curious about the iPhD Path? “iPhD Camp” Stories, a Metacognitive Reflection, and Tips for Anyone Wanting to Take a Road Less Traveled
Ariana Umana	Utilization of DNA Methyltransferases for Enhanced Bacterial Genetics in Fusobacterium Nucleatum
Bradford Stucki	Grandparents Raising Grandchildren in Central, North Central, and South Central Appalachia - An Examination of Local Service Types and Availability
Brittany Shaughnessey	The Price of Education: Moving Sesame Street to a For-profit Network
Bronson Weston	Coping with Stress: The Caulobacter Approach
Grace Wusk	Psychophysiological Monitoring of Aerospace Crew State
Hanna Kiryluk	Brucella abortus is Recognized by the Negative Regulator NLRX1 of the Innate Immune System
Hazem Sharaf	Novel Field-based Interactions Between Soybean and Symbiotic Root Nodule Bacteria
Hoda Mousavi	Tire Interaction with Ice and Snow

Accepted Poster Presentations

Jason Czak	Control Applied to Pattern Formation in Non-linear Reaction-diffusion Systems
Joseph Sarver	Linking Plastic Behavior at High Pressure to the Development of Commercial Products: From Laboratory Benchtop to Tennis Shoe
Kaisen Lin	Understanding the Viability of Infectious Viruses in the Environment and Its Effect on Disease Transmission
KP Puckett	Strategies of LGB Youth Disclosure to Parents
Lauren Buttling	Maternal Residential Proximity to Central Appalachian Surface Mining and Adverse Birth Outcomes
Martina Syvantek	University Policies and the Concept of "Open Access" - Document Collection and Critique
Max Mikel-Stites	Advantages of Lopsided Sensing: Tympanal Asymmetry in O. ochracea
Mingming Ge	Investigation on Cavitating Flows at Different Temperatures with High-speed Video and PIV Methods
Mohammad Bukhari	Simultaneous Energy Harvesting and Vibration Control in a Nonlinear Metastructure: A Spectro-spatial Analysis
Morgan Roth	Sampling Varroa destructor and Screening for Acaricide Resistance
Renata Carneiro	Check-If-Apply: A Sensory Approach to Improve Communication Between Consumers and The Drinking Water Industry
Sarah Power	Remote Characterization of Antarctic Microbial Mat Communities
Taylor Tuhy	Aging Dampens the Immune Response After Traumatic Brain Injury
Tyler McFayden	Measurement-Based Care to Evaluate Psychological Treatment Outcomes in Youth with Autism Spectrum Disorder
Zachary Johnson	RNA Methylation Patterns in the Developing Murine Brain

Risk Aversion: Arousal, Attention and Incentive Effects

Abdelaziz Alsharawy, Flash Talk Presentation (5 Minute), Program: Doctoral

Authors: Abdelaziz Alsharawy, Xiaomeng Zhang, Sheryl Ball, Alec Smith

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Keywords: Risk Aversion, Arousal, Incentive Effects, Decision making

Empirical and experimental research on risky choice documents an increase in risk aversion with stake size. Our goal is to investigate the physiological mechanisms and information processing patterns underlying the effect of increased incentives on risk aversion. We recorded reaction time, gaze fixation, pupil dilation, pulse rate, and skin conductance while participants chose between lotteries involving low real (1x), high hypothetical (50x), and high real (50x) stakes.

Participants were more risk averse and exhibited greater physiological arousal with high real payoffs. Individual differences in the level of arousal were associated with increased high-stakes risk aversion. We also find differential attention patterns under high real stakes, where participants fixated significantly less on the higher payoff of the risky option and significantly more on both payoffs of the safe option compared to hypothetical stakes. Similarly, information processing patterns, inferred from eye movements, differed under high real stakes and with increased arousal, favoring less within option comparisons and more between attribute comparisons. In addition, reaction time increased when the stakes were high and real. These results can inform the development of models that incorporate physiological states and attention allocation into the process of decision-making.

Why's This Useful?

Ahsan Chowdhury, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Mathematics, Education, Teaching, Usefulness, Meaning

Students often ask “when is this ever going to be useful?” when speaking about mathematics. If we take this as a question about meaningfulness, how can teachers respond and how do they even understand the terms ‘meaningful’ and ‘meaning’? I wanted to look at how college instructors thought of this and how they addressed such a question in their classrooms. Drawing on both social and individual cognition perspectives of knowledge, I can define four ways to think of what’s ‘meaningful’ about mathematics. From an individual perspective, teachers can understand ‘meaningful’ as mathematical understanding versus understanding the significance of mathematics. From a social perspective where meaning is taken as the experiences of everyday life within communities, teachers can understand ‘meaningful’ as practices the mathematics community engages versus practices of non-mathematics communities (e.g. pushing computation or critical thinking as a means for maintaining social order; Niss, 2005).

To demonstrate how these meanings play out, I look at some historical goals of education and accounts of actual instructor goals. Historical examples come from education research literature. Instructor examples draw from college instructors of different mathematics classes: math for elementary education, math for liberal arts, statistics, and calculus. What I found was that mathematics instructors often did not care about when mathematics is useful, instead choosing to focus on ‘meaningful’ as mathematical understandings and inherent beauty. However, experiences of not being ‘a math person’ or with underserved communities could spark a realization that ‘meaningful’ needs to be understood and conveyed in other ways. What this suggests is that educators may not respond to students’ questions about usefulness in diverse ways unless more educators come to appreciate mathematics who have also struggled with it personally growing up or have seen the consequences of disenfranchisement.

Converting Waste Heat Using Thermoelectric Generator to Power Microbial Electrolysis Cell for Sustainable Wastewater Treatment

Akshay Jain, Research Oral Presentation (15 Minute), Program: Doctoral

Authors: Akshay Jain, Zhen He

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Keywords: Wastewater treatment, waste heat, hydrogen gas, microbial electrolysis cell, thermoelectric generator

Conventional wastewater treatment is an energy-intensive process and can consume up to 3% of the total electricity demand in the U.S. Yet as the population continues to increase, the amount of wastewater will also increase, resulting in more energy demand. This energy is provided by fossil fuels which lead to an increase in the emission of greenhouse gases in the environment. Furthermore, there is a limited supply of fossil fuel reserves present on the earth. It is, thus, necessary to develop new technologies for wastewater treatment that are both efficient and sustainable. Among new treatment concepts, bioelectrochemical system (BES) is an emerging technology that can accomplish the recovery of energy and nutrients in addition to the treatment of wastewater using microorganisms that can participate in reduction-oxidation reactions. Among different BESs, microbial electrolysis cells (MECs) are of particular interest because of the production of higher-value product hydrogen gas. Hydrogen is a clean, energy-efficient, carbon emission-less fuel, which produces water on combustion. Thus, production of hydrogen while simultaneous treatment of wastewater provides a sustainable approach to a cleaner environment. However, for the production of hydrogen gas, MECs require an additional voltage. This is provided using external sources such as power supply. To make the process environmentally-friendly, this external voltage should be supplied using alternative, renewable resources. Waste heat is one such resource which is available in plenty as a byproduct of many industrial processes. The thermal energy in waste heat could be converted to a useful form of energy to be used as an alternative energy source. Thermoelectric generator (TEG) is a device that uses the difference in temperatures of two different sources to generate electricity. TEG was used to convert waste heat from anaerobic digester into electricity to supply power to MEC, as a long-term sustainable wastewater treatment solution .

Convolution Based Component Segmentation of 3D Point Clouds for Use in Finite Element Modeling of Steel Buildings

Alan Smith, Flash Talk Presentation (5 Minute), Program: Master's

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Keywords: Structural Health Monitoring; Point Clouds; Lidar; As-is Finite Element Modeling

Many structural health monitoring techniques rely on data-calibrated finite element models to identify structural defects and/or schedule maintenance routines. In practice, these models are often limited to as-designed models that may or may not reflect the actual (as-is) structure. Unfortunately, these as-is models are often too time-prohibitive to create. We suggest a novel method for automating the processing of 3D point cloud data to extract the structural configuration of a given structure, which can then be converted to a representative finite-element model. Previous component segmentation approaches have attempted to process the 3D point cloud all at once. Processing a cloud this way either results in very limited scope or utilizes deep learning algorithms requiring large training datasets. Since these datasets don't currently exist for structural elements, we propose an approach which "slices" the point cloud into 2D images then uses convolution by standard cross-sections to identify and locate component centroids. We take advantage of the fact that the majority of elements in a structural system are oriented along the 3 principal component axes. Using a laser scanner, we obtained a scan of a metal building consisting of 350 million points colored by infrared light. We took 1000 slices in each of these directions and voxelized the resulting points into a 2D image representation at 100 pixels per meter resolution. From these images, we apply image processing techniques such as color thresholding, moving average, and morphological operators. We then convolve the image with a structural cross-section template, which highlights all similar structural shapes in the image. We then map these centroids as centerlines back to the 3D point cloud space to build the finite element model. In future work, this model will be validated against experimental tests .

Heart Rate Variability Predicts the Ability to Inhibit Classically Conditioned Fear Responses

Alex Faunce, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Heart rate variability, fear learning, psychology, psychophysiology, classical conditioning

The world can be a dangerous place, so it is helpful for the body to react to threat cues with fearful, defensive responses (e.g. heart rate increasing, startling easily, etc). However, not all stimuli in our environment are threatening; when we are exposed to cues that remind us of prior threats but are proven to be safe, we need to be able to inhibit our fearful responses to these stimuli. This ability, called fear inhibition or safety signal learning, appears to be vital to healthy emotion regulation, with deficits thereof predicting mental health problems such as Post Traumatic Stress Disorder. Another biological measure related to emotion regulation is heart rate variability: variation in the time interval between consecutive heartbeats. High heart rate variability may reflect an enhanced ability to regulate activity in the nervous system in general, and emotions in particular. The present project explored the link between heart rate variability and fear inhibition using two different measures: startle eyeblink magnitude, and sweat gland activity. Participants were exposed to compound stimuli consisting of simple shapes, one of which predicted an aversive stimulus (pressurized air blast to the throat) and one of which did not. Inhibition was defined as the ratio of response magnitude between conditions. Results suggest that heart rate variability (root mean square of the successive differences) predicted greater fear inhibition in sweat gland activity (a measure of sympathetic nervous system activation; $F(1,40)=5.77$, $p<.05$), but not in startle eyeblink response magnitude (a measure that is related to fear but not to autonomic nervous system activity; $F(1,40)=.04$; $p=.84$). The results suggest that heart rate variability predicts greater fear inhibition, particularly when fear responding is indexed using a measure of autonomic nervous system activity. Results shed light on the link between heart rate variability and regulation of autonomic and psychological responding .

Improving Blood Flow Through EphA4 Inhibition as a Novel Stroke Therapy

Alexandra Kaloss, Poster Presentation, Program: Doctoral

Authors: Alexandra M. Kaloss, Benjamin Okyere, and Michelle H. Theus

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Keywords: Neuroscience, Stroke, Blood Flow

Stroke is the fourth leading cause of death and the most common cause of serious long-term disability in the United States. The majority of strokes are caused by a clot within an artery resulting in reduced blood flow and preventing critical nutrients, such as oxygen, from reaching areas of the brain. This lack of blood flow ultimately leads to permanent cell death and severe neurological problems. Unfortunately, most stroke treatments focus only on removing the blood clot, which does not necessarily guarantee the restoration of cerebral blood flow (CBF) to brain regions damaged by the stroke. One possible therapeutic target for restoring blood flow is a specialized network of blood vessels called pial collateral vessels. These vessels are normally very small and inactive but can grow to facilitate the rerouting of blood to oxygen-deprived areas of the brain in a process called arteriogenesis. Following a stroke, these vessels enlarge in diameter thereby allowing increased CBF. It remains unclear why some patients display better vessel growth while others do not, therefore a better understanding of this process is necessary for identifying an effective therapeutic target. Using an established mouse model of stroke, we have shown that a protein called EphA4 may reduce these vessels' ability to enlarge and limit restoration of CBF. When a stroke is induced in a mouse lacking this protein, the resulting damaged brain area is significantly reduced compared to wild-type (control) animals. This data suggests that inhibition of EphA4 may present a novel drug target to facilitate collateral vessel growth and improve patient recovery following stroke.

Physical and Chemical Characterization of Rare Earth Elements in Coal Refuse

Alexandra Russell, Poster Presentation, Program: Master's

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Keywords: Rare Earth Elements, Coal, Sequential Extraction

Rare Earth Elements (REEs) are a critical resource that are necessary to produce cell phones, clean energy applications, and national defense. The United States does not currently have a domestic supply of REEs and is entirely reliant on imports to satisfy the demand of these materials. Due to this need, many alternative resources have been studied to identify if there is a possibility for creating a non-traditional domestic production of REEs. Studies have shown that coal seams and associated byproducts have REE content up to that of economically viable deposits; however these studies have not addressed the mode or occurrence of these elements within the coal material. Due to this knowledge gap, this study aims to address the physical and chemical means by which these elements present themselves within fine coal waste streams. This will be done by an in-depth characterization study, first focusing on size distribution, followed by chemical composition. Size distribution will be carried out via a series of sieves ranging from 1.7 mm to 10 μm, followed by aqua regia digestion and ICP-MS analysis to determine REE content in selected size fractions. Chemical characterization will be done via a seven-step sequential extraction process where each step exploits a different phase of mineral which may contain REEs. After each step, leachate will be sent for ICP-MS analysis which will allow for determination of REE content in a given phase of the material. Finally, both the physical and chemical characterization products will be analyzed under SEM-XPS in order to determine homogeneity and possible phase changes occurring through the extraction process. The results from this study will be used for development of an extraction process for REEs from various coal byproducts within the U.S. to combat the lack of domestic supply .

GAIA is a Cyborg? Exploring Ecological Personhood in Horizon Zero Dawn

Alice Fox, Poster Presentation, Program: Doctoral

Author: Alice Fox

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Keywords: Cyborgs, personhood, videogames, ethics, ecology

Midway through the 21st century, the world was at the peak of automated military practices. One of the greatest achievements, to date, was a combat-ready robot swarm by the name of Chariot. Chariot swarms were designed to utilize biomass as fuel, self-replicate, and be virtually unhackable. Robotic swarms were ideal military units until a glitch in one Chariot unit sparked a series of mutations throughout the army's system that rendered Chariot robots uncontrollable—consuming biomass and replicating at a staggering rate. As the world descended into darkness, project Zero Dawn was enacted as a last-ditch effort to preserve Earth and its inhabitants. At the helm of this operation was AI system named GAIA, who was directed to restore the biosphere and create life once again. This paper will examine the synthetic being GAIA in the game Horizon Zero Dawn to segue into an argument for the inclusion of incipiency and versatility as possible criteria for establishing moral personhood. Two key points will then be derived from the argument: Being a cyborg isn't exclusive to humans. Reimagining Gaia as a cyborg opens a new avenue for exploring rights and duties to the environment.

Insights Into a Novel Regulator of Blood Brain Barrier Dysfunction Following Traumatic Brain Injury

Alison Cash, Research Oral Presentation (15 Minute), Program: Doctoral

Authors: Alison Cash, Thomas Brickler, Xia Wang, Amanda Hazy, and Michelle Theus, Department of Biomedical Sciences and Pathobiology, Biomedical and Veterinary Sciences, Virginia-Maryland College of Veterinary Medicine, Virginia Tech, Blacksburg, VA

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Keywords: TBI, Blood Brain Barrier, Recovery

Traumatic brain injury (TBI) is the leading cause of injury related death and disability in the United States. Each year, almost three million individuals sustain a TBI, however, this number may be greater based on injuries that go unreported. Research into potential therapeutics for traumatic brain injury focus on the secondary injury, the cascade of responses following the mechanical or primary injury to the brain. A known consequence of TBI that is associated with poorer prognosis is decreased integrity of the blood brain barrier (BBB). The BBB normally protects the brain from the circulating blood to maintain homeostasis. Although it is understood that when this system is dysregulated there is subsequent edema, inflammation, and excitotoxicity, the cellular and molecular mechanisms driving this dysregulation are not well understood. Eph receptors, a large family of receptor tyrosine kinases, are coincidentally upregulated following TBI. We can temporally and spatially control the expression of these Eph receptors and our results indicate that when Eph receptors are knocked out on endothelial cells (ECs), there is an increase in blood brain barrier preservation 1-, 4-, and 7 days following injury. Based on these findings, we hypothesize that Eph signaling on ECs negatively regulates BBB integrity and recovery following TBI. To test our hypothesis, we evaluated motor deficits, pathology, and gene expression in our wild-type and knockout mice post-TBI. We observed significant improvement in motor function and decreased injury volume in knockout compared to wildtype mice. This correlated with changes in genes important for BBB integrity; Occludin-1 and Tie2. Future studies will investigate how Eph receptors disrupt the BBB. This data provides evidence that Eph signaling is a novel negative regulator of the BBB following TBI that may be exploited for therapeutic purposes.

Investigating Changes in Immune Cell Populations in Pancreatic Tumors After Novel Treatments

Allison Zeher, Poster Presentation, Program: Undergraduate

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Keywords: Cancer, immune system, histotripsy, IRE

Pancreatic cancer causes thousands of deaths each year worldwide and is the fourth leading cause of cancer related death, due to its low survival rate and lack of treatment options. To address this need, we study two novel therapies that show potential for treating pancreatic cancer: histotripsy and irreversible electroporation (IRE). Histotripsy is a high-precision treatment that utilizes highly-focused ultrasound to create a bubble cloud that can destroy targeted tissues. IRE is a minimally-invasive tumor treatment that utilizes an electric field to disrupt cell membranes and initiate a controlled cell death. The immune response to histotripsy and IRE is relatively unknown. As this can greatly affect patient survival and co-therapy options, we investigated the effect of these treatments on immune cell populations in treated tumors over time. We hypothesized that the treated tumors, for both IRE and histotripsy, would induce a pro-inflammatory immune response. To evaluate this, we utilized a mouse pancreatic cancer model, where we treated the tumors with either histotripsy or IRE once the tumors reached a certain diameter. Tumor were collected, and all cells were then isolated to determine any changes in the immune cell population after IRE and histotripsy. We found that IRE induced a mild inflammation that continues to progress as the tumor undergoes a programmed cell death. Histotripsy, however, kills tumor cells immediately and thus recruited different immune cells that responded to inflammation that occurred as a direct result from treatment. Our findings show that both histotripsy and IRE treated tumors show shifts in the immune cell population that indicate an anti-tumor response. This may mean an increase in immune activation against pancreatic cancer and the potential for immune regulation against disease progression.

