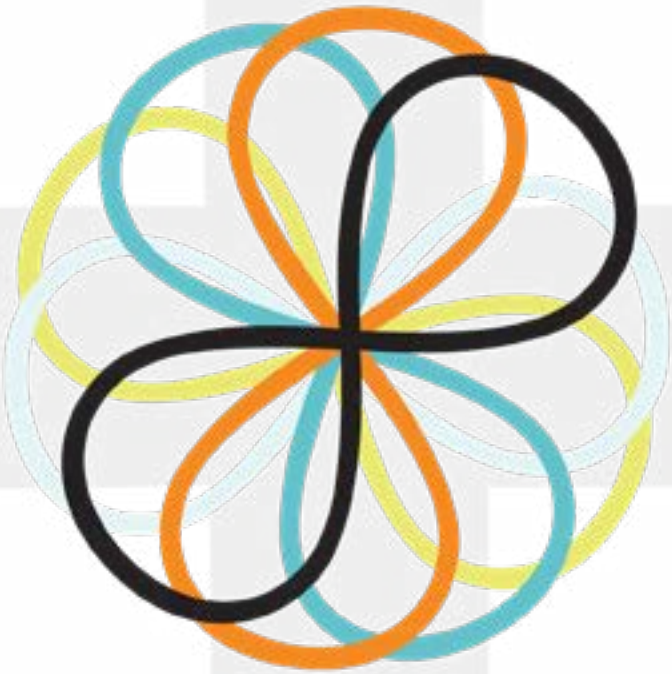
OFFICE OF
UNDERGRADUATE
RESEARCH

2020 Dennis Dean Undergraduate Research & Creative Scholarship Conference



VIRTUAL
APRIL 24, 2020
10AM TO 3PM

RESEARCH.UNDERGRADUATE.VT.EDU

Contents

Jill C. Sible, Ph.D.
Associate Vice Provost for
Undergraduate Education,
Professor of Biological Sciences

Welcome

Welcome to Virginia Tech's Spring Undergraduate Research and Creative Scholarship Virtual Symposium. This event is a celebration of the creative and scholarly accomplishments of undergraduate students' campus-wide. Our program features the work of students reflecting the quality and diversity of undergraduate research at Virginia Tech. Many of the projects are the result of collaborations among several students.

Undergraduate research is recognized as one of the high impact practices in undergraduate education. Students who participate in undergraduate research are more likely to thrive and persist in their education. They become co-creators of knowledge, makers of objects that are useful and beautiful. At the heart and soul of these projects are collaborations between undergraduates and their mentors. Many thanks to the faculty, graduate students and others who commit to these scholarly endeavors with undergraduate students.
It is certainly regrettable that this year, we cannot gather in person for one of my favorite events of the academic year. However, I am grateful for the resourcefulness of the Office of Undergraduate Research in creating the virtual symposium with little time. I am most grateful to Keri Swaby, Director of the Office of Undergraduate Research, for her leadership in executing the symposium, for Nicole Easton for countless hours of behind-the-scenes work, and for the University Libraries, especially Amanda McDonald, to help create a professional and vibrant forum.

Thanks to the Fralin Life Sciences Institute, and especially to Dr. Dennis Dean for continuous support and advocacy for undergraduate research and to the many colleagues who have contributed to building an endowment for this symposium.

My best,

Jill C. Sible, Ph.D.
Associate Vice Provost for Undergraduate Education

Office of Undergraduate Research

Keri Swaby
Director of Undergraduate Research

Welcome to the annual Dennis Dean Undergraduate Research and Creative Scholarship conference at Virginia Tech and its first ever virtual edition! Despite the difficult and unprecedented times we find ourselves in, today we pause and celebrate the exceptional work of our undergraduates. This day-long asynchronous event will showcase the breadth of research and creative scholarship taking place across campus every day at Virginia Tech and will demonstrate how broadly we define this impactful form of experiential learning. Presenting results of a research or creative project is an important part of a student's overall journey because it provides them with the opportunity to learn to effectively communicate to a broad audience, defend their work, exchange ideas, and even be inspired for future research. I applaud our presenters for adapting and learning quickly to present their work in a much different format, via video. And I encourage you to engage these scholars with comments and questions on their "pages". Thank you for participating and helping our students to grow.