Creation and Assessment of Population-Specific Opioid Abuse Education in Southwest Virginia

Anastasia Conyers, Poster Presentation, Program: Master's

Authors: Anastasia Conyers, Kaitlyn Horinko, Kaela Kinder, Misganaw Mengiste, Dr. Anne Brown

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Keywords: Population-Specific Opioid Education

The US is facing a national epidemic on opioids, with 47,600 deaths in 2017 and, ages 25-34 most affected. Focused education is scarce because opioids are a stigmatized subject, with 78% of Americans believing addicts are to blame.

There is a gap in individualized introduction to information and data surrounding the epidemic. Our work seeks to create and assess population-specific education, defined as short courses, for two specific populations. Literature review and interviews identified two target audiences that will benefit most. The first target audience is comprised of Virginia Tech students ages 18-23; this audience represents those who have an increased chance of addiction due to the psychology/physiology of the brain. This age group is more involved in athletics and tend to be prescribed due to related injuries.

The second target audience is either graduate students, faculty, or staff at Virginia Tech, aged 24-55. This group is more likely prescribed opioids for chronic pain. Both target groups include all genders, and other self-identifying characteristics if members fall within the age range and affiliation with Virginia Tech. In the US, the age group with the largest nonmedical use of opioids is 18-25 and the greatest overall use of prescription opioids are 26+.

Each online course can be completed in less than eighteen minutes. They are designed to define opioids, how to properly dispose of prescriptions, the danger of misuse, and background of addiction. Videos will encourage audiences to evaluate values and behaviors surrounding opioid abuse and addiction. Surveys will evaluate the effectiveness of each video as tailored to the audience.

Pre- and post- surveys will measure effectiveness to determine knowledge and attitudes on the importance of opioid education in Southwest Virginia. This study will showcase the need for tailored, population-specific education to better inform audiences on facts and harms of opioids .

Curious About the iPhD Path? “iPhD Camp” Stories, a Metacognitive Reflection, and Tips for Anyone Wanting to Take a Road Less Traveled

Angie De Soto, Poster Presentation, Program: Doctoral

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Keywords: iphd, interdisciplinary, innovation

The world is changing in front of our eyes, and the pace of that change is clearly accelerating. At the same time, the planetary and social challenges we face today are increasingly complex and will require new ways of thinking if they are to be solved in this lifetime. Graduate education and doctoral research are avenues for finding innovative solutions, but sometimes traditional academic programs can unintentionally constrict transdisciplinary creativity and silo problem solvers that want to take a more novel approach. The opportunity to pursue an individualized PhD exists, but designing your own academic program and navigating the multi-step approval process can feel daunting. This TEDx style talk shares the perspective of one iPhD student’s journey to CG&PS&P approval. Details about her sustainability- and impact-focused iPhD approach will be discussed, but a metacognitive reflection on the process itself will provide helpful guiding questions for getting started, integration considerations, and concrete steps to take when exploring the iPhD path. The goal of this talk is to share lessons learned, laugh about failures, provide “wish-I-would-have” tips, and actively encourage anyone curious about charting their own path.

Establishing a Novel Porcine Model for Pre-Clinical Pancreatic Cancer Studies

Alissa Hendricks, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Pancreatic Cancer, Porcine Model, Immunocompromised

Cancer is the leading cause of death in developed nations, and pancreatic cancer is the fourth leading cause of cancer related death. Even with all of the developments made to treatments over the past century, the majority of pancreatic cancer cases do not have effective options. One reason for this, is that traditional models have focused on mice. However, mice overall fail to mimic human disease due to their size, immune system differences, and other basic functions. Thus, the need for a more predictable model is needed. This need has begun to be addressed by utilizing pigs, due to their size, genome, metabolism, and organ micro-structures. Immunocompromised pigs are being used with hopes that they can be used to grow tumors that are similar to human disease and can be reproduced between animals. The current study established the growth of human pancreatic tumors (PANC1 cells) grown subcutaneously in immunocompromised pigs, reaching an averaged of 1cm in diameter 30 days post injection. Tumors were observed to be comparable between animals. All tumors were found to have remained at the site of injection and no metastases were found. Histology of the tumors determined that the cells were comparable to human pancreatic cancer, with morphology and structures similar to existing mouse pancreatic tumor models. To ensure predictable applications, irreversible-electroporation ablation was performed on excised tumors and electrical properties of healthy tissues were evaluated. Tumors were found to ablate similarly to human tumors and the healthy tissue was found to have comparable electrical properties to human tissue. These results indicate that this pig model is a predictable model for human pancreatic cancer pre-clinical studies. It is promising that in the future this model can be used as an orthotopic model where tumors will be placed in organs of origin, allowing for more predictive studies.

Utilization of DNA Methyltransferases for Enhanced Bacterial Genetics in Fusobacterium Nucleatum

Ariana Umana, Poster Presentation, Program: Doctoral

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Keywords: Fusobacterium, methyltransferases, electroporation, transformation

Fusobacterium are Gram-negative anaerobic bacteria that are known for their genetic recalcitrance. Herein, we present the first characterization of Fusobacterium nucleatum 23726 DNA methyltransferases that greatly enhance genetic manipulation by bypassing restriction modification systems. We biochemically characterized the DNA methyltransferases mFnuI and mFnuII and show that purified enzymes or constitutive expression in E.coli efficiently protects plasmids against host nucleases during plasmid transformation. In summary, we provide the first characterization of DNA methyltransferases in Fusobacterium, and have developed a suite of enzymes that enhance our previously developed molecular tools for the genetic modification of F. nucleatum, thereby accelerating our understanding of how this opportunistic oral pathogen contributes to diseases including periodontitis, preterm birth and colorectal cancer .

Factors Affecting Perception of Random Events

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Keywords: Economics, Experiment, Probability, Hot Hand, Gambler's Fallacy

Our study investigates contextual influences on two common patterns in the human perception of probabilistic events, the gambler's fallacy and the hot hand fallacy. These involve the erroneous beliefs that, respectively, recent outcomes tend to reverse or continue. We conduct an incentivized experiment to measure subjects' beliefs about the likelihood of sequences of coin tosses of a fair coin after observing a sequence of prior tosses. The incentives are designed so that the optimal behavior of an unbiased agent is unambiguous, and deviation from this behavior is a clear indication of bias. We vary both the method used to display the previous tosses (graphical or text) and the elicitation of beliefs (estimating the frequency of heads, or betting on the result of a single toss).
We find significant differences in the biases exhibited by participants across the different elicitation methods. When subjects are asked to estimate a frequency, the bias tends to be in the direction of the hot hand fallacy. When asked to predict a particular outcome, the predominant bias is in the direction of the gambler's fallacy. These beliefs are contradictory as subjects are betting in the direction they have estimated to be less likely. There are only limited differences between the graphical and textual methods of belief elicitation. Overall, our results challenge the notion that agents view different probability elicitation questions as equivalent. This suggests that the results of studies on subjective beliefs about random events are sensitive to context and may be specific to a study's design.

Microbial Transformation Reactions Causing Nitrogen and Carbon Loss from Dairy Manure Storage

Bela Haifa Khairunisa, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: 16S rDNA, metabolism, nitrogen loss

Dairy manure is a valuable nitrogen fertilizer for growing crops. Direct application of raw manure poses several environmental and societal problems such as groundwater contamination, increased exposure to antibiotic-resistant pathogens, and generation of unpleasant odors. Manure treatment through storage or composting serves as an effective measure to mitigate these problems as it generates more stable products with less odor and pathogen burden. However, up to 60-80% of the nitrogen is lost during storage as N2 gas and nitrous oxide, a greenhouse gas (GHG). Similarly, carbon is also lost as two GHGs, CO2 and CH4. These conversions are mediated by complex microbial processes, and understanding these processes is essential for developing strategies to minimize nitrogen losses and methane emission during manure storage. To gain this knowledge, we have investigated two manure storage systems, earthen pit (EP; five sampling sites) and concrete storage (CS; three sampling sites). Manure samples were collected from three different depths (surface, middle, and bottom of the storage) using a custom-made sampler (a PVC pipe fitted with a pressure-regulated valve) and an articulating boom lift. The 16S rDNA libraries (V4 region; 515F and 806R primer set) prepared from DNA purified from the manure samples were sequenced on the Illumina MiSeq platform and analyzed using QIIME2. The results showed that the microbiomes of both EP and CS manure storage were dominated by Bacteroidetes (EP: 50%; CS: 41%) and Firmicutes (EP: 15%; CS: 28%) and contained organisms that transform nitrogenous compounds. Euryarchaeota (EP: 10%; CS: 7%), specifically methanogen species belonging to the genera Methanomassiliicoccaceae, Methanomethylophilaceae, Methanocorpusculum, and Methanoculleus, were more enriched in EP, indicating more methane production in this system. Tenericutes were observed to be twice more abundant in CS (EP: 2%; CS: 4%).

Batch-Sequential Design and Heteroskedastic Surrogate Modeling for Delta Smelt Conservation

Boya Zhang, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Gaussian process surrogate modeling, agent-based model, active learning

Delta smelt are a small endangered fish whose fate is intimately linked with water management practice in the Sacramento river delta system, and who more broadly serve as a barometer for environmental health in the San Francisco Bay. Researchers have developed a stochastic, agent-based simulator to virtualize the system, with the goal of assisting in a study of delta smelt life cycles and to understand sensitivities to myriad natural variables and human interventions. However, the input configuration space is high-dimensional, running the simulator is time-consuming, and its noisy outputs change nonlinearly in both mean and variance. Getting enough runs to effectively learn input–output dynamics requires both a nimble modeling strategy and parallel supercomputer evaluation. Recent advances in heteroskedastic Gaussian process (hetGP) surrogate modeling helps, but little is known about how to appropriately plan experiments for highly distributed simulator evaluation. We propose a batch sequential design scheme, generalizing one-at-a-time variance-based active learning for hetGP surrogates, as a means of keeping multi-core cluster nodes fully engaged with expensive runs. Our acquisition strategy is carefully engineered to favor selection of replicates which boost statistical and computational efficiencies when training surrogates to isolate signal in high noise regions. Design and modeling performance is illustrated on a range of toy examples before applying similar schemes to a cascade of delta smelt simulation campaigns supporting a high-fidelity input sensitivity analysis, and ultimately other down-stream tasks .

Grandparents Raising Grandchildren in Central, North Central, and South Central Appalachia - An Examination of Local Service Types and Availability

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Keywords: Grandparents raising grandchildren, Appalachia, Services

Past research has found that there are higher numbers of grandparents raising grandchildren in Appalachia, a region spanning from Georgia to Maine, compared to the rest of the United States. While grandparents living in Appalachia have diverse needs that could benefit from services, the availability of these services may be limited. When grandparents raising grandchildren cannot access needed services, their physical and mental health can be negatively affected. This study used the "2017 GrandFacts: State Fact Sheets for Grandfamilies" and examined the seven states as part of the Central Appalachian region (e.g., Central, North Central, and South Central) as defined by the Appalachian Regional Commission (ARC). In 2018, ARC found that these three regions have been largely classified as economically at-risk or economically distressed, which may further complicate the availability of services for grandparents raising grandchildren. This study examined the both local service type and availability in the Central Appalachian regions. The most common service types were grandparent emotional support, financial assistance, and information and referral, not including state and federal public benefits. The least common service types were legal services, grandparent education grandchild special health needs, early childhood intervention, and case management/crisis intervention. Local service availability was limited. All three sub-regions of Central Appalachia were found to have no local services in over 65% of their counties. Further, South and North Central Appalachia regions had no local services in over 90% of their counties. Although state and federal public benefits can help cover some of the gaps in services, there is still much to explore on how to assist grandparents raising grandchildren. Implications for service providers will be discussed.

Why Do Teachers Change Their Teaching Practice? Answers From Literature.

Brigitte Sánchez Robayo, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: instructional change, mathematics teaching, teaching practice, motivations

Although the answer to the question in my title could sound self-evident for many people, changes in the teaching of math have been only marginally incorporated, or even classroom practices refuse to change at all. In my path of understanding instructional change in mathematics, I analyzed 12 peer-reviewed articles for identifying the reasons for what motivates teachers to change their practice. I considered change in teaching practice as any reform, reconstruction, adaptation, or introduction of new or different elements to the instruction done by the teacher. I analyzed the reasons according to the kinds of motivations associated with them. I considered the expectancy-value theory of motivation that states that subjects' choice and performances can be explained by their beliefs about how well they will do the activity (expectancy of success) and the value they assigned to it. In my research, I found that success in previous experiences and advice from a community agent in educational settings are reasons associated with expectancy of success. In the first reason, mastery or vicarious experiences nourish self-efficacy, which refers to how confident a person is about performing some action. In the second, the persuasion from a colleague or some other entity recognized by the teacher as credible, increases their perceptions of success in class. Different reasons like developing a more profound students' understanding of mathematics, increasing the number of engaged students, strengthening students' good feelings toward math, the richness of a resource, or creating experiences for students are all associated with the value of the change. Some reasons align with the three elements of students' academic motivation proposed by Jones (2018): students' motivation, students' engagement, and learning. This means that some of the teachers' reasons for changing their teaching practices are associated with students' academic motivation configurated from the relationships that occur within it.

The Price of Education: Moving Sesame Street to a For-Profit Network

Brittany Shaughnessey, Poster Presentation, Program: Master's

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Keywords: children's media, framing

Developmental television may be utilized in place of preschool for those who cannot afford traditional education. Sesame Street's 2016 move to Home Box Office from PBS added a new cost to the once accessible educational programming for underprivileged youth. Since its inception, Sesame Street has been one of the only children's programs with a set curriculum, conceptualized in 1968 with the Children's Television Workshop, revisited in 1999, and are now updated each season. This study expands on previous research testing to determine if the presence and valence of curricula differed from HBO to PBS. Framing theory asserts there are several ways to describe the same issue: issues can be framed in different manners, dependent on the network. Priming theory asserts that over time, the media can change consumer's attitudes over time. Sesame Street intends to teach underprivileged children preschool curricula, eventually "priming" them.

Aspects of both curricula were tested as individual frames in a content analysis of two seasons of Sesame Street: the final season to air on PBS and the first to air on HBO. The unit of analysis was further broken down into individual scenes; these were distinctive as the program is split into segments. A total of 368 scenes were coded from 77 episodes. These frames were tested for both presence and valence, the tone in which the curriculum frame was presented: positively, negatively, or neutrally. Intercoder reliability was tested between three coders using a randomly determined portion of the sample. The researchers conducted an ANOVA test to determine presence and a Chi Square to determine valence. Significant differences were found in the pride and self-esteem, reading and writing, cooperation, and symbolic representation frames. In sum, this study tests if the cost of education supersedes quality.

A Novel Methodology to Extend Our Understanding of the Microbiome in Human Health and Disease

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Keywords: Microbiome, Flux Balance Analysis, Systems Biology, Probiotics, Cardiovascular Disease

The gut microbiome, a community of hundreds of bacterial species that reside in the intestinal tract, was thought to play a relatively minor role in human health in the 20th century. In the 21st century, the gut microbiome is at the center of a scientific renaissance. Recent advances in metagenomics and metabolomics have opened the door to new discoveries. We now understand that the gut microbiota play tremendous roles in shaping our immunological health, our metabolism and even our mental health. Studies investigating microbiota involvement in human health typically utilize statistical analysis of microbiota in “healthy” and “disease” populations. Such studies have tied the human gut microbiome to hundreds of diseases, including arthritis, cardiovascular disease, depression and autism. However, these studies have several shortcomings and provide no mechanistic insight into how the microbiome influences human health and disease. Importantly, while statistical methods are restricted to individual (or a handful of) bacterial species in their analysis, the microbiome functions as a cohesive ecosystem rather than the sum of its parts. In order to design new therapies and leverage the microbiome to improve human health, new methodologies will be required to investigate the contributions of the microbiome to host health. Here I propose a novel methodology to construct mathematical models that predict the contributions of individual bacterial species to the larger microbial community and how the microbiota act synergistically to influence human health and disease. As an example, I will explain how this methodology might be used to design new probiotics to treat cardiovascular disease. Finally, I will extend the discussion towards the methodology’s numerous applications.

Coping with Stress: The Caulobacter Approach

Bronson Weston, Poster Presentation, Program: Doctoral

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Keywords: Systems Biology, Cell Cycle, Microbial Stress Response

The freshwater bacterium, Caulobacter crescentus, divides asymmetrically and produces daughter cells of different phenotypes, in order to enhance its biological fitness in oligotrophic environments. The 'stalked' cell utilizes a stalk organelle to attach to surfaces in its environment, while the 'swarmer' cell utilizes a flagellum to move through the water in search of more favorable environmental conditions. When the swarmer cell is satisfied, it differentiates into a stalked cell, clings to an environmental surface, and proceeds with the cell cycle. The molecular mechanisms that underlie this intriguing behavior are well studied; however, the response of the mechanism to environmental stresses is not so clear. Here I present a mathematical model trained by experimental data to capture the dynamics of the molecular mechanism driving the C. crescentus cell cycle. I investigate how environmental stress signals feed into the molecular network and provide new insights into molecular responses. In particular, I utilize my model to challenge current conceptions of the stress response in Caulobacter and to propose new hypotheses when necessary.

Maternal Intrusiveness and Multisensory Integration are Negatively Related in Older Infants

Caroline Taylor, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: language development, SES, parenting

Maternal influence on subsequent infant and toddler development is multifaceted in importance. In particular, maternal sensitivity (MS) involves contingent and cooperative behavior when interacting with her child, and MS has been shown to influence many domains of development such as attention, expressive vocabulary, and multisensory integration (MSI) (Bruce, in progress; Tamis-Lemonda, Bornstein, & Baumwell, 2001). MSI refers to the ability to perceive information from two or more sensory systems (Bahrick & Lickliter, 2000) and MS is related to MSI skills in 24-month-olds (Bruce, in progress). MS is evaluated by behavioral measures including maternal attention facilitation, positive affect, and intrusiveness. Maternal intrusiveness is defined by behaviors that are over-controlling and inappropriate in regard to the toddler's behavior and social cues, while attention facilitation measures the attention directing behaviors of the mother, and positive affect captures the positive affect of the mother's speech and expressions. However, it is unclear which specific attributes of MS have a greater influence on MSI skills: is MS positivity (i.e., attention facilitation, positive affect) or MS intrusiveness more predictive of MSI skills? Here, 36 infants ages 22-27 months, (female = 22, M = 23.79 months, SD= 1.51) were tested on a MSI task. Results indicated that only MS intrusiveness was significantly correlated to MSI performance ($r = -.385$, $p = .019$); no significant relationship was found between MS positivity and MSI performance ($r = .243$, $p = .148$). Additionally, only MS intrusiveness significantly predicted MSI, $\beta = -.342$, $p = .04$; MS positivity did not significantly predict MSI, $\beta = .135$, $p = .41$. It seems maternal intrusiveness demotes the ability of older infants to locate and maintain attention on congruent face+voice events. This result will be discussed in terms of social risk related to socioeconomic status (SES) in the first two years of postnatal life.

ThoughtSwap: Helping Evoke Conscientious Discussion among Students in Classroom

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Keywords: Classroom Discourse, Facilitating Discussions, Conscientious Discussions

There are difficulties holding and participating in classroom discussions for both instructors and students. Such difficulties become even more challenging when we attempt to give discussions a meaningful direction and conduct conscientious discussions in classroom. This could be because students lack confidence, lack of comfortable space to share thoughts, their focus on mere participation by sharing rather than listening as well; and for instructors the risk involved in opening up a topic for discussion with minimal idea on how the students perceive that topic could be discouraging. To address these issues, we introduce ThoughtSwap, a web application designed to promote conscientious discussions in a classroom setting. With key features like real time prompt sharing, anonymous responding and enabled redistribution of the anonymous responses, ThoughtSwap presents a platform for students to share their opinions/thoughts without any fear of having the different/unpopular opinion in class. The instructor by promptly receiving the responses on their screen, is able to get a general sense of how the topic is perceived by students in class, thus creating the possibility for strategizing on how to proceed with the discussion further. The instructor is also able to redistribute the responses, where each student receives a response submitted by one of their peers in class. Here we ensure that students are not just sharing their original opinions but also "listening" to others in class, which might be similar or contrasting to their own. The tool itself is not meant to be the focus of the process, rather a platform for initializing conscientious discussion strategies. The focus needs to shift from within the tool to the actual verbal discussions in classroom. Therefore we present ThoughtSwap as a tool that along with suitably planned and recommended pedagogical strategies can promote conscientious discussion among students in classroom.

Does Commonness Confer Connectivity? A Genomics Case Study of a Backyard Frog

Chloe Moore, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: anthropogenic change, landscape genetics, amphibians

Habitat alteration, such as urbanization, is a major driver of declines and extirpations of amphibians worldwide. Yet a few amphibians successfully occupy human-modified landscapes. One of these common, “backyard” amphibians is the spring peeper (Pseudacris crucifer). Despite the species’ commonness, little is known about its ability to persist in heavily-modified environments. Persistence and stability of a species are often tied to genetic variation and connectivity between populations. Common species are often assumed to have high genetic diversity and connectivity across landscapes. However, these species may be experiencing environmental selection in modified landscapes that is not captured in natural or unmodified landscapes alone. The objective of my research is to assess drivers of the spring peeper’s persistence in modified landscapes by testing whether environmental differentiation, i.e. modified versus unmodified habitats, predicts genetic variation and connectivity. My proposed research seeks to address this challenge by leveraging approaches at the forefront of the genomics revolution in conservation biology. I will sample genomic DNA from spring populations across a gradient of unmodified (e.g. forested) to modified (e.g. urban) habitats across southwestern Virginia. To date, I have collected tissue from 268 individuals across 13 populations for an average of 20 individuals per population. Two populations were classified as modified-urban, five as modified-agriculture, and six as unmodified-forest. I am currently genotyping 5 geographically distant populations to quantify a rough estimate of genetic variation. I will use these results to identify priority populations across the study extent for the upcoming 2020 field season. As the global footprint of human-modified landscapes continues to grow, these mechanisms become increasingly important in predicting common species’ response to rapid environmental change and whether they will retain their perceived ‘common status’.

Ticks in the Pollinator Mix

Chris McCullough, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: pollinators, ticks, wildflowers

With growing concern about the decline of pollinators, actions are being taken to stymie this trend. One action is the creation of on-farm pollinator refuges, which are planted with a mix of native wildflowers to provide floral resources for pollinators. The benefits of these refuges to pollinators is well studied, but it is possible they are performing an ecosystem disservice by harboring ticks. Pollinator refuges have the potential to create more favorable microclimate for ticks compared to what was previously there. Ticks spend the majority of their lives off-host, leaving them to survive in the environment by finding microclimates with high relative humidity and stable temperatures. The purpose of this research was to determine if ticks were utilizing pollinator refuges as habitat, how tick abundances in refuges compare to other on-farm areas, and what factors may be influencing the distribution of ticks among the sampled habitats. During a two-year study, ticks were sampled from pollinator refuges, weedy field margins, and forested areas on 10 farms in eastern Maryland and Virginia. Ambloymma americanum, the lone star tick, was the predominant species sampled. Ticks were detected in pollinator refuges at a similar abundance to weedy field margins, with forested samples having the greatest abundance. While ticks were sampled from pollinator refuges, they do not appear to pose a risk for increasing on-farm tick abundance. The biotic and abiotic factors that contributed to this result are further discussed, such as white-tailed deer movement and the height of the vegetation in the sampled areas.

Thioredoxin-based Stabilization of Methyl Coenzyme-M Reductase (Mcr), a Tool for Bioconversion of Methane to Liquid Fuel

Christian Heryakusuma, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: methane, Mcr, bioconversion, thioredoxin

Natural gas which consists primarily of methane is highly abundant and accessible, and it is used as a fuel. However, a liquid fuel is preferable due to its higher energy density. In the recent years, an attempt has been made for the bioconversion of methane to liquid fuel by utilizing an enzyme called methyl coenzyme-M reductase (Mcr). This enzyme, which is found in methanogens, methane producing organisms, and anaerobic methanotrophs, methane oxidizing organisms, is highly oxygen sensitive and extremely unstable, making the manipulation of this enzyme particularly difficult. We hypothesize that deep-sea hydrothermal vent methanogens carry special tools that stabilize the Mcr and these are proteins called thioredoxins. In order to investigate these tools, our lab has established specific genetic analysis methods. We present results from our ongoing research.

Development of a Standardized Scaling Test Protocol for Evaluation of Scale Reduction Devices and Technologies

Christina Devine, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Calcium Carbonate, Scaling, Water Heater

Precipitation of calcium carbonate (i.e. scaling) is a major problem in both traditional tank (electric and gas) and tank-less hot water systems. Within the system, scaling causes energy loss, flow reduction, pressure loss, and erosion corrosion. Consumers are also concerned with unsightly soap scum, cloudy water, discolored glassware, and failing appliances and fixtures. There are many scale reduction devices on the market that aim to ameliorate scaling problems, and several efforts have been made to develop standardized test protocols to verify and quantify their performance. A critical evaluation of previous efforts revealed limitations in terms of reproducibility and an ability to measure key aspects of scale deposition including quantity, location, and deposit durability.

A Standardized Scaling Test Protocol (SSTP) was developed to address these deficiencies and measure key parameters of scaling throughout a model premise plumbing system, using a synthetic water that could provide reproducible results in any laboratory. The synthetic water developed for the SSTP simulates a ground water at saturation with calcium carbonate, which develops a very high scaling potential after it is heated. The goal was to achieve a realistic scaling scenario that had no chance of forming a precipitate in the apparatus before the water was heated, which was the source of irreproducible and variable results in past attempts of standardized testing.

Preliminary testing showed that this synthetic water was able to produce significant scaling (25.1 grams of calcium carbonate) in the water heater within the desired short-term experimental time frame of 5 days. The Standardized Scaling Test Protocol (SSTP) was therefore deemed acceptable to evaluate the effectiveness of scale reduction technologies, and preliminary work was then conducted to validate the capabilities of the approach for a range of technologies. Scale reduction for the devices tested ranged from 0-100% under the standardized protocol .

From Stem Cell to Mini Organ: Cultivating Organoids to Better Understand Cancer Development

Christina Mounzer, Flash Talk Presentation (5 Minute), Program: Undergraduate

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Keywords: Stem cells, cancer, organoids

Colorectal cancer (CRC) is very prevalent in medicine today, in fact, it is the second deadliest cancer in the United States. Certain signaling pathways in the body have been linked to events that could lead to the development of CRC. Our pathway of interest is the noncanonical NF-kB pathway, which is involved in immune response. When this pathway is interrupted or malfunctions, we see implications in gastrointestinal health that could lead to CRC. To better understand this pathway and its role in CRC, we generated colonic organoids. Organoids are “mini organs” that provide more complexity than a cluster of cells, but less complexity than its counterpart organ, in this case, the colon when studying cancer development. Generating organoids is an innovative process that involves transforming a single stem cell into a miniature organ. We used stem cells from mice that have been genetically modified to have a malfunctioning noncanonical NF-kB pathway so that we may better understand the cell composition of the colon in its faulty state and relate it back to CRC. Once the organoids were developed, we were able to get a snapshot of the cells in the colon by performing immunohistochemistry (IHC). Immunohistochemistry is an advanced staining technique that identifies specific cell types by proteins found on their surface. IHC is useful in identifying one cell type from another, since each cell has its own specific protein. This allows us to identify common cell types generally found in healthy colons and compare it to the genetically modified organoids to identify any differences. This gives us insight to any discrepancies in the mutated colon and leads us to better understand how CRC develops. This novel process can be used to better develop drugs and treatments for CRC, and potentially identify susceptible cell types for early detection.

Single Atom Catalysis: Iridium on Titania

Coogan Thompson, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Catalysis, Mechanism, Single Atom

Single atom catalysis has opened the door to many new and exciting chemistries that have previously been impossible or impractical to perform with traditional nanometer sized solid catalysts. Single atom catalysts are unique as they are one single atom isolated on a support. In this work, I present iridium single atoms that have been put on an anatase titania support and measure how catalytically active the single iridium atoms are for the oxidation of carbon monoxide into carbon dioxide. I show a collection of spectroscopy techniques to verify I have created isolated single atoms. I then show a collection of reactivity measurements, how much carbon monoxide is turned into carbon dioxide, to better understand how the catalyst works. With the spectroscopic evidence and reactivity data, we can propose a mechanism, a series of simple steps that show how the catalysts converts the carbon monoxide into carbon dioxide. This knowledge allows us to create better catalysts and use current catalysts to their maximum efficiency.

How Wrong Are We? A Quantitative and Critical Exploration of the Roots of Error in Self-Reporting of Online Behavior

Damien Williams, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: science and technology studies; facebook; internet and digital research; social media; politics

In this paper, we perform a critical and quantitative analysis of Facebook users' online behaviors, forming a basis for exploring assumptions, values, and biases in both social networking technologies and their users. By comparing users' behavior in their various types of engagement with how these users think they have behaved, we can determine the direction and size of error between expected and actual behavior. This measurement can, hopefully, teach us something about who is more or less likely to misjudge their behaviors, and hopefully suggest an explanation as to why. What was the difference between self-estimated behavior and behavior collected by the app? What was the intersection between race, gender, political interest, education level, and age of Facebook users, and their political engagement habits and affiliations? Might we be able to account for the impact of disability on behavioral awareness, as well? Using these and other questions as a basis, we hypothesize that people will likely over-report their political awareness and potentially underreport their online political activity, but that this outcome will be less likely to pertain in the case of Left-Leaning Black women, across age groups; we hypothesize that these Black women's estimates of their behavior will be more likely to match what the app records. We hypothesize that Right-leaning white men will be most likely to underreport how often they comment on or engage in politically-oriented news stories on Facebook. Engaging in critical analysis with tools from Science, Technology, and Society, we may come to understand that the structure and framing of Facebook's algorithmic interface allows if not encourages users to misjudge and misunderstand their own online behavior and motivations. Further, we hypothesize that marginalized identities' awareness of their behavior online will mirror the kind of awareness which, in their offline behaviors, is a necessary tool for survival .

Breaking the Sound Barrier: Understanding the Physics of Aerodynamic Noise

Danny Fritsch, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Engineering, Aerospace Engineering, Acoustics, Aerodynamics, Turbulence

Chaotic, swirling motion, called turbulence, in fluid flows near solid bodies is a strong source of undesirable noise. The impact of this noise creates a negative experience for people who live near airports, wind turbine farms, and military bases, often creating the need for restrictive rules. The study of this noise, called aeroacoustics, has been the subject of extensive research in recent decades, but our ability to make accurate predictions of flow noise is still extremely poor. Six peer-reviewed and widely accepted models have been proposed, but the differences between them are so great they are practically unusable; the disagreement between the highest and lowest predicting models is a factor of fifteen, meaning our ability to predict the noise on an aircraft is only accurate to the range between a garbage disposal and a rock concert. One of the reasons for the lack of significant progress in this research area is the nearly infinite number of variables that may contribute to the production of aerodynamic noise. Finding an organized way to generate and characterize all of these variables has presented a huge challenge, but it's critical for advancing the field of aeroacoustics and improving human quality of life. My team has designed a novel wind tunnel experiment that manages to neatly divide up the different variables of the problem in controllable and repeatable ways by using a rotating airplane wing model to change the conditions on the test surface. The preliminary results of these experiments show that it is in fact possible to control and study this phenomenon in a systematic way, which we believe will help reveal the underlying physics and improve our ability to make accurate noise predictions.

Characterizing Algae using Raman Spectroscopy and the Generating Reducing Equivalents Using Photosynthetically Active Algal Extracts

David Sherr, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Algae, Raman Spectroscopy, Reducing Equivalents

Raman Spectroscopy is a useful analytical technique for characterizing complex biological samples with many different chemicals present at once. These Raman Spectra can be viewed as a molecular thumbprint that is unique for individual cells grown under different conditions. Recently, our lab has developed a software called Rametrix Pro that can analyze thousands of Raman Spectra at once and identify which peaks differ the most between samples. This technology has been applied to a species of algae, Scenedesmus sp A6, in order to evaluate changes in the Raman spectra when a variety of stressors are applied to the algae at once. Rametrix Pro is then used to perform Global Sensitivity Analysis (GSA) to find which stress conditions cause statistically significant changes in Raman spectra. Using this protocol I have already found that heavy metals, herbicides, and acetic acid cause statistically significant phenotypic change. This Research can be applied to the algal biofuel industry and to the detection of toxic runoff. In addition, I have a developed a protocol for repeatedly creating a photosynthetically active algal extract (PAAE) which can reduce redox dyes for over one hour. The PAAE has also demonstrated the capability of reducing a variety of quinones using an assay invented by me that relies on chemiluminescence of the chemical luminol. With this assay I can characterize what types of quinones are most readily reduced by the PAAE. The aim of this project is to use the PAAE to generate an electrical current with quinones as a mediator. This technology can then be applied for the development of a bio-solar cell. Further, the PAAE can be applied to catalyze the reaction of methane to methanol in conjunction with a methanogen extract, a reaction crucial to the natural gas industry.

A Bioinformatics Approach to Determining Enzyme Functions

Elisa Gagliano, Research Oral Presentation (15 Minute), Program: Master's

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Keywords: Computational, Biochemistry, Chemical reaction prediction

Radical SAM enzymes are ancient, necessary macromolecules that perform chemical reactions in virtually all living organisms and are involved in producing antibiotics, generating greenhouse gases, human health, and likely many other essential roles that have yet to be established. However, many of these radical SAM enzymes are yet to be identified or characterized. There have been great leaps forward in the amount of enzyme sequences that are available in public databases, but benchtop experiments to investigate what chemical reactions the enzymes perform take a great deal of time. Benchtop experiments are especially difficult for radical SAM enzymes, and need to be performed in anoxic conditions, otherwise oxygen degrades the iron-sulfur cluster that the enzymes require. In our work, we utilize computational techniques to identify possible radical SAM enzymes from organisms across the tree of life, and predict their possible functions. Radical SAM enzymes can be identified by a hallmark, iron-sulfur cluster binding pattern in their sequence. The functions of radical SAMs can be predicted based on other parts of their sequences that are similar to enzymes that have been characterized in benchtop laboratory experiments. Here, Sequence Similarity Networks (SSN) built from 400 organisms across the tree of life were used. The SSN grouped together predicted radical SAM enzymes by their likely functions. This allowed function inference of the enzymes that grouped with those that have already been characterized, and to identify groups of reactions that have yet to be experimentally determined. Although the majority of uncharacterized radical SAM enzymes were expected to be present in archaeal genomes, we instead identified select eukaryotic organisms with a surprisingly high percentage of radical SAM enzymes. This work sets the stage for the functional characterization of these essential yet elusive enzymes in future benchtop experiments .

Forest Disturbance has Long-Term Effects on Soil Bacterial and Fungal Communities in Appalachian Ecosystems

Ernie Osburn, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: soil, forest, bacteria, fungi, ecosystem

In Appalachian ecosystems, forest disturbance has long-term effects on ecosystem functions such as nitrogen (N) cycling. For example, at the Coweeta Hydrologic Laboratory in the mountains of North Carolina, clear-cut forests export N to streams at elevated rates for decades following the clear-cut. However, effects of past forest disturbance on soil microorganisms such as bacteria and fungi remain poorly understood. To investigate potential effects of past forest disturbance on soil microorganisms, we selected four previously disturbed watersheds and four adjacent undisturbed reference watersheds at Coweeta. Disturbances included clear-cutting, conversion to pasture, conversion to pine plantation, and commercial clear-cut cable-logging. In each watershed, we established six 4 m x 4 m plots and collected soil cores from each plot. We extracted DNA from soils, amplified marker genes for bacteria and fungi using PCR, and sequenced amplified DNA samples on the Illumina MiSeq platform. We then grouped sequences into operational taxonomic units (i.e., “OTUs,” a proxy for microbial species), and classified sequences using the Greengenes and UNITE databases for bacteria and fungi, respectively. Our results show that disturbed soil bacterial communities were more diverse than reference communities and were distinct from reference communities at both the OTU (i.e., “species”) level and the phylum level, with disturbed communities having lower abundance of Acidobacteria and higher abundance of Proteobacteria and Nitrospirae. In contrast, disturbed fungal communities did not show differences in diversity and were not consistently different from reference communities at the class level. However, disturbed and reference fungal communities were distinct at the OTU level and some important fungal functional groups (i.e., ectomycorrhizae) were more abundant in disturbed soils. These results suggest that disturbance has long-lasting effects on soil bacterial and fungal communities, which has potential implications for the ecosystem functions of previously disturbed forest environments in the Appalachian region .

Trust and Economic Freedom: A Multi-country Study

Esha Dwibedi, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Behavioral economics, Experiments, Economic Freedom, Trust

We look at establishing a relationship between the existing trust in a society with the level of economic freedom prevalent there. Trust and trustworthiness play a crucial role in cementing relationships, fostering cooperation among individuals and building a cohesive society. Higher level of trust increases efficiency and leads to better economic outcomes. Economic freedom pertains to the right of individuals in a society to produce, consume, work and invest freely, without hindrances in mobility of labor, capital and goods. Theoretically, individual level behavioral pattern is shaped by the economic environment that an individual resides in. Economically freer societies, comprising of stricter enforcement of rule of law and having higher business, labor and monetary freedom should hence, also have higher levels of trust and cooperation among individuals. This paper aims to empirically test the relationship between observed trust and economic freedom measures across multiple countries. We use data on the Economic freedom index, which is a measure of a country's economic freedom along the lines of rule of law, regulatory efficiency, government size, and open markets. Additionally, we use data from 162 replications of the Berg, Dickhaut, and McCabe Investment game (the trust game) as a laboratory experiment across multiple countries. We aim to establish a relationship between the year specific Economic freedom index for a particular country and the trust and trustworthiness measures reported in the games conducted during that particular year in that particular country. We also look at geographic variations on the same. We find evidence that individuals in countries with more restricted economic freedom display less trust in the trust game as compared to countries that have greater economic freedom. This implies that there exist differences in "other-regarding" behavior across societies .