I must recognize the support, time, boundless energy, and expertise offered by our amazing partners in University Libraries, as we embarked on a unique collaboration to host the spring conference at the Newman Library prior to the pandemic. Even though we have abandoned those plans, the foundation has been laid for an exciting event next year.

I would like to thank everyone in the Office of Undergraduate Education for helping to figure out the best option to make today happen and for supporting its evolution. And an extra special thank you to Amanda MacDonald for her guidance and time spent testing and troubleshooting the conference site and for being a collaborator extraordinaire!

Critical to the success of the OUR this year has been the hard work of our Program Assistant, Nicole Easton; the guidance of an active 18-member advisory board, comprised of faculty, administrators, and undergraduate and graduate students; and the 21 amazing Ambassadors who tirelessly work to help students get involved with undergraduate research. Without these dedicated people, the operations of the OUR would not be possible. I would also like to say 'thank you' to the Fralin Life Science Institute, whose continued financial support allows us to celebrate undergraduate research and creative scholarship every day.

As always, I am humbled by the quality of work on show as part of this symposium and invite you to marvel at the wealth of research and creative scholarship the university has to offer. I invite you to engage, to explore, to connect, and to have fun… all from the comfort and safety of your own home!

Keri Swaby
Director of Undergraduate Research

ACC Meeting of the Minds

Due to the COVID-19 pandemic the 2020 ACC Meeting of the Minds (ACC MOM) at the University of North Carolina – Chapel Hill was canceled. The scheduled conference dates were March 20-22, 2020. The Office of Undergraduate Research would like to recognize the students who were invited to present but were not able to attend.

Each year, 5-10 outstanding undergraduate researchers (accompanied by a faculty/staff member) from each ACC university gather at a host institution to present their research, either orally or as a poster. Virginia Tech representatives are selected by a competitive refereed process. It is truly an honor to be invited to participate in this conference. Student name, academic major, title of presentation, and faculty mentor listed below alphabetically.

Malikah Ajose (Clinical Neuroscience)
THE ROLE OF CONNEXIN 43 IN ASTROCYTIC COMMUNICATION AFTER MILD TRAUMATIC BRAIN INJURY (MTBI)
Dr. Stefanie Robel

Christopher Bonilla (Mircobiology)
VISUALLY DRIVEN THREAT-SENSTIVE BEHAVIORS IN LARVAL MOSQUITOES
Dr. Vinauger

Nathan Freeman (Animal and Poultry Sciences)
FOOTPAD DERMATITIS IN BROILER CHICKENS:NOVEL REMEDIAL TREATMENTS
Dr. Leonie Jacobs

Taylor Olson (Residential Environments and Design)
HAENYEO HOUSE
Dr. Eunju Hwang

Elizabeth Sholtis (History; Professional and Technical Writing)
SHAKING THINGS UP: THE INFLUENCE OF WOMEN ON THE AMERICAN COCKTAIL
Dr. Marian Mollin

NCUR

Due to the COVID-19 pandemic the 2020 National Conference on Undergraduate Research (NCUR) at the University of Montana was canceled. The scheduled conference dates were March 26-28, 2020. The Office of Undergraduate Research would like to recognize the students who were selected and invited to present but were not able to attend.

The National Conference on Undergraduate Research (NCUR), established in 1987, is dedicated to promoting undergraduate research, scholarship and creative activity in all fields of study by sponsoring an annual conference for students. Unlike meetings of academic professional organizations, this gathering of young scholars welcomes presenters from all institutions of higher learning and from all corners of the academic curriculum. Through this annual conference, NCUR creates a unique environment for the celebration and promotion of undergraduate student achievement, provides models of exemplary research and scholarship, and helps to improve the state of undergraduate education.

Student name, academic major, title of presentation, and faculty mentor listed below alphabetically.