Psychophysiological Monitoring of Aerospace Crew State

Grace Wusk, Poster Presentation, Program: Doctoral

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Keywords: spacewalks, psychophysiology, workload

As next-generation space exploration missions necessitate increasingly autonomous systems, there is a critical need to better detect and anticipate crewmember interactions with these systems. The success of present and future autonomous technology in exploration spaceflight is ultimately dependent upon safe and efficient interaction with the human operator. Optimal interaction is particularly important for surface missions during highly coordinated spacewalks, which consist of high physical and cognitive demands with limited ground support. Crew functional state may be affected by a number of variables including, but not limited to, workload and stress. In response to the need for objective, passive assessment of crew state, the aim of this work is to develop a robust prediction model of crew functional state for surface spacewalks using multimodal psychophysiological sensing. The psychophysiological monitoring approach relies on extracting a set of features from physiological signals, such as heart rate and breathing rate, and using these features to classify or estimate a psychological state. Data collection is ongoing using a sensor suite of three commercially available wearable devices during a series of benchmark and operationally-relevant tasks. The benchmark tasks are used to induce specific cognitive states under controlled conditions, creating a labeled dataset to train the model with supervised machine learning techniques. In order to test the model in an operationally relevant task, a virtual reality (VR) exploration translation task is being developed and evaluated. During this task, subjects simulating crewmembers are translating, as in moving from point A to point B, along a VR lunar surface while monitoring systems, managing resources, and communicating waypoints. Prior to testing the model on the translation task, high and low cognitive workload configurations of the VR lunar translation task will be validated using subjective assessment, performance, and physiology measures .

Brucella abortus is Recognized by the Negative Regulator NLRX1 of the Innate Immune System

Hanna Kiryluk, Poster Presentation, Program: Undergraduate

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Keywords: brucellosis, pattern recognition receptor, immune system, inflammation

Brucella abortus is a bacterium that causes the disease brucellosis and is most commonly transmitted from livestock to humans. B. abortus is relatively understudied in relation to the immune system, a network of cells and proteins that defends the body from infections like brucellosis. Bacteria such as B. abortus contain proteins that activate immune responses and are recognized by Pattern Recognition Receptors (PRRs). PRRs can promote or inhibit the expression of signaling proteins that regulate inflammation. NLRX1 is a PRR that inhibits inflammation, and this is important because chronic inflammation can lead to various diseases. However, B. abortus is unique in that it can avoid immune recognition and the inflammatory response. Removing NLRX1 from B. abortus could allow for increased immune response to the bacterium, therefore enhancing the ability to defend against brucellosis. This suggests that PRRs such as NLRX1 are critical to the implementation of brucellosis drug therapies. However, the activation of NLRX1 in response to B. abortus infection has yet to be determined. To explore this topic, we designed an experiment to provide insight into the response of the immune system to B. abortus infection in both the presence and absence of NLRX1. We used white blood cells from normal mice and experimental mice without NLRX1 to analyze inflammatory signaling protein response to B. abortus infection. We hypothesized that the experimental mice would have elevated levels of inflammation in comparison to the normal mice because the absence of NLRX1 should increase inflammatory response. Our results were consistent with this hypothesis, as the white blood cells from the experimental mice demonstrated increased proinflammatory signaling proteins. This suggests that B. abortus is recognized by NLRX1 in the immune system. Further studies focusing on the absence of NLRX1 are fundamental to understanding the immune response to brucellosis and developing effective treatments .

I Clove you, AsFMO: The Characterization of an Enzyme in Garlic Flavor Production

Hannah Valentino, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Garlic, natural products, enzymology

Garlic is one of the most well recognized and consumed spices world-wide with its distinct flavor being attributed to the production of sulfur containing compounds including allicin and diallyl disulfide (DAD). Along with providing flavor, these pungent compounds also have been shown to provide numerous health benefits including antimicrobial, anti-cancer, and anti-inflammatory functions. The problem with these compounds is that they are relatively unstable and production of them in garlic widely varies. Better understanding of the enzymes involved in this pathway would make it possible to engineer allicin and DAD production improving flavor and there use in medicinal application. The goal of this study was to determine the function of a specific enzyme involved in the allicin biosynthesis pathway known as AsFMO. AsFMO has been proposed to be involved in producing a stable precursor of allicin called alliin. Understanding the chemistry of this reaction by elucidating the mechanism of AsFMO would contribute to the overall goal of regulating allicin production by allowing researchers to understand how an essential step in this pathway is performed. AsFMO also serves as a model for understanding the function of other enzymes as it represents a group of poorly understood plant enzymes involved in similar pathways found in onion and cabbage. Surprisingly, the results from this study show that AsFMO does not complete the expected reaction to create alliin. Instead, AsFMO shows dual activity with L-cysteine and the major garlic metabolite allyl mercaptan producing L-cystine or DAD from this reaction. This information indicates that AsFMO is directly involved in allicin and DAD production in garlic suggesting that regulation of AsFMO expression in the garlic plant would greatly impact the production of allicin. This information also shows that the current understanding of this pathway needs to be further studied and revised.

Measuring the Influence of Anger on Takeover Performance in Semi-Automated Vehicles

Harsh Sanghavi, Research Oral Presentation (15 Minute), Program: Master's

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Keywords: Affect, Driving, Automated Vehicles, Angry Driving

As autonomy in vehicles increases, the role of the driver will diminish, moving on to more non-driving related tasks. We are at a juncture at which cars have the ability to drive themselves, but only if the driver is ready to take over control of the vehicle if required (e.g. Tesla autopilot). It is therefore, important that adequate transition warnings are used to warn drivers to take control from these semi-automated vehicles. A lot of research has been conducted to help design the safest warnings for this takeover transition. Anger is one of the emotions that has been shown to impair driver judgement and performance in previous research. Driver takeover performance data was used to compare angry drivers versus neutral drivers. Takeover performance characteristics such as lane deviations, takeover reaction time, braking jerk and glance frequency on review mirrors was collected. As secondary research objectives, I go on to measure the effects of increased perceived urgency in auditory alarms. Takeover reaction times relative to increases in fundamental frequency and number of repetitions per second was collected. Additionally, I focus on using the data from this research to help test mathematical driver behavior modelling using the QNMHP cognitive model. Mathematical driver behavior modelling will help predict driver reaction times to auditory warnings, which will help develop safer semi-automated vehicles. This study aims to make a significant contribution to research into emotions on takeover performance in semi-automated vehicles as well as takeover warning design .

Novel Field-Based Interactions Between Soybean and Symbiotic Root Nodule Bacteria

Hazem Sharaf, Poster Presentation, Program: Doctoral

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Keywords: Soybean, novel bacteria, pseudomonas, root-nodules, sustainability, drought

Symbiotic nitrogen-fixing bacteria associated with legumes can provide soybean with up to 95% of its nitrogen demands. Some studies have reported presence of non-nitrogen fixing bacteria inside nodules of legumes, including soybeans. While specificity of soybean-diazotroph interactions has long been established, little is known about the impact of presence non-diazotrophs on soybean traits. Additionally, nitrogen-fixation is sensitive to environmental perturbations such as soil water-status. A knowledge gap exists regarding environmental interactions of the soybean root-nodule microbiome. To address this deficit, we planted nine diverse cultivars of soybean at Virginia Tech's Kentland Farm in 2014. We subjected them to natural rainfall and irrigation treatments. Then, we harvested the root nodules, extracted DNA, amplified the 16S rDNA gene as a marker of the overall bacterial community, and iron nitrogenase nifH gene as a marker of diazotrophs. We also profiled the amino-acid composition of the nodules. Results revealed a surprising nodule microbiome bacterial diversity that was cultivar specific. Families such as Pseudomonadaceae and Enterobacteriaceae contributed up to 45% of the nodule microbiome. Unsurprisingly, the diazotroph population were exclusively composed of Bradyrhizobium sp. However, they were more sensitive to the variation of water status than the other bacteria, as expected. Functional changes in the nodules were attributed to both the cultivar and water-status. While the role of these bacteria is still unknown, these results can be exploited towards sustainable agriculture, and have the potential to change soybean breeding, and crop management practices. Future directions will involve associating microbiome changes with the plant genome traits.

Organic Fertilizers Improve Apple Orchards' Soil Microbial Health and Tree Biomass

Hazem Sharaf, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Apple Orchard, Soil health, sustainability, soil microbes

Apple growers in the state of Virginia are currently modernizing orchards to a more efficient and highly productive systems. This requires replacing traditional apple trees with new dwarf rootstocks that allow for densely planted orchards. Current orchard management practices involve adding synthetic fertilizers that support immediate tree growth but have adverse effects on soil microbial health and the environment. The main objective of this experiment is to see the effect of replacing synthetic fertilizers with more natural environmental friendly ones on the health of orchard soils and above-ground apple tree traits. We applied four different fertilizer treatments to them: non-amended control, synthetic fertilizer application, organic chicken litter, and yardwaste compost. The study was implemented using a randomized two-way factorial design in large pots using field soil. We sampled the root-zone microbial community after 3 years of fertilizer applications. We have also assayed the soil properties, and above-ground tree traits. Preliminary results have revealed that the fertilizer applications caused a significant change on the soil microbial population structure. We have also observed associated physiochemical changes in the soil and physical changes in above ground tree traits that support the positive effect of the organic amendments. Several tree biomass measurements were higher in response to the organic fertilizer compared, to the control and synthetic treatments. the These effects are driven by key soil bacterial indicators in each fertilizer application. Each Bacterial groups associated with each organic treatment were concomitant with metabolic changes supporting enriched soil carbon recycling, an indicator of improved soil health. These results promise that organic, environmentally friendly natural fertilizers can replace traditional synthetic fertilizers in these new highly productive modern orchard systems. Thus, Virginia apple growers can switch to organic soil amendments without jeopardizing prospective yield, and while ensuring sustainable agriculture practices .

Tire Interaction with Ice and Snow

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Tire design involves a deep understanding the effect of each tire parameter on its performance and, in general, on the vehicle control, stability, and safety. Such knowledge helps a manufacturer improve tire performance for specific operational conditions such as icy and snowy roads. On average each year there are 156,164 crashes due to driving on the icy roads.

To improve the design of the winter tire it is essential to recognize the most effective parameters on the tire performance. The material properties of the rubber compounds, which are highly dependent on temperature, have a vital role in the tire behavior. A comprehensive study on the effect of the rubber properties on tire performance, for different temperatures, as well as different road conditions is required to adequately predict the performance of tires on ice.

In this study, a theoretical model has been developed for the tire-ice interaction. The model has been validated using experimental results for three similar tires with different rubber compounds properties. After validating the simulation results, the model has been used to perform a sensitivity analysis on the tire performance with respect to six material properties of the tread rubber. In addition to study the effect of the tread pattern of the tire on its performance another tire model with detailed tread pattern has been developed. The model validated using experimental data and have been used to study the effect of different tread pattern characteristics on tire performance.

Redness, Swelling, and Heat, Oh My! – Inflammation Results in Cancer Development

Holly Morrison, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: inflammation, cancer, cells, gastrointestinal health

Inflammation is characterized by redness, swelling, and heat and is the body's natural response to damage or infections. Inflammation signals to the body that this damaged area needs wound repair (ex. twisted ankle) or that a bacterial infection needs to be fought off (ex. strep throat). Under normal conditions, this inflammation is beneficial in ensuring good health by promoting the body's immune response. However, chronic inflammation results in too much inflammation that causes damage rather than healing. Our interest is in how chronic inflammation results in cancer formation. Several cellular pathways regulate mechanisms that initiate inflammation. One such pathway is NF-kB, which is further divided into two pathways: canonical and noncanonical signaling. Canonical NF-kB signaling is synonymous with inflammation, while noncanonical signaling is understudied, particularly in regards to gastrointestinal health, like the gut and colon. Our research investigates how dysregulated noncanonical NF-kB signaling results in chronic inflammation and the development of colorectal cancer (CRC). We hypothesize that the noncanonical NF-κB signaling pathway has a novel and pertinent role in maintaining gut health and when dysregulated causes susceptible cell populations to become cancerous under inflammatory conditions. We evaluate how certain cell-types may be more susceptible to forming cancer by using genetically-modified mouse models that have this noncanonical pathway altered in certain types of cells, including intestinal and immune cells. Our data shows that deletion of noncanonical signaling in intestinal cells results in increased susceptibility to the formation of tumors in the colon, while immune cells show no significant variation. Results from this project will yield valuable insight into the mechanism that drives CRC formation and the early stages of disease progression, thus unveiling critical information that may revolutionize diagnosing those with CRC.

Cross Laminated Timber a Sustainable Envelope System

Houri Sharifnia, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Building envelope, Cross Laminated Timber, prefabrication, environmental impact

The building construction industry has a significant impact on global energy use and global warming, both in developed and developing countries. Designing high performance or low energy buildings is considered as a solution for reducing the environmental impacts of buildings. Since building envelopes are the separator between the exterior environment and the interior space of the buildings, they have a significant impact on energy consumption. Therefore, improving buildings' performance can be achieved for instance by adding materials to envelopes, which can either be done by adding more insulating materials or by simply increasing the mass and thickness of walls. This approach has shown significant improvement in building energy performance. However, it typically increases the amount of embodied energy and thus, the environmental impact. To find a solution for this issue, biomaterials such as hempcrete, wood, and wood-based composites are investigated as alternative low carbon materials for envelope design. Amongst wood products, Cross Laminated Timber (CLT) has recently been utilized increasingly as a naturally resourced material in the building construction industry. CLT is a giant prefabricated wood panel that is produced by cross layering wood lumber in a continuous production line. It could be used as a wall, floor, or roof. However, CLT has not been studied extensively as an individual alternative wall system to traditional enclosure systems in previous researches. Therefore, the aim of this study is to introduce CLTs as part of a lightweight prefabricated exterior wall system. The information presented here incorporates the initial literature review and investigation of opportunities for developing prefabricated, light-weight CLT (CLT-l) exterior wall panels as an alternative to the conventional walls. The primary reviews of material impact and fabrication process revealed the positive environmental impact of utilizing CLT, which provides insights to further explore CLT wall panels' performances in our research .

Quantifying the Effects of Histotripsy Ablation on the Release of Immune Markers from Cancer Cells

Jacqueline Sereno, Research Oral Presentation (15 Minute), Program: Undergraduate

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Keywords: Cancer, Innate Immune Response, Histotripsy

Cancer is the second leading cause of death worldwide. One problem in fighting cancer, is that tumors can flip the immune system from anti-tumor to pro-tumor. To address this, drugs and therapies are being developed to recalibrate the immune system. Our work focuses on histotripsy, a non-invasive ultrasound therapy that uses focused ultrasound to generate a bubble cloud that can destroy targeted tissues and shows promise in generating an anti-tumor immune response. Given that histotripsy has no thermal mechanism, it should not destroy potential immune signals, such as damage associated molecular patterns (DAMPs) that could be released in higher levels than other therapies. We hypothesize that histotripsy is capable of releasing DAMPs at levels higher than or comparable to freezing, heating, and electrical therapies. To test this, the effects of all four of these therapies on the release of DAMPs was quantified through measuring the release of protein and DNA, types of DAMPs, from partially and fully treated cells. Results show that histotripsy is capable of releasing high levels of proteins, even with partial treatments, and that, in fully treated samples, targeted proteins are still able to be clearly identified. Additionally, histotripsy was found to release segments of DNA that appeared to be fragmented. The combination of proteins and fragmented DNA being released by histotripsy was comparable to levels found in freezing, slightly higher than electrical, and notably higher than heating therapies. These results indicate that histotripsy is capable of releasing molecules that can stimulate immune responses. A variety of the released proteins and DNA detected outside of the cell will stimulate anti-tumor pathways and lead to an inflammatory immune response. Overall, these results indicate that histotripsy can potentially shift a pro-tumor environment to an anti-tumor environment .

Control Applied to Pattern Formation in Non-Linear Reaction-Diffusion Systems

Jason Czak, Poster Presentation, Program: Doctoral

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Keywords: Control Theory, reaction-diffusion systems

The Gray-Scott model has been subject of numerous investigations. Due to the nonlinear nature of the coupled reaction-diffusion equations, the system exhibits interesting behavior for certain parameter sets. In many previous studies of this system investigators have used a limited range of parameter values dictated by neglecting diffusion effects. Through systematic parameter adjustment we are able to find novel system pattern formations that were previously overlooked. We present a comprehensive view of these pattern regions and discuss effects of control schemes applied to this system.

Accurate and Efficient Gene Function Prediction using a Multi-Bacterial Network

Jeffrey Law, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Gene function prediction; Multi-bacterial network

The dramatic decrease in sequencing costs has led to hundreds of thousands of newly characterized prokaryotic genomes. Unfortunately, fewer than 0.01% of genes in these genomes have had their functions determined experimentally. Therefore, many computational methods to supplement experimental functional annotations have been developed. Despite these efforts, as many as 40% of genes in sequenced genomes lack any experimentally-determined or computationally-predicted function.

To address this gap, we seek to develop methods for gene function prediction that integrate heterogeneous data for multiple species while also operating on a genomewide scale. However, the large size of such multi-species networks pose a challenge for the scalability of current state-of-the-art methods which typically operate on a single species or a small group of genes at a time.

Inspired by this challenge, we develop a novel iterative label propagation algorithm called FastSinkSource. By using mathematically-provable bounds on the rate of progress of FastSinkSource to develop a new convergence strategy, we decrease the running time by a factor of 100 or more without sacrificing prediction accuracy.

We systematically compare and evaluate many approaches to construct a multi-species bacterial network and apply FastSinkSource along with other state-of-the-art methods to these networks. We find that by pre-computing scores for species with experimentally-validated annotations and then transferring those scores to other species, FastSinkSource is able to make the most accurate functional predictions for 200 bacterial species, taking under 4 minutes for this computation. Our results point to the feasibility and promise of multi-species, genomewide gene function prediction, especially as more experimental data and annotations become available for a diverse variety of organisms. .

An Invitation to Understand: An Alternative Approach to the Corporate Voice in Public Relations

Jenna Davis, Research Oral Presentation (15 Minute), Program: Master's

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Keywords: invitational rhetoric, public relations, corporate voice, Twitter, Bud Light land

This study explores how public relations practitioners and scholars can learn the benefits of using an invitational rhetoric approach to the corporate voice instead of relying on traditional rhetorical approaches that are grounded in persuasive, authoritative intent. Because of societal changes inspired by changing gender norms, the traditional masculine corporate voice may no longer be the most effective corporate communication style. Thus, it seems traditional approaches to corporate communication are being challenged by more inclusive approaches that emphasize meaning co-creation with the public over purely persuasive approaches. Thus, my thesis conducts a case study of the Bud Light brand's use of Twitter. The purpose is to determine if the brand makes use of an invitational rhetoric approach and if so, explore how it uses invitational rhetoric, as well as analyze the implications of this approach for corporate public relations practice. I argue an invitational rhetoric approach to corporate public relations may encourage more equitable communications between organizations and publics rather than privilege one authoritative, persuasive corporate voice.

Parents and Children Negotiating Family Interactions with Alexa

Jessica Resor, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: families; smart home speakers; technology; qualitative

Smart home speakers are becoming more widespread as a quarter of American adults report having one in their home (Auxier, 2019). Smart home speaker virtual assistants, like Amazon's Alexa, have grown in popularity since their releases in the 2010s. Little research has been done to understand how families, particularly children, utilize these devices.
The study's purpose was to understand parent-child interactions around smart home speakers. Twelve families were given one Amazon Echo (2nd gen.) each. For inclusion, families had to have not previously own this device and had to have at least one child above the age of 7. In total, there were 40 participants (ages 7-54). Semi-structured interviews (~30-60 minutes) were conducted in-person with each family at 3 timepoints (baseline, midpoint, final) and a post-study follow-up survey over 6 months. Families completed surveys about device usage and preferences. Interviews were transcribed and coded by the authors. Analysis was done using grounded theory (Charmaz, 2014).

This presentation focuses on the theme of how parents and children interact around Alexa. Codes included instances of parents and children agreeing, disagreeing, or correcting each other about Alexa or technological savviness. Three subthemes are: (a) sons positioning themselves in the family technological hierarchy, (b) parents' dismissal/appraisal of their children's thoughts, (c) children contributing to household decisions. Sons particularly positioned themselves as the "technology" person of the household or as second to dad. Some parents dismissed children's comments on technology or spoke on their behalf. Other parents valued children's comments, turning to them for input. Lastly, many children volunteered their opinion for household decisions, such as placement of or buying more Echo devices. Implications for family dynamics and technology use will be discussed. This research is important for understanding how family interaction and privacy are changed, improved, and challenged by the use of Alexa .

Mosquitoes and Frogs: Discovering the Factors Underlying this Unusual Relationship

Joanna Reinhold, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: mosquitoes, frogs, chemical ecology, behavior

Mosquitoes can feed on almost any animal, including other mosquitoes. While most research involves species that feed on humans, one species, Culex territans , specializes in feeding on ectotherms, primarily amphibians and reptiles. Although this species is fairly widespread in North America and Europe, surprisingly little is known about its biology and ecology. We know that Cx. territans can transmit trypanosomes to their amphibian hosts, and with the decline of amphibians worldwide due to global warming and disease, it is imperative to study any potential contributions to their decline. We therefore have begun to study the host-seeking abilities, feeding behavior, and the physiological adaptations Cx. territans has developed for feeding on cold blooded vertebrates. To better understand the cues Cx. territans uses to find its hosts, we performed olfactometer experiments and feeding assays coupled with thermographic imaging. We also used SPME scent collection coupled with GC/MS to analyze the scents of two species of frogs. Next, we plan on running electro-antennograms coupled with gas chromatography and antennal RNA analysis to understand the ways mosquitoes process the odorant cues emitted by the frogs. Using RNAseq, we will determine the genetic basis and some of the physiological adaptations developed by this mosquito to feed on ectotherms. Together, this data is helping us to build a more complete picture of the evolution of blood-feeding on vertebrate hosts in mosquitoes.

Digital Media and Screen Time in Parents Magazine: A Thematic Analysis

Jocelyn Hotter, Flash Talk Presentation (5 Minute), Program: Master's

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Keywords: digital media, thematic analysis, parents, framing, magazine

Over nine million parents turn to Parent magazine as a source of information about digital media and screen time use for their children. The current study is a thematic analysis of the representation of digital media and screen time in a year's worth of monthly issues of Parents magazine guided. Framing theory was used as the lense to examine magazines. Each magazine was analyzed for their articles' stance on digital media and screen time, the sources of information, the number of screens visible, the use of the term "screen time," and the indication of media articles in the table of contents. Themes of community and well-being emerged from articles with pro-media stances, while anti-media stances framed media to be harmful to physical and emotional well-being. Themes emerged from the images of screens shown in the magazines, as well as from the sources of the information. Future directions and implications of digital media use in parenting magazines are discussed.

Identifying Dynamic Regulators of Glutamate Transport in Glioblastoma Multiforme

Joelle Martin, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Glioblastoma, Glutamate, Hyaluronic Acid, EGFR

Glioblastoma Multiforme (GBM) is the most common and malignant form of adult brain cancer, with 95% of patients succumbing to their disease within 5 years of diagnosis. One factor contributing to this poor prognosis is upregulation of the protein transporter system xc- (SXC) found on GBM cells. Patients with tumors that express high levels of SXC have accelerated disease progression compared to patients with low SXC expression. SXC contributes to a worse prognosis by transporting toxic levels of the neurotransmitter glutamate out of the tumor cell, which kills neurons and creates room for the tumor to invade. Thus, molecules that regulate SXC expression and function have the potential to be exploited as novel therapeutic targets to combat GBM. We investigated two known promoters of GBM progression and invasion: the epidermal growth factor receptor (EGFR) and hyaluronic acid (HA). We hypothesized that EGFR and/or HA interact with SXC, promoting SXC expression and function. To address this hypothesis, we determined if altering EGFR protein expression impacts SXC protein levels. Knocking down EGFR through siRNA transfection resulted in a reduction of SXC protein in GBM cells, suggesting that EGFR plays a role in regulating SXC expression. Additionally, we found that GBM cells with high SXC expression produce more HA than cells with low SXC expression. To determine if HA influences SXC function (i.e., glutamate release), extracellular glutamate levels were analyzed after decreasing HA concentration. This inhibition of HA signaling resulted in a significant decrease in glutamate release. Taken together, these results suggest a dynamic relationship between SXC and two key signaling molecules, EGFR and HA. Further investigation of the mechanisms through which EGFR regulates SXC expression and HA modifies SXC function is warranted to identify novel target pathways for GBM treatment .

Understanding Customer Trust in Hotel-Chatbot Interaction

Jonilda Bahja, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: chatbots; conversational AI; anthropomorphism; trust; hotels

Introduction

Artificial intelligence (AI) is rapidly transforming customer experience, services,and business performance across sectors. Hospitality and tourism, being an information intensive industry and largely focused on services, offer great potential for the application of AI (Tussyadiah, & Park, 2018). In the hospitality and tourism, robots, chatbots and voice bots have been widely used, such as improving guest experiences in hotels, facilitate check-in process (The Guardian, 2017), and delivering products in hotel rooms (Tech Crunch, 2014). Particularly, chatbots are AI systems that use deep learning to automate the task of assisting users (Portela & Granell-Canut, 2017). Chatbots use text-to-speech or voice-to-speech (Dale, 2016) to interact with users and help businesses enhance customer experience.

In the previous studies, visual feedback improved efficiency and smoothness of interactions (Boyle et al., 1994) in a computer mediated interaction. According to Riek et al. (2009), placing graphical images with the social robot affects people's empathy towards the robot, highlighting that empathy is a key to social interactions with robots (Gockley et al., 2005). Further, the theory of anthropomorphism suggests that human-like features in designed in technologies increase the trust of users in that technology (Waytz, Heafner, & Epley, 2014). Thus, visual representation of the technology in the form of a picture (or anavatar) leads to more human-like similarity and is engaging to users. In the same manner, using an avatar profile picture in chatbot profile effects customer interaction with chatbot, thus, affects trust. Therefore, the purpose of this study is to understand how an avatar picture and greeting message affect the customer's trust in chatbots.

Methods

This study employs a 3 (male image vs. female image vs. chatbot logo) X 2 (greeting message vs. non) completely randomized experimental design. To conduct this experiment, a chatbot is created in Facebook chatfuel platform, one of the biggest platforms.

Linking Plastic Behavior at High Pressure to the Development of Commercial Products: From Laboratory Benchtop to Tennis Shoe

Joseph Sarver, Poster Presentation, Program: Doctoral

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Keywords: Sustainability, Instrumentation, Foaming

Polymers, colloquially referred to as plastics, are used as the materials to generate foams like the sole of a tennis shoe or the Styrofoam coffee cup on your desk. Currently, these materials are made using environmentally damaging and potentially health hazardous chemicals that are gradually being phased out by global regulators. Producing polymer foams, or foaming, using carbon dioxide is a more environmentally favorable process to generate porous or “foamed” materials. To manufacture these materials important to understand how the polymer behaves in a high pressure environment with gases such as carbon dioxide.

A High-Pressure Torsional Braid Analyzer (HP-TBA) has been developed that allows researchers to determine how polymer materials change in the presence of high-pressure fluids. HP-TBA consists of a polymer impregnated pendulum that is housed in a stainless-steel body. The pendulum is externally oscillated in the presence of high-pressure fluids or gases and the decay of the oscillation is measured to understand how the polymer softens with pressure and/or temperature. This technology will enhance researchers’ ability to determine the processing conditions (i.e. temperature, time, pressure) that will be suitable for processing polymers with compressed gases. This information will allow producers to switch their current processes to a more environmentally friendly methods employing carbon dioxide.

In this poster presentation, our recent results in the plastic foaming, or polymer foaming, area are framed in the context of how this unique research impacts society and the everyday consumer. Linking the outcomes of academic research performed in a laboratory setting to the development of commercial products is a challenging process. This poster aims to discuss how scientific observations in the lab are translated to the experiences of a consumer and the considerations that are added to the scientific process when factors like scale-up or cost are considered .

The Deadly Bacterium Brucella abortus is Recognized and Targeted with Inflammation by the Inflammasome of the Immune System

Juselyn Tupik, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Brucellosis, pattern recognition receptor, inflammasome, inflammation

Brucella abortus, a bacterium that causes the deadly disease brucellosis, is relatively understudied with regards to how it is recognized by the immune system. Brucellosis is transmissible from animals to humans, and once an individual is infected, the bacteria's ability to hide from the immune system makes it difficult to kill with antibiotics. Because brucellosis lacks a definitive cure with current treatments and kills millions worldwide, it is important to understand how the immune system responds to a B. abortus infection. In the immune system, pattern recognition receptors, such as NOD-like receptors (NLRs), play a key role by recognizing harmful pathogens. After recognition, some NLRs become building blocks with the protein ASC to form a structure called the inflammasome. Once formed, the inflammasome activates signaling proteins to promote inflammation and fight off infections, making the inflammasome a possible defender against B.abortus if it becomes activated. The activation of the inflammasome in response to B. abortus has not been fully characterized. Therefore, we used normal and genetically-modified mice that cannot form the inflammasome (due to the removal of ASC) to understand what signaling proteins are expressed in response to B. abortus infection. Because preventing inflammasome formation in the genetically-modified mice should reduce inflammation, we expected to see decreased inflammatory signaling proteins in the liver, spleen, and immune cells compared with normal mice. As expected, we saw decreased inflammatory signaling in the liver and immune cells of the genetically-modified mice. Additionally, these mice had higher mortality rates than normal mice. This may indicate that Brucella abortus is detected by NLRs of the inflammasome and that the inflammasome subsequently protects against this infection by inflammatory protein signaling. This work contributes to a greater understanding of B. abortus immune recognition and further contributes to our development of a novel vaccine for brucellosis .

Understanding the Viability of Infectious Viruses in the Environment and Its Effect on Disease Transmission

Kaisen Lin, Poster Presentation, Program: Doctoral

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Keywords: Disease transmission, Viability, Infectious viruses, Relative humidity, Chemical composition

Background: Infectious diseases are among the leading causes of death globally. Lower respiratory infections, such as influenza, cause millions of illnesses and over 10,000 deaths every year in the United State. The recent novel coronavirus outbreak globally is also a big health concern. Successful transmission of infectious disease requires infectious agents to remain viable during their transport from infected individuals to susceptible individuals. According to literatures, the chemical composition of particles that contain infectious viruses and the environmental conditions that surround the particles are the two most important factors that affect viruses' survival in the environment. Thus, understanding the effects of chemical composition and environmental factors is critical in control of infectious disease transmission.

Methods: In this study, we investigated the effects of chemical component, including salt, protein, and surfactant, on the viability of two viruses (MS2 and Phi-6) by manipulating the chemical composition of virus-containing particles. We also explored how low, intermediate, and high relative humidity (RH) affect viruses' viability.

Results: Chemical components had different effects on the survival of infectious viruses. Specifically, high sodium chloride concentration inactivated viruses, but also facilitated the formation of virus aggregation at certain conditions, which protected viruses. Surfactants had similar effects on viruses' viability. Proteins provided protective effect, which helped the survival of viruses in the environment. Results suggested that RH had great impacts on the viability of viruses. MS2 decayed most at intermediate RH, and remained its viability at low and high RHs. Phi-6, however, generally survived better at higher RHs.

Conclusion: Viruses are able to remain infectious in the environment for a relative long time, which will increase the risk of disease transmission. Both particles' chemical composition and the environmental conditions are important to the survival of infectious viruses in the environment .

Plights of Rural Public Sex Education: No Funding, No Formal Assessment

Kasey Richardson, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Community; Context; Education; Professional Development

Sex is ubiquitous, and discourse on sexualities is pervasive and prolific. Within this discourse, sexuality education in public schools in the US is a uniquely contentious issue stemming from decades of historical-political ideologies and, frequently, cultural taboos of what it means to be an adolescent embodying a sexual being (Drazenovich, 2015; Strasburger & Brown, 2014). Sexuality education typically covers sexual health, identities, acts and behaviors, reproductive biology, relationships, intimacy, and violence (Ismail, Shajahan, Sathyanarayana Rao, & Wiley, 2015; Naz, 2014). In this qualitative investigation, phenomenographic analysis of interviews (Tight, 2016) and thematic analysis (Braun & Clarke, 2006) were used to collect, organize, and interpret perceptions of school personnel and public health stakeholders on the efficacy of their sexuality education praxes and their school districts' family life curricula in two rural school divisions in the southeastern US (n = 29). Participants indicated that legislation and state standards are issued top-down without training or funding for stakeholders, severely restricting these stakeholders' capacity to educate and inform. Participants reported support for curricular reform and a strong desire for professional development. They also shared that the context of their instruction is heavily influenced by popular values, poor design, paucity of funding, and a lack of formal assessment aligned with state standards of instructions (Giroux, 2011). While comprehensive education could inform adolescents about responsible choices—e.g. disease and teen pregnancy prevention—per the participants, restricted information fosters ignorance among students and within the community. This causes ignorance to flourish, with (mis)information exchanged information informally among peers, on social media and the internet, etc. (Richardson, 2017). Recommendations are made for developing collaborative formative and summative tests that align with state standards while accounting for differing values. Results will be presented to participating schools and external entities that provide funding for teacher training and assessment development.

Very Low Doses of Endotoxins Induce Non-Resolving Chronic Inflammation in Immune Cells

Kisha Pradhan, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Macrophages, Bacterial endotoxins, chronic inflammation

Chronic inflammation and related diseases such as atherosclerosis are some of the major health risk factors highlighted in recent studies. An imbalance between “induction of immune responses” to kill pathogen, and “resolution of inflammation” to repair tissue damage post-inflammation plays a critical role in initiating and exacerbating chronic inflammation. Despite rigorous research, the underlying mechanisms that disrupt this balance and sustain inflammation are not clearly understood. Bacterial endotoxins induce inflammation in a dose dependent manner. Higher doses of bacterial endotoxins induce a robust but short-lived inflammation followed by resolution of the inflammation to maintain homeostasis. However, very low doses of bacterial endotoxins can induce mild but prolonged inflammation as they can permeate into the blood circulation of patients that have compromised mucosal barriers. Macrophages are dynamic innate immune cells that can either polarize into a pro-inflammatory phenotype when they recognize bacterial endotoxins or into an anti-inflammatory phenotype when they resolve inflammation post-infection. This switch in polarization is critical to maintain homeostasis and prevent chronic inflammation. Here, we characterize novel molecular mechanisms that may “skew” macrophages to a prolonged pro-inflammatory phenotype when exposed to very low doses of endotoxin, with diminished anti-inflammatory responses. Chronic exposure to very low doses of bacterial endotoxins induce expressions of immune-stimulating markers CD40 and CD11a in macrophages. This phenotype was further validated by activation of transcription factors that regulate the expressions of such markers. Furthermore, these immune-stimulated macrophages can interact with and influence the other immune cells’ inflammatory responses. Taken together, our study suggests novel approach to investigate mechanisms leading to prolonged inflammation in macrophages via very low doses of endotoxins.

Strategies of LGB Youth Disclosure to Parents

KP Puckett, Poster Presentation, Program: Doctoral

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Keywords: LGBT, sexual minority youth, family

The decision for youth to disclose their sexual orientation to family members can be challenging for sexual minority youth and their parents. The present qualitative study explores the relationship between sexual minority youth (n = 31) and their family members. Specifically, we examined the specific strategies utilized by lesbian, gay, and bisexual (LGB) youth disclosing their sexual identity to family members. Semi-structured interviews with youth were coded and categorized into themes and sub-themes through thematic analysis. Three preliminary main themes, comprised of various sub-themes emerged. Primary themes included: pre-disclosure strategies, specific disclosure strategies, and future disclosure strategies. Within pre-disclosure themes, sub-themes of sharing LGB-themed posts on social media, watching disclosure videos, and considering the familial order of disclosing (for example, disclosing first to siblings). Within specific disclosure strategies, participants reported direct disclosure (for example, while driving in a car), secondhand disclosure (for example, parents disclosing the youth's LGB identity to grandparents), indirect disclosure (for example, when a parent finds a letter from the youth's significant other), and disclosing multiple times over a long time period. In terms of future disclosure, participants reported situations where they would disclose to family members in the future, such as being in a long term same-sex relationship and if they need to correct family members about their partner's gender. Reasons for non-disclosure will also be briefly discussed (for example, parents telling youth that they should not disclose to grandparents). Implications for practice and program development will be explored.