Shruti Das (Mechanical Engineering)
SOUND MANIPULATION TECHNIQUES AND APPLICATIONS
Dr. Shima Shahab

Ryan D'Onofrio (Clinical Neuroscience)
A STUTTERING ASSOCIATED MUTATION IN THE GENE GNPTAB ALTERS RAT PUP ULTRASONIC VOCALIZATIONS
Dr. Mike Bowers

Renee Howard (Major)
WHAT ARE THE MOST NOTABLE WAYS THAT INFRASTRUCTURE PROJECTS LIKE THE MOUNTAIN VALLEY PIPELINE AFFECT ENVIRONMENTAL AND COMMUNITY HEALTH?
Faculty mentor

Delaney Snead (Civil Engineering)
THE KINGDOM OF AHHIYAWA AND ITS RELATIONSHIP TO THE TROJAN WAR
Professor Christine Steer

Reagan Snead (Business Management)
REFUGEE INTEGRATION IN THE AMERICAN WORKFORCE
Dr. Anna-Katherine Ward

Kevin Williams (Biochemistry)
GLOBAL CHARACTERIZATION OF FUSOBACTERIUM VIRULENCE PROTEINS USING GENOMICS, BIOINFORMATICS, AND CELLULAR MICROBIOLOGY
Dr. Daniel J. Slade

Informational Booths

We invite you to visit and talk with representatives from several graduate programs, from across Virginia Tech's Blacksburg, Roanoke, and National Capital Region campuses.

TRANSLATIONAL BIOLOGY, MEDICINE AND HEALTH

OFFICE OF SCHOLARLY INTEGRITY AND RESEARCH COMPLIANCE

VIRGINIA TECH GRADUATE SCHOOL

SIGMA XI

UNIVERSITY LIBRARIES

2020 Outstanding Undergraduate Research Mentor Award

An often overlooked, unrecognized and unrewarded mode of teaching is mentoring undergraduate students in research. Two years ago, the Office of Undergraduate Research launched the Outstanding Undergraduate Research Mentor Award- for a Faculty and a Graduate Student- to recognize the hard work, time, dedication, and guidance that research mentors provide to undergraduate students.

Undergraduates were asked to nominate one Virginia Tech faculty or graduate student research mentor from any discipline for this award. We received 24 nominations: 13 nominations for 10 faculty members and 11 nominations for 5 graduate students. It was extremely humbling and inspiring to review the thoughtful and passion-filled nominations. Many recognized the tireless and often unrewarded efforts of their mentors and indicated that their mentor made their VT experience unique and overwhelmingly had a positive impact on their future plans.

The recipient of this year's Outstanding Undergraduate Research FACULTY Mentor Award is Eli Vlaisavljevich, PhD from Biomedical Engineering and Mechanics, who received three nominations. Students described him as driven, encouraging, fair, thoughtful, motivated, knowledgeable, well-rounded, intelligent, and supportive.

The recipient of this year's Outstanding Undergraduate Research GRADUATE STUDENT Mentor Award is Jeannie Purchase from Civil and Environmental Engineering, who received a whopping six (6) nominations in which she was described as insightful, encouraging, organized, leader, caring, empowering, patient, inspiring, dedicated, communative, supportive, passionate, driven, student-oriented, adaptable, and honest.

Thank you to all undergraduate research mentors. Without mentors, students could not engage in research and without exceptional mentors, students would not gain as much out of the research experience!

Abstracts

AMBER R. N. ABBOTT

VIRGINIA TECH / MICROBIOLOGY

NEUROTROPHIC FACTOR SIGNALING PATHWAYS REGULATING HERPES SIMPLEX VIRUS LATENCY AND REACTIVATION

Neurotrophic factors (NTFs) are a class of endogenous soluble proteins that contribute to the maintenance of herpes simplex virus (HSV) latency in neurons. We previously determined that deprivation of two NTFs, glial cell-derived neurotrophic factor (GDNF) and neurturin (NTN), induces HSV reactivation from latency in adult sensory neurons. The goal of this project was to identify the signaling mechanisms involved in this process. Upon binding to GDNF family receptors (GFRs), GDNF and NTN activate Ret, a receptor tyrosine kinase that regulates numerous intracellular signaling pathways involved with cell proliferation and differentiation. One of these signaling pathways, PI3K/Akt, has previously been implicated in maintaining HSV latency in embryonic sympathetic neurons. However, results from western blots indicate that Ret is not activated in adult sensory neurons at the phosphorylation site that activates the PI3K/Akt pathway, nor at multiple others, suggesting that adult sensory neurons possess different intrinsic mechanisms regulating viral latency. Because GDNF can also signal through neural cell adhesion molecule (NCAM), we used an NCAM function-blocking antibody to determine if GDNF may potentially use this pathway as a Ret-independent signaling mechanism for maintaining vial latency. Quantitative polymerase chain reaction (qPCR) experiments indicate that NCAM may serve as a novel, Ret-independent signaling mechanism of maintaining viral latency in adult sensory neurons.