Understanding the Harmful Effects of STING-Mediated Neuroinflammation in TBI

Lauren Bochicchio, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Neuroscience, inflammation, injury

Neuroinflammation stimulates immune cells in the brain to release inflammatory factors after injury or disease. While limited amounts of inflammation promote tissue repair, sustained inflammation can quickly spin out of control causing more damage. Traumatic brain injuries (TBI) cause inflammation in the brain that leads to exacerbated cell death; however, there are no treatments available to help prevent inflammation after injury. As a leading cause of death and disability in the United States, understanding the mechanisms of neuroinflammation in TBI is critical for developing therapeutics to improve patient quality of life. Recent studies have shown that human TBI patients have interferon proteins present in their brain. Interferons are normally produced in response to viral infection and prevent a virus from replicating by promoting inflammation. Their presence in the injured brain suggests they may contribute to neuroinflammation; however, why and how these proteins are being produced in the brain is unclear. I have shown that a protein called STING (STimulator of INterferon Genes) is activated in the brain in a preclinical mouse model of TBI. As its name implies, STING's primary function is to promote production of interferon proteins, but most studies focus on its function outside the brain. To assess the role of STING protein in neuroinflammation, we utilized mice with genetic removal of STING. After TBI, these animals showed significantly less brain tissue damage compared to wildtype control animals. Our data also demonstrates that STING is a key regulator for detrimental inflammation after injury. My research is among the first to show that not only is STING present in brain tissue, it can be activated after trauma and contributes to harmful processes that exacerbate the injury. This suggests that STING may be a novel therapeutic target to help reduce neuroinflammation after TBI, and STING inhibitors may improve patient outcome .

Maternal Residential Proximity to Central Appalachian Surface Mining and Adverse Birth Outcomes

Lauren Buttling, Poster Presentation, Program: Master's

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Keywords: rural health, public health, epidemiology, environmental health, birth outcomes, environmental epidemiology

Active surface mining in Central Appalachia has been associated with elevated particulate matter, diesel exhaust, and water pollution, all of which have been established to increase adverse birth outcomes. Previous studies on this topic rely upon relatively coarse, aggregated county level data. This research compares health metrics from hundreds of thousands of individual birth records and proximity of maternal home address to surface mines for a fine scale, epidemiological study.

Surface mining boundaries in Central Appalachia have been developed using Landsat satellite imagery. These boundaries determined changes in birth outcomes before, during, and post active surface mining. Births records supplied by VA, WV, KY, and TN health departments were geocoded and assigned the amount of surface mining within a 5km radius of residence. Births were also assigned exposures based on the amount of surface mining within their residential zip code and county. Mining exposures were categorized into quantiles of high, moderate, and low amounts or no exposure. Regression models were built to determine the association between surface mining activities during gestation and birth weight, preterm birth (PTB), low birth weight (LBW), and term low birth weight (TLBW), adjusting for demographic factors.

Preliminary models indicate that prenatal exposure to high amounts of post mining operations within 5km of residence significantly decreased birth weight by 26 g (95% CI:15 g,38 g). Zip code and county level analyses were consistent with street level results. Results suggest surface mining does not strongly impact a child’s odds of being PTB, LBW, or TLBW at any spatial scale. For example, in the zip code level analysis odds of PTB were 1.01(95% CI: 1.01, 1.02) in high post mining areas.

While there is a relationship between Central Appalachian surface mining and birth weight, proximity does not appear to directly cause negative clinical presentations.

Toward a Better Understanding of the Effects of Vitamin A on Lupus Disease

Leila Abdelhamid, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Lupus disease, Vitamin A, Kidney,Joints, inflammation, Healthcare

Lupus is a chronic inflammatory disease with no known cure. The patient population is heterogeneous and the disease symptoms are variable as lupus can affect multiple organs of the body. Kidney damage affects nearly 60% of lupus patients and is a common cause of their death if left without treatment. Lupus-associated arthritis (joint inflammation), on the other hand, causes chronic pains in the joints and affects up to 95% of lupus patients. Current treatments against lupus include long-term use of medications that dampen the immune system, making the patients vulnerable to infections. In addition, the estimated annual medical costs of $13,000 per patient and reduced capability to work full-time greatly impact the life quality of lupus patients. There is an imperative need for new and cheaper treatment options. Recently, a derivative of vitamin A called all-trans-retinoic acid (tRA) has been used in combination with existing medications to control lupus. However, the safety of this approach was not investigated. Using a lupus mouse model, we found that tRA exerts tissue-specific effects when given at different stages of the disease. Pre-disease tRA supplementation aggravated lupus-associated kidney inflammation. This is through increasing signals associated with kidney fibrosis and priming immune cell activation, their migration, and infiltration into the inflammatory sites. In contrast, tRA treatment during active disease decreased inflammation with a reduced level of antibodies targeting self-antigens and decreased expression of pro-inflammatory molecules in the kidney. However, while it may dampen kidney inflammation, tRA treatment during active disease worsened inflammation of the joints through promoting the infiltration of immune cells into the joints. Collectively, our findings suggest that tRA differentially modulates lupus-associated kidney and joint inflammation depending on the time of administration, and indicate the need for personalized healthcare plans tailored towards the specific symptoms of lupus patients.

Multisensory Integration in Social and Nonsocial Events and Emerging Language in Toddlers

Madeline Bruce, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: multisensory integration, language, toddlerhood, parenting

Multisensory integration enables young children to combine information across their senses to create rich, coordinated perceptual experiences. Events with high intersensory redundancy (e.g., simultaneous, overlapping information arising from tempo or intensity) across the senses provide salient experiences which aid in the integration process and facilitate perceptual learning. Thus, this study's first aim was to evaluate if toddlers' multisensory integration abilities generalize across social/nonsocial conditions, and if multisensory integration abilities predict 24-month-old's' language development. Additionally, previous research has yet to examine contextual factors, such as parenting behaviors, that may influence the development of multisensory integration skills. As such, this study's second aim was to evaluate whether maternal sensitivity moderates the proposed relationship between multisensory integration and language outcomes. Results indicated that toddlers' multisensory integration abilities, $F(1,33) = 4.191$, $p = .049$, but not their general attention control skills, differed as a function of condition (social or nonsocial), and that social multisensory integration significantly predicted toddlers' expressive vocabularies at 24-months old, $\beta = .530$, $p = .007$. No evidence was found to suggest that maternal sensitivity moderated the detected relationship between social multisensory integration abilities and language outcomes; rather, mothers' maternal sensitivity scores directly predicted toddlers' expressive language outcomes, $\beta = .320$, $p = .044$. These findings suggest that at 24-months of age, both sensitive maternal parenting behavior and the ability to integrate social multisensory information are important to the development of early expressive language outcomes.

Destination Mitochondria: The Roadmap to Understanding NLRX1 as a Tumor Suppressor

Margaret Nagai-Singer, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Cancer, Immuno-oncology, Immunology

Breast and pancreatic cancer are deadly diseases, collectively accounting for nearly 90,000 deaths in the United States in 2019 alone. Hence, there is an unquestionable need to discover new tools to fight these diseases. The immune system is the body's defense against infectious diseases, but its critical role in cancer is becoming increasingly evident. NLRX1 is an immune system protein most well-known for suppressing inflammation, and whose potential anti-cancer properties make it a budding candidate for a new cancer-fighting tool. However, there is much disagreement regarding NLRX1's location and subsequent function in cancer cells. The goal of this research is to elucidate the location and function of NLRX1 in breast and pancreatic cancer cells, and we propose an innovative hypothesis that explains previous disputing data. We hypothesize that NLRX1 shuttles between the cytosol and the different layers of the mitochondria, allowing NLRX1 to affect multiple pathways important to cancer biology and act as a tumor suppressor. We identified a site in the NLRX1 sequence for processing by Mitochondrial Processing Peptidase, an enzyme that directs proteins to the mitochondria, indicating that transport into the mitochondria is possible. This was supported by our microscope images that visualized NLRX1 moving to the mitochondria following stimulation with a pro-inflammatory molecule, tumor necrosis factor, in both pancreatic and breast cancer cells. Furthermore, in vivo cancer models show NLRX1 expression in mice is protective against breast cancer spreading to the lungs, but this protective effect was not observed in pancreatic cancer. As mitochondrial function is important to regulating the spread of cancer throughout the body, NLRX1 likely affects the spread of cancer by moving to and interacting with the mitochondria. Determining the location and movement of NLRX1 throughout the cell is essential to harnessing the anti-cancer abilities of this protein for future cancer therapies.

Going Beyond "No Search Results"

Martina Syvantek, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: research methods, reproducible, accessibility

One of the barriers to investigating Disability within higher education is that institutional discussion of Disability is often non-existent, even within larger discussions of diversity and inclusion. What is a researcher to do when they are trying to pay attention to multiple sites without creating an undue burden on themselves or others?

This project outlines an alternative approach; instead of conducting surveys or interviews with individuals, the institutions themselves are the source of information. Using methods that center accessibility, affordability, and feasibility, an intensive document collection process was undertaken at three separate institution of higher education to elucidate barriers in performing research across time and space, focusing on the concept of research methods and results that would be truly "open access" in a manner that goes beyond financial consideration.

I myself am persistently aware of the privilege of performing this research, as research around Disability is so frequently performed “on” or “for” as opposed to “by” or “with”. The methods discussed in this paper utilize the motto of Disability activism, “Nothing about us, without us” as a guiding principle, leading to strategic methodological choices that will enhance the reproducibility of both the methods and the research findings.

University Policies and the Concept of "Open Access" - Document Collection and Critique

Martina Syvantek, Poster Presentation, Program: Doctoral

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Keywords: archival practices, open access, accessibility, higher ed

One of the barriers to investigating Disability within higher education is that institutional discussion of Disability is often non-existent, even within larger discussions of diversity and inclusion. This is also true within institutional policy documents, in terms of their development, organization, and maintenance.

Using methods that center accessibility, affordability, and feasibility, an intensive document collection process was undertaken at three separate institution of higher education. The poster will present the results of this search - the findings at those institutions across a time frame of 25 years following the passage of the Americans with Disabilities Act. Highlights include the definition of a"digital wall" as well as the accessibility of the resulting document collection.

Advantages of Lopsided Sensing: Tympanal Asymmetry in O. ochracea

Max Mikel-Stites, Poster Presentation, Program: Master's

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Keywords: asymmetry, acoustic, sensing, parasitoid, model

Ormia ochracea is a parasitoid fly, well-known by biologists for its outsized ability to consistently and accurately locate the origin of specific types of sounds. Amazingly, female O. ochracea are capable of pinpointing their hosts of choice in which to deposit its larvae (male Gryllidae crickets), just by listening to them chirp. The limitations imposed by the physics of sound propagation and the fly's small size should prevent this entirely, but instead, they locate crickets an azimuthal precision of 2◦, a level of precision equal to that of human hearing (Mason et al., Nature, 2001). This ability is a direct result of the mechanical structure employed by O. ochracea, which connects the fly's acoustic sensing structures, a pair of tympanal membranes (Miles et al., J Acoust Soc Am, 1995). This results in O. ochracea being able to resolve nanosecond time differences in incoming sound waves, as demonstrated by Miles et al. The mechanical coupling enables this by increasing the difference in response between the two membranes, called the interaural time delay or ITD.The structure itself can be approximated by a simple symmetric mechanical model, represented by a pair of coupled ordinary differential equations. Here we examine the impact of altering the existing mathematical model, provided by Miles et al., by introducing an asymmetry surface area between the two membranes. With this modification in place, we demonstrate that an asymmetry of less than 10% between the left and right tympanal areas can increase the ITD by more than a factor of 22. In addition, 38 O. ochracea tympanal membranes were measured, and it was found that there was an average asymmetry in the tympanal area of approximately 5.61% present in the sample population.

Rubber Wear and Friction

Mehran Shams Kondori, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: (none provided)

Rubber is a material that has been used in many objects such as shoe heels and soles, wiper blades, and tires. For some of these applications, the friction and wear of the rubber are important parameters. For example, for tire application, the amount of wear rate of the tire will define the tire durability and the friction of the tread part of the tire, which is made of rubber as the base material, is the main factor in tire traction. In addition, the rubber particles that are producing due to the wear mechanism will mix with the air or water around the roads and cause environmental and health problems. Having said that, studying on the rubber characteristics to find the important parameters to reduce the wear rate of the rubber is a matter of interest.

In this study, the friction and wear rate of different rubber samples has been investigated using three approaches: Analytical modeling, numerical modeling, and experimental approach. To validate the developed models and also to study the wear rate experimentally, a Linear Friction Tester machine has been designed and manufactured. The designed system has several advantages over those available in the market such as having higher speed as well as higher accuracy. The developed models have been used to predict the wear rate and friction of the rubber samples with different material and physical properties .

Investigating Changes in Population Size of Virginia Bog Turtles (Glyptemys muhlenbergii)

Michael Holden, Research Oral Presentation (15 Minute), Program: Master's

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Keywords: Ecology, Population Assessment, Endangered Species, Conservation, Wildlife

Bog turtles (Glyptemys muhlenbergii) are a federally threatened species that occur in a disjunct range (northern and southern populations). Declines have been documented across their range, with many populations in the north being extirpated or severely reduced in comparison to historic distributions. In Virginia, bog turtles are listed as State Endangered, but prior to this past summer, population sizes had not been estimated in over two decades which limits managers' ability to infer their population status. In 1997, the Virginia Department of Game and Inland Fisheries and Virginia Tech conducted an intensive mark-recapture survey at six sites of known occupancy. During the spring of 2019, we resurveyed the same sites using the same methodology (survey effort, surveyors, and survey technique) to obtain current population estimates. Both the number of capture events and the number of unique individuals captured were lower in 2019 than 1997, suggesting that the populations in question have, for the most part, declined. The data collected (and supporting information on habitat changes and from less intensive surveys in the past 10 years) indicate populations at two of six sites are extirpated, two of six sites have experienced declines, and two sites may still be stable. However, it is possible that changes in phenology and detection probabilities influenced capture rates, which we plan to investigate via surveys in 2020. We will discuss the implications of these results for bog turtles in the southern portion of their range as

Investigation on Cavitating Flows at Different Temperatures with High-Speed Video and PIV Methods

Mingming Ge, Poster Presentation, Program: Doctoral

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Keywords: cavitation, high-speed video, PIV, thermal effect

Cavitation is a phenomenon in which rapid changes of pressure in a liquid lead to the formation of small vapor-filled cavities or bubbles. The physical process of cavitation can be compared with boiling in which the evaporation occurs when the liquid temperature reaches the saturation temperature (e.g. 100°C at 1 atmospheric pressure). While cavitating vapor appears even at room temperature when the local pressure falls far below the saturated vapor pressure (e.g. 0.023 atm for 20°C). Cavitation is a significant cause of the erosion damage of aircraft propellers, and system vibrations of high-speed marine vessels. However, by controlling the cavitating flow, the power can be harnessed and rendered non-destructive. For example, the induced shock wave may enhance chemical reactions in medicine processing or eliminate bacteria in the water treatment industry. In this experiment, the hydrodynamic cavitation was developed in a 3D-printed venturi-type flow channel. A higher flow velocity was generated at the throat for a given pressure drop across it. To investigate the effects of temperature, a heating and cooling functioned loop was installed to adjust the water temperature. A high-speed visualization system was used to record cavitating flow structures, and a PIV (particle image velocimetry) system was used to measure the velocity field. The fluid is seeded with tracer particles which are sufficiently small that are assumed to faithfully follow the flow dynamics. The fluid with entrained particles is illuminated so that particles, which represent the motion of the flow, are visible. The image processing results show that the methods provided here can obtain a clear observation of the cavitation development quantitatively. This novel approach is proved to be eligible for further applications, such as to improve the underwater gestures for Olympic swimmers, or to investigate planetary motions through star trails .

Developing a Neural–Kalman Filtering Approach for Estimating Traffic Stream Density Using Connected Vehicle Data

Mohommad Aljamal, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Connected Vehicles, Traffic Estimation, Traffic Signal Performance, Kalman Filter

This research presents a novel model for estimating the number of vehicles along signalized Links using data from the new connected vehicle technology. Connected vehicle is defined as the vehicle that can provide and share its location and speed data. The estimation is important to achieving better traffic operations management in urban areas, as the estimations can be provided to traffic signal controllers to optimally determine the allocation of green time for each traffic signal phase (each movement). Moreover, this can improve intersection performance by reducing traffic delays, vehicle crashes and environmental impacts. The proposed estimation model utilizes the adaptive Kalman filter (AKF) to produce reliable traffic vehicle count estimates, considering real-time estimates of the system noise characteristics. The AKF utilizes only real-time connected vehicle data. The AKF is demonstrated to outperform the traditional Kalman filter, reducing the estimation error by up to 29%. In addition, the research introduces a novel approach that combines the AKF with a neural network (AKFNN) to enhance the vehicle count estimates, where the neural network is employed to estimate the connected vehicles' market penetration rate. The market penetration rate is defined as the number of connected vehicles to the total number of vehicles (connected and traditional). Results indicate that the accuracy of vehicle count estimates is significantly improved using the AKFNN approach (by up to 26%) over the AKF. In conclusion, the proposed AKF is more accurate than the traditional Kalman filter. Finally, the AKFNN approach is more accurate than the AKF and the traditional Kalman filter since the AKFNN uses more accurate values of the connected vehicle market penetration rate.

Simultaneous Energy Harvesting and Vibration Control in a Nonlinear Metastructure: A Spectro-Spatial Analysis

Mohammad Bukhari, Poster Presentation, Program: Doctoral

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Keywords: Nonlinear Metamaterial, Energy Harvesting, Spectro-Spatial Analysis, Acoustics Diode, Solitary waves

Considerable attention has recently been given to the study of simultaneous energy harvesting and vibration attenuation in metastructures. However, only linear metastructures were investigated although nonlinear metastructures and nonlinear electromechanical devices offer superior interesting wave propagation phenomena (e.g., birth of solitary waves, tunable bandgap, acoustic nonreciprocity) and broadband energy harvesting. In this work, we investigate the wave propagation in a weakly nonlinear metastructure with electromechanical resonators. Explicit expressions are derived for the nonlinear dispersion relations using the method of multiple scales. These expressions are validated via direct numerical integration. We carried out parametric studies to investigate the role of different parameters of the electromechanical resonators on the linear and nonlinear band structure. To obtain further detailed information on the nonlinear wave propagation, we employ spectro-spatial analyses on the numerical simulations. This spectro-spatial analysis can reveal the output voltage distortion due to different types of nonlinearities. The results indicate that nonlinear chain can enhance energy harvesting through the birth of solitary wave and without degrading the boundary of the bandgap. The results also suggest that such a system is suitable for designing electromechanical diodes and rectifiers .

Sampling Varroa destructor and Screening for Acaricide Resistance

Morgan Roth, Poster Presentation, Program: Doctoral

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Keywords: Varroa destructor, Apis mellifera, Acaricide Resistance

European honey bee (Apis mellifera L.) health has been a matter of increasing concern over the past 50 years, as Varroa mites (Varroa destructor) now pose a serious, near-global, apiculture threat. From colony weakening through feeding, to virus transmission, V. destructor infestations can lead to heavy colony losses, and they are thought to be key contributors in Colony Collapse Disorder (CCD). In the past, V. destructor infestations were generally treated with synthetic acaricides, the most popular being: amitraz, coumaphos, and tau-fluvalinate. However, repeated use has led to observations of widespread acaricide resistance. The goal of this study was to examine V. destructor resistance to amitraz, coumaphos, and tau-fluvalinate by testing apiaries located in three geographic regions of Virginia. Mite infestation levels were monitored throughout the 2018 field season through the powdered sugar shake method, which revealed increasing mite populations in almost all apiaries. By the end of the sampling season, all apiaries had mite populations exceeding the seasonal economic threshold. Resistance screening through glass surface contact bioassays was carried out using mites collected through monitoring, and results indicated that resistance to amitraz, coumaphos, and tau-fluvalinate was not present. Additionally, general esterase activity and cytochrome P450 monooxygenase activity bioassays were performed. The activity of these enzymes did not significantly differ by region, which corroborates the results obtained from the resistance screening bioassays. The information from this study has important implications for Virginia apiculturists, as use of these acaricides, within an Integrated Pest Management (IPM) approach, may successfully combat these destructive ectoparasites.

Women in STEM: The Role of Role Models

Muchin Bazan, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Field Experiment, Role Models, Economics of Education

The gender enrollment gap in STEM continues to be a concern for policy makers around the World given the high returns of STEM majors in term of wages. This paper addresses an important yet understudied factor responsible for gender gaps in STEM participation: Female role models. There exist barriers for the exposure to female role models, some of them are gender imbalances, limited networks, and time constraints, because of these factors it is difficult for senior high school women to come into direct contact with women who have majored or are in the process of majoring in male dominated fields such as engineering. We believe that a face to face speech given by female engineering students or recent graduates in the field is an effective and low-cost intervention that influences young women's college career choices.

Existing research has focused on several different factors responsible for the low enrollment of women in STEM such as differences in mathematical aptitude (Emerson et al. 2012), the gender of teachers (Bottia et al. 2015), the role of peers (Park et al. 2017), and the importance of external validation (Agurto et al. 2019), and few studies investigate the effect of female role models in the context of majoring choices at higher education.

Contrary to previous role model studies, we run a field experiment using a face to face communication (20-minute presentation) between women in engineering and high school students. The intervention takes place in 51 randomly selected high schools located in Northern Peru while another 58 schools do not receive the role model visits.
Our results show that math skilled female students exposed to the role models were more likely to choose engineering fields. Therefore, our intervention is an effective policy to reduce the gender enrollment gap in STEM .

Can Panopticon Prevent a Pandemic? The Impact of Surveillance and Monitoring of Citizens on the Containment of COVID-19

Nicholas Brown, Flash Talk Presentation (5 Minute), Program: Doctoral

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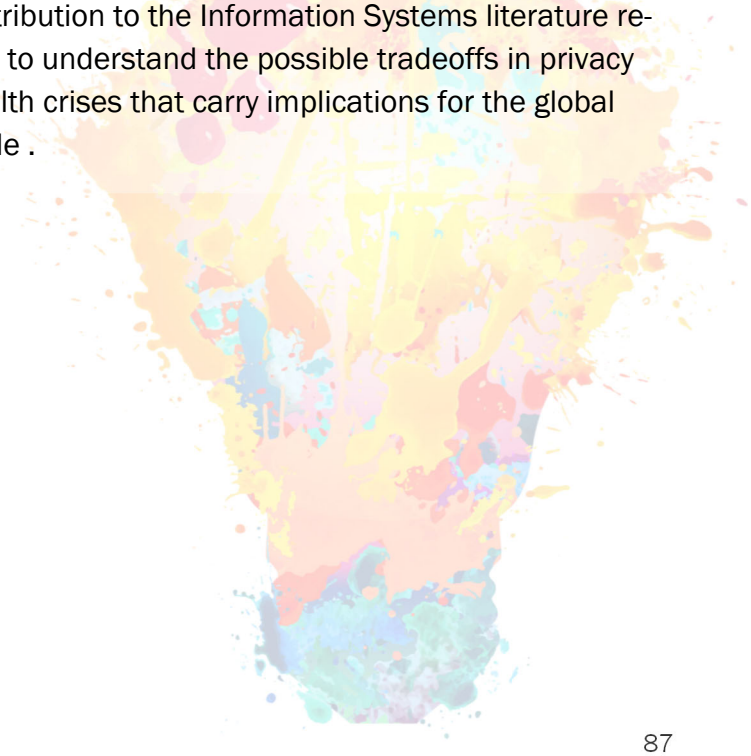
Keywords: China, COVID-19, coronavirus, surveillance, technology

Coronavirus 2019 (COVID-19) is a communicable virus that affects the respiratory system and spreads through person-to-person contact, with the first documented outbreak originating in Wuhan, China. Since the initial outbreak, the coronavirus has spread to 56 countries (and counting), impacting supply chains, clinical workflow processes, drug and testing kit distribution, travel, conferences, events, and more. However, every nation has different laws regarding public policies and their citizens' privacy and human rights, thus countries can employ different containment strategies to prevent the spread of the virus. To contain and mitigate the spread of COVID-19, China enacted mandatory village and city quarantines--monitoring the activities of citizens, their whereabouts, and their interactions using hi-tech tools such as drones, facial recognition, and geolocation--inciting privacy and human rights advocates to question the usage of hi-tech surveillance practices to enforce containment. My research involves a study into the different types of interventions used by various countries to contain the spread of the coronavirus and to understand the effectiveness of the strategies employed, documented through the number of new COVID-19 cases. Thereafter, I will conduct an econometrics analysis to determine any causal impact on the containment of the coronavirus through the use of surveillance and monitoring of citizens to ensure their compliance with mandatory lockdowns, operationalized through the use of a specific hi-tech tool such as QR codes or drones. My hope is to make a contribution to the Information Systems literature regarding the use of technology for surveillance purposes to understand the possible tradeoffs in privacy and human rights allowances in the midst of public health crises that carry implications for the global economy and the population health of citizens worldwide .



Mosquito Visual Avoidance Behavior Under Different Behavioral Contexts

Nicole Wynne, Research Oral Presentation (15 Minute), Program: Master's

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Keywords: vision, mosquito, behavior, neuroethology, escape

Mosquitoes are the deadliest animals in the world because of the several diseases they can transmit. Females are the only ones that bite, since they require a blood meal in order to produce offspring. The task of obtaining this blood meal from a mobile, and defensive host can be extremely dangerous. The females must find a host, approach it, land, feed, and flee without being killed so they can reproduce. At any point, the host might detect the mosquito and try to kill it, typically by swatting at it. For this reason, mosquitoes have evolved the ability to navigate in close proximity to the host, while assessing their level of defensiveness and avoiding these threats. Insects, in general, are well known to display escape behaviors in response to visual, predator-like, looming stimuli. However, in spite of great epidemiological relevance, very little is known about the mechanisms that allow mosquitoes to evade their predators, including swatting from their hosts. Mosquitoes use visual, olfactory, and thermal cues to track their hosts but what kinds of sensory cues are being used to avoid threats? As a first step towards bridging this knowledge gap, we analyzed the behavioral responses of the Yellow Fever mosquito, Aedes aegypti, to looming visual stimuli. For this, we used a virtual-reality environment designed for mosquitoes, where we displayed looming squares to mosquitoes in a variety of conditions (for example: landed, in flight). Results from these experiments allowed us to characterize the escape responses of mosquitoes, by determining the angles and distances to the stimuli that are most likely to trigger an avoidance response. Ultimately, better understanding mosquito vision in the context of their escape behavior, can help us improve the design of control tools, such as traps, to increase their efficiency.

Strain-Level Identification of Tomato Pathogens from Metagenomic Sequences Obtained with the ONT MinION

Parul Sharma, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Metagenomics, Plant Pathogens

Early detection and correct diagnosis of plant diseases is an essential component of sustainable production of food and other plant-derived products. Although molecular technologies are available, many of them are either slow because they depend on culturing the pathogen first, are limited to specific pathogen species and thus cannot detect any newly emerging diseases, or have low resolution. With recent advances in sequencing technologies, it has become possible to sequence the DNA of an entire plant sample, called the metagenome, at relatively low cost and with relatively easy and fast protocols using the Oxford Nanopore Technologies (ONT) MinIONTM device. MinIONTM software What's in my pot (WIMP) offers read-based taxonomic identification from the metagenome. In this study, we have used the MinIONTM device to sequence laboratory-inoculated tomato plants and field samples of infected tomato plants to establish the efficiency of WIMP in identifying the underlying plant pathogens. The taxonomic classifications, at the species-level, from WIMP were compared with the results from the third party Sourmash and MetaMaps tools. Since species-level identification is not always sufficient, for example, when tracking pathogen dissemination pathways, custom reference libraries were used to attempt strain-level classification with Sourmash and MetaMaps as well as identification with the LINbase Web service based on metagenome-assembled genomes (MAGs). Our study showed that reliable species-level identification is possible with either WIMP, Sourmash, or MetaMaps. There is the potential for strain-level accuracy, however improvements in the error rate of the MinIONTM and availability of appropriate reference databases is necessary.

You are Worthy of My Grace: Queer Erasure in Neon Genesis Evangelion

Rachel Hargrave, Research Oral Presentation (15 Minute), Program: Master's

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Keywords: queer theory, queer erasure, anime

This presentation will focus on the cultural ramifications of a queer-coded character being straight-coded after 20 years of interpretation as queer. Neon Genesis Evangelion was credited as a cultural icon which led to a rebirth of the anime industry when it premiered in the 90's. The original English translations added overt queerness to the interactions between protagonist Shinji Ikari and another boy, Kowaru. In a bathhouse, Kowaru tells Shinji, "It means I love you" in the original English translation. Later, Shinji tells another character, "Kowaru said he loved me...it was the first time someone told me they loved me". In January 2019, Netflix bought the distribution rights and retranslated the script, erasing the queer subtext between Shinji and Kowaru. The lines became, "It means I like you" and later, "That's the first time anybody's ever said they liked me. Ever". While there is debate regarding which translation sheers more true to the original Japanese, the cultural impact of recoding Shinji as straight when audiences embraced him as queer representation for decades is damaging and erases queer representation in media. Additionally, this is the first widely available version of NGE in America since the 90's, making the new translation the most accessible to new viewers, preventing American audiences from experiencing the original queer context. By analyzing the differences in the lines themselves but also the framing of the scenes and the cultural impact of NGE, we will explore the original queer context compared to the erasure this new translation brings to American audiences 20 years after NGE's original release. I will illustrate the ways in which the erasure of the queer themes suppresses traditional Japanese anime and manga tropes, erasing both queer representation in media as well as preventing American audiences from further understanding traditional Japanese media tropes and culture .

Irreversible Electroporation Increases Antitumor Immunity and Therapy Options in Pancreatic Cancer

Rebecca Brock, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: cancer, IRE, immunology, biomedicine

Pancreatic cancer's late diagnosis, rapid disease progression, and lack of treatment options have led to a survival rate of only 9%. Surgery is one of the only curative treatments available, but most patients are not eligible due to the tumor localization near or around sensitive vital structures such as major arteries. Irreversible electroporation (IRE) is a novel treatment for pancreatic cancer that spares vital structures yet can destroy cancerous tissue and has had astounding success in clinical trials. Unfortunately, many patients still suffer from disease recurrence. In order to increase patient survival, more must be understood about the biological and immunological effects of IRE on pancreatic cancer to determine potential co-therapy targets and options. We hypothesize that IRE can induce inflammatory cell death that recruits anti-tumor immune cells to the treatment site and produce cancer markers that the immune system can use to reduce disease burden and prevent recurrence. We utilized both cell and mouse models of pancreatic cancer to investigate changes in immune signaling and marker presentation strength. Our studies show significant increases in specific anti-tumor immune cell populations, a reduction in cancer-supportive cells, and high production and presentation of cancer markers that the immune system can use to identify disease. However, the increase in inflammation also increases the expression of anti-immunity markers on the cancer that could reduce later immune cell recruitment and allow recurrence. Our work identifies co-therapy targets for IRE in immunotherapeutics, previously ineffective on pancreatic cancer, that could increase patient survival .

Sensory Evaluation Supports Selection of Edamame Varieties for U.S. Production

Renata Carneiro, Flash Talk Presentation (5 Minute), Program: Doctoral

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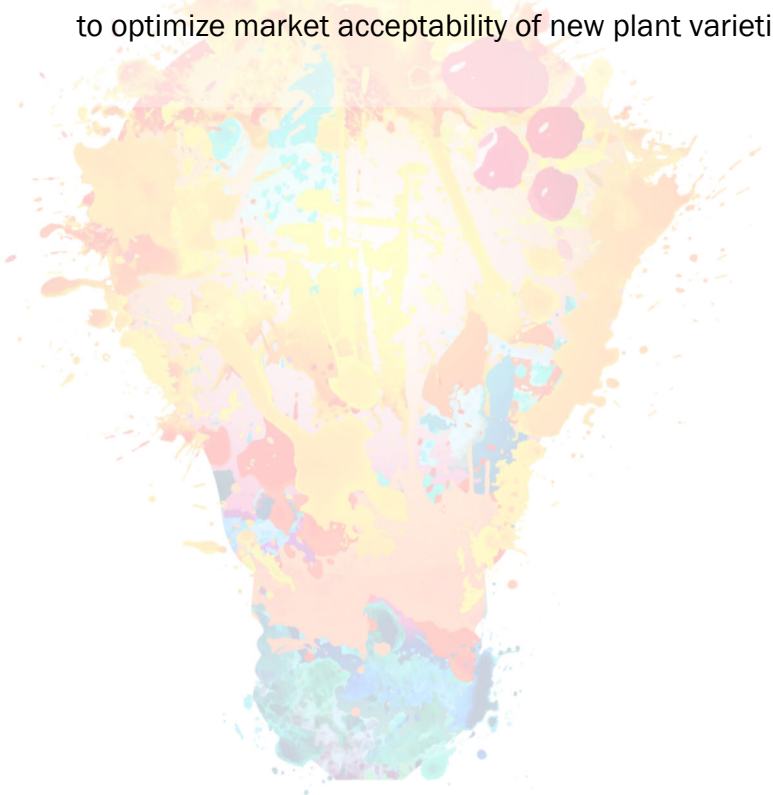
Keywords: Edamame, vegetable soybean, plant breeding, sensory

The consumption of edamame (vegetable soybeans) has increased significantly in the U.S. over the last years, but most edamame is imported from Asian countries. Due to increasing market demand, edamame has been promoted as an alternative crop to replace tobacco in Virginia. A multistate plant-breeding program led by Virginia Tech researchers has focused on developing varieties that grow well in our region. However, it is important that these improved varieties meet consumers' needs and expectations. In our study, we used sensory evaluation to identify edamame genotypes preferred by consumers. Twenty edamame varieties were grown in three different locations. Participants in sensory panels used a 9-point preference (hedonic) scale (1 = "dislike extremely"; 9 = "like extremely") to evaluate sensory attributes (overall-liking, taste and texture). Next, they used a 'check-all-that-apply' (CATA) list of selected sensory terms to describe the sensory profile of each sample. Statistical analyses were performed using R, RStudio, and JMP Pro®14.0.0. Overall-liking, taste, and texture scores were significantly different among varieties ($p<0.05$). Samples described as "bitter" or "starchy" were associated with lower acceptability scores while "salty" and "sweet" were correlated with higher acceptability. Sensory data were used to select the best varieties for further field trials. These studies support selection of varieties that will be released by 2021 for domestic production. Sensory evaluation is a powerful tool to help direct breeders to optimize market acceptability of new plant varieties.



Check-If-Apply: A Sensory Approach to Improve Communication Between Consumers and The Drinking Water Industry

Renata Carneiro, Poster Presentation, Program: Doctoral

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Keywords: Drinking water, taste and odor, quality control, consumer study, sensory

Consumers offer important feedback to support the drinking water (DW) industry identifying quality issues linked to the presence of undesirable taste and odor (T&O) compounds. For 21 common chemicals associated with undesirable off-flavors in DW, knowledge about their T&O sensory terms can help in their identification. The objectives of this study were to develop comprehensive sensory descriptors associated with each of the 21 chemicals, then reduce the comprehensive sensory descriptors to a shorter list that could facilitate communication between consumers and the DW industry. The shorter list is in the form of a Check-If-Apply (CIA) method adapted from the Check-All-That-Apply (CATA) approach used by food sensory scientists. The 21 chemicals yielded a list of 72 descriptors; after review, like terms were combined (e.g., earthy-musty-moldy), and all terms were cross-referenced with the Drinking Water Taste and Odor Wheel. Our final CIA list contained 28 groups of terms (40 individual words) and was tested by 75 non-trained subjects. DW samples of bottled and tap water, with and without notable T&O attributes, were tested at the Virginia Tech Sensory Evaluation Lab (Blacksburg, VA, USA). Participants rated sample acceptability using a traditional 9-point hedonic scale (1 = "dislike extremely"; 9 = "like extremely"), then described using our CIA list. Data were collected using Compusense Cloud and analyzed in R, RStudio, and JMP® Pro ($\alpha = 0.05$). Highest acceptability scores were attributed to DW with no noticeable T&O issue (overall-liking = 6.23±1.47) and lowest acceptability to a sensory-tainted DW (overall-liking = 3.43±1.74). There were significant differences between sensory profiles (p-value < 0.05): "salty" with NaCl, and "earthy/dirt" with MIB. Consumers checked 2.54±1.40 descriptors per sample, on average. CIA list was considered an easy tool to describe DW samples (mean = 3.44±1.07) and is suggested as a friendly method to receive feedback from non-trained consumers .

Mechanisms of Neutrophil Exhaustion Relevant to Sepsis

Rui-Chi Lin, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Sepsis; Neutrophil exhaustion; TICAM2; Innate immune memory

Sepsis, a systemic inflammatory reaction to severe infection/injury leading to multi-organ failure, accounts for 5.3 million deaths reported annually across the globe. The long-reaching effects of sepsis, which drive the sepsis-related death shifting from biphasic to triphasic distribution, have become an important and emerging topic in the field of immunity and sepsis. The long-term sepsis morbidity and mortality suggest the presence of altered innate immune memory as neutrophils, the dominant innate immune cells that are essential for microbial eradication, collected from septic patients possess exhausted and dysfunctional characteristics, which persist long after sepsis symptoms have alleviated. In the present study, we reproduce phenotypic and functional features of sepsis-related exhausted neutrophils, depicted by upregulated PD-L1, ICAM1, CD29 and iNOS, downregulated CD62L as well as CXCR2, and impaired swarming ability, in murine neutrophils by the prolonged lipopolysaccharide (LPS) challenge in vitro. We also demonstrate that TICAM2, an adaptor in TLR4 downstream signaling to initiate the MyD88-independent pathway, partially governs the LPS-induced neutrophil exhaustion. TICAM2 knock-out mice with dextran sodium sulfate (DSS)-induced acute sepsis have the mitigated weight-loss, alleviated symptoms, higher survival, and less expression of exhaustion-associated markers on neutrophils as compared to WT mice, resonating with our in vitro findings that neutrophil exhaustion is in a TICAM2-dependent manner and supporting that exhausted neutrophil has been implicated in the post-sepsis mortality.