Mentor: Dr. Andrea Bertke(Dept. of Population Health Sciences, Virginia-Maryland College of Veterinary Medicine)

TESS M. ALEXANDER

VIRGINIA TECH / BIOLOGICAL SCIENCES

INVESTIGATING QUALITY AND BIASES OF OCCURRENCE POINT DATASETS FOR CONSERVATIONLATENCY AND REACTIVATION

Occurrence data report species locations at a specific point in time. These data are widely available, easily accessible, and used to measure species distributions that inform our understanding of biodiversity. Occurrence data are collected and reported through a range of sources, from museums to citizen scientists to ecologists. Although this contributes to wide availability, it leads to varying quality of data. We examined occurrence data for 106 anuran (frog and toad) species found throughout the contiguous United StateInvestigating Quality and Biases of Occurrence Point Datasets for Conservations from two databases: the Global Biodiversity Information Facility (GBIF) and HerpMapper. We focused on anurans because they include a diverse species range, both common and rare, with generally high sensitivity to global change. We compared data quality between and within both datasets. We hypothesized that GBIF data will have more errors and identical data points because it collates data from multiple sources, whereas, HerpMapper assembles data from select sources and experts. To test this hypothesis, we compared the number of occurrences and percentage of occurrences lost when removing errors and non-unique records. Our results will demonstrate the quality and biases of these datasets and highlight the need to exercise caution when using occurrence data in biodiversity research.

Mentor: Meryl Mims (Department of Biological Sciences, Virginia Tech)
Chloe Moore (Department of Biological Sciences, Virginia Tech)

DANIELLE ALMS

VIRGINIA TECH / BIOLOGICAL SCIENCES

INFECTION WITH MYCOPLASMA GALLISEPTICUM SUPPRESSES PREENING BEHAVIOR BUT DOES NOT ALTER FEATHER QUALITY IN HOUSE FINCHES LATENCY AND REACTIVATION

Songbirds, when fighting an active pathogen infection, can face energetic trade-offs that affect several systems. Behavioral feather maintenance (âpreening) is critically important to songbird survival. Mycoplasma gallisepticum (MG), a common pathogen in house finches, causes the disease mycoplasmal conjunctivitis. To date, no studies have looked at how preening behavior changes with MG infection and how these differences affect feather quality. To test this, 32 wild-caught but captive-held house finches were given one of three treatments into the conjunctiva: a 104 dose of MG, a 103 dose of MG, or a control treatment of sterile media. Behavioral videos were recorded pre-infection and peak-infection to determine the time spent preening and the time spent inactive. One month post-inoculation, a secondary flight feather was clipped and examined to score the amount of degradation on a 1-4 scale. We found that birds infected with MG, regardless of dose, preened significantly less often and were significantly less active than healthy controls. However, there was no difference in the feather quality scores between control and infected birds, which may be due to the controlled captive environment. Our data suggests that infection affects the behavior of house finches by decreasing overall activity, including preening. Further work is needed to determine whether MG-infected house finches in the wild experience fitness costs due to reduced feather maintenance.

Mentor: Dr. Dana Hawley (Biological Sciences, Virginia Tech)
Marissa Langager (Biological Sciences, Virginia Tech)

MEGHAN, E. BABINGTON

VIRGINIA TECH / EXPERIMENTAL NEUROSCIENCE AND PSYCHOLOGY

SEX DIFFERENCES IN THE IMMUNE CELL RESPONSE TO THE LONG-TERM VARIABLE STRESS MODEL FOR DEPRESSION

Depression is the leading cause of disability, impacting around 300 million people worldwide. Depression in humans is associated with inflammation meaning they have a higher white blood cell count compared to the average person. In our lab my focus was on the effects of stress on wild-type mice both males and females to measure the changes in their white blood cell count. Being able to model this helps connect the immune system and potential biological markers for depression. The 28-day variable stress model involves three major stressors, one test given each day for 28 days followed by a submandibular blood draw, and five different behavior tests for the following week immediately after stress. These behavior tests help us identify mice that are stress susceptible or stress resilient. After the blood draw, we performed flow cytometry and achieved the following results from targeting specific populations of cells within the adaptive and innate immune systems. In the innate immune system, we screened for neutrophils and monocytes while in the adaptive immune system we looked for B cells, T-helper cells, and Cytotoxic T cells all involved in protecting the body. Based on our results, we found no evidence for lasting changes to immune cell populations in circulation 24 hours following the last stress of a 28-day variable stress paradigm. However, we observed a sex difference in the number of cytotoxic T cells. Cytotoxic T cells' role are to induce apoptosis in virally infected cells, although their role in response to stress is unknown.

Mentor: Georgia Hodes (Neuroscience, Virginia Tech)

AVA D. BIR VIRGINIA TECH / COGNITIVE AND BEHAVIORAL NEUROSCIENCE
ALEXANDRA E. COPELAND VIRGINIA TECH / HUMAN DEVELOPMENT
MICHELLE H. TRAN VIRGINIA TECH / CLINICAL NEUROSCIENCE
BREANNE C. DE VERA VIRGINIA TECH / BIOLOGICAL SCIENCE
RHEA BHATIA VIRGINIA TECH / HUMAN DEVELOPMENT
EMAN AYAZ VIRGINIA TECH / HUMAN DEVELOPMENT
BETHANY GROCOCK VIRGINIA TECH / HUMAN DEVELOPMENT
CARLOLINE R. KRAMMER VIRGINIA TECH / HUMAN DEVELOPMENT
EVA C. GRUMBINE VIRGINIA TECH / INTERNATIONAL PUBLIC POLICY
KATIE R. JOHNSON VIRGINIA TECH / HUMAN DEVELOPMENT
SARA BELAY VIRGINIA TECH / CLINICAL NEUROSCIENCE
MOLLY A. SIMEK VIRGINIA TECH / BIOCHEMISTRY
VALERIE SALMON VIRGINIA TECH / HUMAN DEVELOPMENT
ANVITHA R. METPALLY VIRGINIA TECH / CLINICAL NEUROSCIENCE
TAYLOR C. COVINGTON VIRGINIA TECH / HUMAN DEVELOPMENT

ARE YOU STILL WATCHING ON YOUR PHONE OR TV? THE IMPACT OF MOBILE MEDIA ON VISUAL ATTENTION AND LEARNINGLATENCY AND REACTIVATION

Mobile devices are ubiquitous in our daily lives. Will technology-mediated learning become more effective through the use of mobile media devices? Using desk-mounted eye-tracking systems, researchers revealed that adults systematically deploy visual attention during video viewing: Adults' attention is primarily captured by relevant features, which could contribute to comprehension (Franchak et al., 2015; Kirkorian & Anderson, 2018). However, few studies to date have investigated how adults pay attention to and learn from mobile media content. Using a head-mounted eye-tracking system, this project examined how adults pay attention and learn from portable and non-portable media devices. College students (N = 24) between the ages of 18 and 25 years completed a one-hour lab session consisting of computerized cognitive tasks, surveys, and eye-tracking sessions while watching videos. Participants wore eye-tracking glasses and watched videos displayed on a tablet through two conditions: either by holding the tablet (portable) or leaving the tablet on a stand (fixed). If holding the device is beneficial for learning, we would expect that better attention to and comprehension of video in the portable condition compared to the fixed condition. If holding the device is detrimental for learning, we would expect the reversed pattern. Data analysis is in progress. This research has implications for understanding how learners can effectively use digital devices for learning.