To Join or not to Join: Coalition Formation in Public Good Games

Sakshi Upadhyay, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Coalition, Social prefernce

Commitment devices such as coalitions can increase outcome efficiency in public goods provision. This paper studies the role of social preference in a two stage public good game where, in the first stage, heterogeneous agents first choose whether or not to join a coalition then, in the next stage, the coalition votes on whether its members will contribute. We find that individuals with stronger social preferences are more likely to join the coalition and vote for the coalition to contribute to the public good. We further show that higher marginal benefits of contribution leads to more people joining the coalition and contributing to the public good. These results hold whether the coalition's decision is determined by a majority voting or a unanimous voting rule. The results are also robust to different model specifications .

Assessing Susceptibility to Usutu Virus in Avian Models

Sarah Kuchinsky, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: zoonotic disease, avian, host susceptibility

Usutu virus (USUV; Flavivirus), a close phylogenetic and ecological relative of West Nile virus (WNV), is a zoonotic virus that can cause neuroinvasive disease in humans. USUV is maintained in an enzootic cycle between mosquitoes and birds. Over the last two decades, USUV outbreaks have caused at least a dozen mass mortality events in several bird species across Europe. Currently, researchers lack a working avian model to assess characteristics of USUV infection and transmission. Furthermore, avian hosts important for USUV maintenance are currently unknown. In this study, we aim to investigate the susceptibility of domestic and wild avian species to USUV, to determine an appropriate model to study this virus. We hypothesize that avian hosts susceptible to or responsible for maintenance of WNV will also be susceptible to USUV. First, two chicken lines bred for strong or weak immune responses against sheep red blood cells were used to evaluate USUV replication. Two-day-old chicks were inoculated with USUV. All challenged individuals developed viremia (i.e. virus detected in blood) and high viral titers in heart and kidney tissues. Morbidity and mortality were observed only in chicks with weak immune responses. Next, primary fibroblast cells derived from American robin (Turdus migratorius), house sparrow (Passer domesticus), and American crow (Corvus brachyrhynchos), three wild bird species associated with WNV, were inoculated with USUV. American robin and house sparrow cells, but not American crow cells, were susceptible to multiple USUV strains. Finally, wild-caught house sparrows were inoculated with USUV strains and ~75% of birds developed viremia. Together, these studies demonstrate that avian hosts respond to USUV infection in markedly different ways. Furthermore, 2-day-old chickens and house sparrows can serve as appropriate animal models to further evaluate USUV pathogenesis and transmission. Identifying potential host species can help determine the likelihood of spread and continued emergence of USUV .

Remote Characterization of Antarctic Microbial Mat Communities

Sarah Power, Poster Presentation, Program: Doctoral

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Keywords: Antarctica, microbial mat, satellite imagery, NDVI, remote sensing

The McMurdo Dry Valleys (MDV) of Antarctica are ecosystems where life approaches its environmental limits. Cyanobacteria, however, have adapted to survive in this extreme environment as the most dominant life form and are the main drivers of primary productivity (i.e., photosynthesis) in the MDV. Cyanobacterial mat communities exist on soil surfaces adjacent to glacial meltwater streams, lakes, and ponds layered in mats up to several cm thick. The cryptic nature of these communities and their patchy distribution make assessments of productivity challenging. We used satellite imagery coupled with in situ surveying, imaging, and sampling to systematically estimate microbial mat biomass in selected wetland regions in Taylor Valley, Antarctica. On January 19th, 2018, the WorldView-2 multispectral satellite acquired an image of our study areas, where we surveyed and sampled seven 100 m2 plots of microbial mats for percent ground cover, organic matter content, and pigment content (e.g., chlorophyll-a, scytonemin). Image analyses revealed the strong absorption of visible light and strong reflectance of near-infrared light, consistent with photosynthetic signals. The study plots contained high normalized difference vegetation index (NDVI) values, also indicative of the presence of photosynthetic life. Strong correlations of microbial mat ground cover (R2 = 0.84), biomass (R2 = 0.74), chlorophyll-a content (R2 = 0.65), and scytonemin content (R2 = 0.98) with NDVI values demonstrate that satellite imagery can detect both the presence of microbial mats and their key biological properties. Using the NDVI – biomass relationship we developed, we estimate carbon stocks of 21,715 kg in the Canada Glacier Antarctic Specially Protected Area. This is the first satellite-derived estimate of microbial mat biomass for this region of Antarctica. Ultimately, this research is working towards the creation of a remote sensing tool that will allow us to quantify terrestrial productivity in the MDV and monitor this ecosystem in a changing climate .

Physiological and Molecular Dissection of Salinity Tolerance in Arabidopsis and Maize

Suman Lamichhane, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Salt, PROTEOLYSIS 6 (PRT6), Arabidopsis, Maize

Soil salinity is a serious constraint that threatens food security worldwide. Currently, more than 20% of the cultivable lands are affected by excess salt. To meet growing demands for plant-based products at the global level, it is imperative to improve salinity tolerance in major crops. Although several genes involved in salt tolerance have been identified in a model plant Arabidopsis, the regulatory functions of these genes are yet to be characterized in commercially important crops such as maize. The PROTEOLYSIS-6 (PRT6) gene is a well-characterized negative regulator of flooding stress tolerance in Arabidopsis. This study assessed whether this gene is involved in adaptation to salinity stress in Arabidopsis and maize by evaluating the growth and survival of their respective prt6 mutants under high salt. Consistent with flooding tolerance, our study showed that the PRT6 gene also functions as a negative regulator of salinity stress tolerance in Arabidopsis. The prt6 mutation in Arabidopsis activated the key transcriptional and hormone response pathways associated with the adaptation to both salinity/osmotic stress and sodium toxicity, resulting in enhanced tolerance to excess salt at various developmental stages. In maize, functional disruption of the PRT6 gene decreased seed germination, primary root elongation, and shoot biomass growth under high salt, which is opposite to our observations in Arabidopsis. Additionally, the maize mutant plants encountered more oxidative stress, as demonstrated by the higher accumulation of malondialdehyde (MDA) under high salt. Moreover, maize prt6 mutants exhibited an increased anthesis-silking interval and reduced grain yield under high salt. Altogether, our results provide new insight into the functional divergence of the PRT6 gene to salinity tolerance between Arabidopsis and maize. This is a useful information for the development of new maize varieties with improved salt tolerance .

Performing Challenging Reactions with Enzymes: The Formation of Diazo Groups by CreE

Sydney Johnson, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: Natural Products, Enzymology, Biochemistry

One of the main focuses of the Sobrado Lab is to characterize the mechanisms of action of the biologically relevant class of enzymes known as flavin-dependent monooxygenases. This enzyme class possesses many benefits such as catalyzing reactions that form natural products. Therefore, characterizing these mechanisms can help us form these natural products in ways that are much simpler and safer than traditional organic synthesis that would require a chemist. One of these natural products that our lab is particularly interested in is cremeomycin, because this compound contains chemical groups that possess anticancer properties. These groups are called diazos, which are defined as one nitrogen atom double bonded to another nitrogen atom. Diazo groups are commonly found throughout nature as they are utilized heavily by many bacteria. However, despite their commonality, the mechanism by which the diazo group on cremeomycin is formed is poorly understood. Therefore, with this work, we show the beginning stages of a novel characterization of enzyme that performs a reaction required to form the diazo group. Our results suggest that a flavin-dependent monooxygenase known as CreE, catalyzes a reaction that lays the groundwork for the formation of the diazo group that cremeomycin possesses. We have experimental evidence showing that CreE is adding a hydroxyl group (an oxygen bound to a hydrogen) to the nitrogen atom that will go on to form the diazo group of cremeomycin. Here, we present these exciting findings that were elucidated using assays that study the catalysis and reaction scheme of this enzyme. It is our belief that characterizing the mechanism of CreE will pave the way for further studying the formation of the diazo-containing cremeomycin. This will in turn, lead to higher yields and a safer production process of a potentially powerful chemotherapeutic, cremeomycin.

Understanding the Mechanism of Juvenile Hormone Mimic Pyriproxyfen in Mosquito Reproduction

Tamina Ahmed, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Mosquito, juvenile hormone, pyriproxyfen, fertility, reproduction

The Aedes aegypti female mosquito bites to get a blood meal that is required for their egg production, thus act as a vehicle to transmit several infectious diseases including dengue, yellow fever, chikungunya, and zika fever. As there is still a lack of vaccines or effective treatments for most of these diseases and insecticide resistance becomes a huge problem, we are in urgent need to develop new insecticide with a different mode of action. Juvenile hormone (JH) is an insect hormone, regulates mosquito development and reproduction. Pyriproxyfen (PPF) is a JH mimic that is well-known for its ability to kill the earlier stage of mosquitoes and recently its negative effect on adult mosquito reproduction has been found. However, the mechanism of PPF to hamper the reproductive outcome remains understudied. Here, Ae. aegypti mosquitoes were exposed to the PPF-treated net and the dose-dependent response was examined, considering untreated and cyclohexane solvent treated as control groups. From this study, we selected the minimum dose of PPF with the maximum negative effect on mosquito fertility (hatching of larvae). With that dose, we further determined how PPF decreases egg number and hatching and found that PPF hampers ovarian development and follicles cannot fully mature due to this treatment. Moreover, PPF significantly changed the stored carbohydrate and lipid levels. Our gene expression analysis also supported the alteration of metabolic levels found in the direct measurement. Therefore, we concluded PPF interferes with the normal ovarian development and metabolism that ultimately causes female mosquito to become sterile so that they cannot produce eggs capable of hatching into larvae. Overall, this comprehensive study sheds light on the underlying mechanism of PPF and could be an excellent approach to control the number of adult mosquito populations and disease transmission in the future .

Understanding Habits of Engagement in Engineering Thinking Among Parent-Child Dyads

Tawni Paradise, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: engineering, parent-child dyads, preschool, habits of engagement

Currently there exists a critical national priority to broaden participation in engineering. One potential avenue for addressing this need for more trained engineers is creating a pipeline to engineering degrees, with organizations suggesting early engagement in engineering activities as a starting point for these pipelines. Within early exposure engagements, parents can support their children as an educator or more knowledgeable other throughout the activity. While parents are widely influential and can support development among their children, they may have limited understanding of engineering and how to engage children in engineering activities. The area of study I'm interested in is the engagement of parents and children in engineering activities, with a focus on the parent as the central educator throughout these engagements. Pedagogical content knowledge (PCK) is an important element of effective education within a specific content domain, so my studies will likely explore the development and impact of parents PCK in early engineering activities. To study this, design-based implementation research (DBIR) is necessary to develop and implement Head Start Parent Engagement Program (HSPE) that the research will be set in.

Aging Dampens the Immune Response After Traumatic Brain Injury

Taylor Tuhy, Poster Presentation, Program: Undergraduate

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Keywords: Neuroscience, Traumatic Brain Injury, Inflammation

Traumatic brain injury (TBI) is a leading cause of death and disability, occurring mainly in young adults and the elderly. Injuries occur in two phases: primary injury, which consists of mechanical damage to the brain tissue, and secondary injury that includes inflammation which both aids and inhibits tissue repair hours/days later. Precautions are in place to reduce the risk of sustaining a TBI, such as the use of helmets in sports; but, after an injury has occurred, there are no effective therapeutic interventions targeting inflammation. This is in part due to the complexity and lack of understanding of the types of inflammatory responses that occur after injury. Using a preclinical mouse model of TBI, we profiled the immune response to injury in young adult (2 months) or aged mice (6 months) to reflect the human populations susceptible to TBI. Our previous work has shown that inhibiting the function of an immune regulatory protein called STING (stimulator of interferon genes) may be beneficial at 2 months of age. In mice lacking a functional STING protein (STING knockout), the inflammatory response was decreased compared to 2-month-old wildtype (control) mice resulting in tissue protection. When evaluating the immune response at 6 months of age, our data shows a blunted response in the production of inflammatory molecules after injury when compared to 2-month-old mice. Our data suggests that a lack of inflammation following TBI in the aged mouse may restrict the therapeutic potential of inhibiting STING in certain older populations. Future studies will investigate STING expression and determine TBI outcome between STING knockout and wildtype in aged mice. By understanding inflammatory events after TBI in aged mice versus young adult mice, this preclinical data will aid in better therapeutic design for drug targets and dictate clinical trial populations that may most benefit .

Measurement-Based Care to Evaluate Psychological Treatment Outcomes in Youth with Autism Spectrum Disorder

Tyler McFayden, Poster Presentation, Program: Doctoral

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Keywords: Autism, Treatment, Evaluation, Insurance

Measurement-Based Care (MBC) is the use of repeated measurement to assess patient progress. Akin to getting your blood pressure/temperature measured at every doctor's visit, MBC in psychological clinics to assess psychopathology symptoms has emerged as a best-practice and an evidence-based procedure to evaluate treatment outcomes. However, MBC has yet to be examined with youth with Autism Spectrum Disorder (ASD). ASD is a neurodevelopmental disorder with a manifestation of symptoms that makes it difficult to monitor the effectiveness of treatment progress and to select appropriate treatment goals. The current study aimed to evaluate the course of treatment for youth with ASD using MBC in a community clinic. Participants (n = 40, 15 females) seeking treatment at a cognitive-behavioral clinic completed brief, symptom-specific questionnaires at each treatment session. Twenty ASD participants were sex-, age- and primary presenting problem-matched with 20 clinical controls (Mage = 13.9, SD = 4.89). Results of t-tests indicated differences in number of treatment sessions, $t(38) = -2.23$, $p = .03$, where ASD clients (M = 31.7; SD = 20.43) were seen significantly longer than non-ASD clients (M = 20; SD = 11.06). ASD clients had significantly smaller change scores than non-ASD clients, regardless of treatment duration, $t(38) = 2.42$, $p = .02$, indicating that although they were seen for longer, they made less progress in treatment. Results from multilevel growth model analyses indicated no significant group differences on the severity of the symptoms at intake, $t(36) = .38$, $p = .71$ or the rate of change over time, $t(36) = 1.39$, $p = .17$. However, models suggested that clinical controls reached healthy levels after 23 weeks, but ASD only after 37 weeks. Taken together, these results have important implications for practitioners and insurance: youth with ASD may require double the number of sessions to effectively treat psychological disorders .

Wet Fractionation Process to Recover Protein-rich Product from Brewer's Spent Grain as a Replacement Feed Ingredient for Fishmeal in Shrimp Diet

Yanhong He, Research Oral Presentation (15 Minute), Program: Doctoral

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Keywords: Brewer's spent grain; Alcalase; Alternative protein; Fishmeal; Shrimp diets

Brewer's spent grain (BSG) is the main (about 85%) byproduct in the brewing industry. For every 100 L of brewed beer, approximately 20 kg of wet BSG is produced. Currently, BSG is predominantly used as cattle feed or disposed in landfill due to its relatively high fiber, low protein content and high water content (77-81%), leading to substantial resource losses. On the other hand, the limited supply and high price of fishmeal is emerging as a big challenge to the sustainable growth of the aquaculture industry. In this study, a wet fractionation process was developed to separate value-added protein-rich product (PP) from BSG; the effects of replacing dietary fishmeal with PP on the growth, feed utilization efficiency, and nutritional composition of Pacific white shrimp was investigated.

The effect of different concentrations (1, 3, and 5%, w/w) of chemicals (sodium hydroxide and sodium bisulfite) and enzyme (Alcalase, 5, 20 and 35 μL/g dry BSG) treatments on PP yield and composition was investigated, to maximize the process separation efficiency and potentially reduce the chemical and enzyme consumptions. Under the optimal condition (20 μL/g dry BSG) using Alcalase, the protein separation efficiency was 84%, and the protein concentration in PP was 43% (w/w), almost double the protein concentration (23%, w/w) in original BSG. The effectiveness of PP as a replacement for fishmeal was evaluated by replacing fishmeal with PP at 0, 10, 30, 50, and 70% levels in shrimp feeding. Shrimp production performances with different fishmeal replacement levels was assessed by survival rate, specific growth rates, and feed conversion ratio. The results showed that up to 50% of fishmeal replaced with PP did not negatively affect the shrimp survival, growth performance, feed utilization efficiency, or the protein content and amino acid profile of shrimp.

Mathematical Modelling Gliding Motility Control and Coordination in Myxococcus xanthus

Yirui Chen, Flash Talk Presentation (5 Minute), Program: Doctoral

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Keywords: mechano-sensing, intercellular communication, Myxococcus xanthus, mathematical modelling

Intercellular communication plays a critical role in the organization and physiological function of microbial communities. Although the communication mechanism based on diffusive chemical signals are well-studied, the other mechano-sensing based mechanism remain under-explored. Myxoccous xanthus present a system in which cells coordinate with each other through direct cell-to-cell physical contact. Recent works showed that direct cell-cell contacts in the myxobacterial colony resulted in a spatiotemporal dynamic pattern – rippling wave. In ripples, the coordination of M. xanthus cells propagates two waves that move towards opposite direction and collides with each other. Therefore, we utilized M. xanthus as our model organism to understand the underlying communication mechanism induced by mechanical cues in the environment though mathematical models .

RNA Methylation Patterns in the Developing Murine Brain

Zachary Johnson, Poster Presentation, Program: Doctoral

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Keywords: RNA, methylation, development, transcriptome

The study of ribonucleic acid (RNA) modifications or “epitranscriptomics” is a blossoming field in the world of genetics research. Over 100 types of RNA modifications have been discovered, though studies on the temporal resolution of these modifications have been limited. One such modification of mRNA molecules, 5-methylcytosine (m5C), has been shown to play a key role in the regulation of mRNA nuclear exports and modulating protein translation. In addition, it has been recently reported to indirectly influence the development of germ-line cells in drosophila. DNA methylation has been well-studied in the development and activation patterns of neurons, but the area of RNA methylation is relatively unexplored.

In order to gain a better understanding of RNA methylation dynamics in neurons, we utilized RNA-bisulfite sequencing in conjunction with RNA-sequencing in primary murine neural stems cells (NSCs) challenged with potassium chloride (KCl). KCl treatment is a commonly used inductor of depolarization in neuronal cell culture. By challenging neurons with KCl, we are able to identify the expression and methylation of early and late-response mRNAs at 0-hour, 2-hour (early), and 6-hour (late) timepoints. Among these groups, we explore similarities and differences in binding locations of m5C, rates of RNA methylation, differentially methylated sites (DMS), and biological pathways enriched by differentially expressed and methylated RNAs .

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