Mentor: Koeun Choi (Human Development and Family Science, Virginia Tech)

CHRISTOPHER, A BONILLA

VIRGINIA TECH / MICROBIOLOGY

VISUALLY DRIVEN THREAT-SENSITIVE BEHAVIORS IN LARVAL MOSQUITOESLATENCY AND REACTIVATION

The complex life cycle of mosquitoes involves an aquatic larval stage wherein they are faced with predators attempting to feed upon them. These mosquitoes utilize a variety of cues (e.g. mechanical, olfactory, visual, etc.) to detect and respond to in a threat-sensitive manner. While we know how mosquito larvae respond behaviorally by perceiving chemical cues signaling threat, the relative significance of visual cues in contexts of threat is largely unknown. My research in the Vinauger Lab is aimed at understanding the neural and molecular processes that mediate visually driven threat-sensitive behaviors in mosquito larvae. To simulate threat, I used an LED arena to deliver a looming, predator-like visual stimuli to freely-swimming mosquito larvae. The results from these experiments will allow me to determine the variables (e.g. distance between larvae and the stimulus, orientation of larvae towards the stimulus) that are likely to trigger threat-sensitive responses in larvae. To further investigate the mechanisms underlying the observed threat-sensitive behavioral responses, I will be employing molecular, neurophysiological, and imaging approaches targeting the larval visual system (e.g. the rhodopsin movement to and from the rhabdomere). A better understanding of the role of mosquito larval vision, from a behavioral perspective in contexts of threat, will reveal novel targets for stage-specific control strategies.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE ACC MEETING OF THE MINDS CONFERENCE IN UNIVERISTY OF NORTH CAROLINA - CHAPEL HILL ON MARCH 20-22,2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC.**

Mentor: Clement Vinauger (Department of Biochemistry, Virginia Tech)

KALEB, S BOSWINKLE

VIRGINIA TECH / BIOCHEMISTRY

INVESTIGATING THE PRODUCTION OF COENZYME F430 VARIANTS IN METHANOGENIC ARCHAEALATENCY AND REACTIVATION

Methanogenesis is the biological production of methane and is utilized by methanogenic archaea (â€œmethanogensâ€) as a form of anaerobic respiration. Methane, with a warming potential 84 times that of carbon dioxide over a 20-year period, is a potent greenhouse gas, and also is the main component of natural gas, a clean and increasingly valuable energy source. Therefore, understanding the biochemistry of this process could lead to greenhouse gas mitigation strategies and inform bioenergy technologies. Methyl-coenzyme M reductase (MCR) catalyzes the methane-forming step of methanogenesis and requires coenzyme F430, a unique nickel-containing tetrapyrrole prosthetic group. Recently, multiple F430 variants have been discovered in several methanogens, including two model methanogens, Methanococcus maripaludis and Methanosarcina acetivorans. Our recent research indicates that at least two of these variants, mercaptopropionate-F430 (F430-3) and vinyl-F430 (F430-5), are produced primarily in stationary phase, possibly in response to nutrient depletion, as opposed to early-stage growth where nutrients are plentiful. Our research also indicates that F430-3 may not be associated with MCR and, if future experiments confirm this, F430-3 will be the first F430 found to not function with MCR, thus implicating new roles for F430 in nature. Future research will further elucidate the roles F430 variants play in methanogenic metabolism.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE AMERICAN CHEMICAL SOCIETY NATIONAL MEETING IN PHILADELPHIA ON MARCH 22-26,2020 AND THE MID-ATLANTIC UNDERGRADUATE RESEARCH CONFERENCE IN BLACKSBURG, VIRGINIA ON MARCH 28-29, 2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC.**

Mentor: Kylie Allen (Biochemistry, Virginia Tech)

ISABEL T. BYRNE

VIRGINIA TECH / MATHEMATICS

MARGARET A. WINSLOW

VIRGINIA TECH/ MATHEMATICS

ANURADHA G. TRIVEDI

VIRGINIA TECH/ MATHEMATICS

NIKITA M. PATEL

VIRGINIA TECH/ MATHEMATICS

FAILED POWER DOMINATION FOR FAMILIES OF GRAPHS LATENCY AND REACTIVATION

The power domination number has applications in the placement of phasor measurement units (PMUs) in networks. PMUs are vital to GPS navigation as well as power grids, and much work has been done on determining the minimum number required to monitor a network. However, placement of the PMUs is crucial when working with only this minimum number, and not every arrangement of them will monitor the network. In this presentation, we consider a new graph variant called the failed power domination number of a graph G, denoted FP(G). Determining the FP(G) is important because it indicates that any set of nodes whose cardinality is greater than FP will dominate the graph (and hence monitor the network) regardless of which vertices are selected. It also gives the number of PMUs required in case of node failure. We consider three families of graphs: grids, cylinders, and tori. In each case, we provide lower bounds for the failed power domination number.

Mentor: Gretchen Matthews (Mathematics, Virginia Tech)

KRYSTAL S. CHAO

VIRGINIA TECH / BIOLOGICAL SCIENCES

USING PHYLOGENETIC DIVERSITY IN CHINESE MAGNOLIIDS TO PREDICT NEW MEDICINAL SPECIESLATENCY AND REACTIVATION

Thousands of years of Chinese history and culture has generated a vast traditional knowledge of medicinal plants. Chinaâ€™s high botanical diversity, with over 30,000 native plant species, has aided the development of the Han Chinese pharmacopoeia. The well-known malarial drug artemisinin developed by Chinese scientists from Artemisia annua is one of many modern drugs that are directly or indirectly derived from plants. In this study, we documented traditional medicinal uses of magnoliid dicot species in China. The magnoliid dicots are a group of woody flowering plants that include magnolias, nutmeg, cinnamon, and black pepper. There are about 9,000 species of magnoliid dicots worldwide with 869 species in China, 72 of which have medicinal properties. We created a table of medicinal uses from an extensive literature search. Species were categorized into 19 medicinal uses that included: inflammation, lungs/cough, stomach, and analgesic uses, among others. We constructed a phylogeny of Chinese magnoliid dicot taxa using MatK sequences downloaded from GenBank. We used Phylocom to identify âhot nodes, â clades that are over-represented with medicinal species. Our results predict which magnoliid dicot should be investigated further for potential drug development.

Mentor: Jordan Metzgar (Biological Sciences, Virginia Tech)

ELIZABETH P. CHIMENTO

VIRGINIA TECH / PSYCHOLOGY

USING A WORD FRAGMENT TASK TO REVEAL THE IMPLICIT SELF-CONCEPTLATENCY AND REACTIVATION

Leaders are present in many contexts, including in businesses and the military. Thus, understanding the factors that determine how leaders are perceived is important. One factor often discussed is the idea of how the follower views themselves: known as follower self-concept (Kark & Shamir, 2011). At a basic level, people view themselves as an individual, or as part of a collective. The purpose of our study is to utilize a novel method of measuring implicit self-concept using a word fragment task (Johnson & Saboe, 2011) and study how it may be related to leadership perceptions. The task reveals the subconscious, automatic thoughts of a person. As the self is largely preconscious, relying on automatic processes, using an implicit measure (word fragment task) is beneficial for studying the self. The task involved word fragments that could be completed with either individual or collective words. 238 members of a university student-military organization completed the task and answers were scored as individual or collective responses. After scoring, it was discovered that there is variability among their answers; both types of self-concept were active. On average, they created about 16.82 words. The average individual words were 2.86 with a variation of 1.32 whereas the average collective words were 2.77 with a variation of 1.63. We found our implicit measure to be a useful measure for capturing self-concept. We plan to expand on how this self-concept impacts leader perceptions.

Mentor: Dr. Roseanne Foti (Psychology, Virginia Tech)

SYDNEY A. CORRAL

VIRGINIA TECH / WILDLIFE CONSERVATION

DEVELOPING A RANGE MAP OF ASPLENIUM TRICHOMANES SUBSPECIES IN VIRGINIALATENCY AND REACTIVATION

Asplenium trichomanes is a rock loving fern with a wide geographic range across many temperate regions, including Virginia. This taxon has multiple cytotypes with both diploid and tetraploid subspecies present in North America, along with sterile triploid hybrids of the two. Diploid and tetraploid individuals are difficult to distinguish and often mistaken for one another. Though they may prefer different habitats, spore size is the most reliable method to distinguish the two. Tetraploid spores are significantly larger, with an average longest dimension of 41 Î¼m, while diploids are approximately 29 Î¼m long. Using 60 herbarium samples of Asplenium trichomanes from across Virginia, we constructed a range map of the diploid and tetraploid subspecies. For each specimen, we measured 20 spores, resulting in the measurement of 1200 total spores. Each spore was measured across their widest point including the perispore. Images were captured using a Zeiss Primo Star compound microscope and ImageJ software. Our measurements identified separate diploid, triploid, and tetraploid populations across the state and used to produce a range map.

Mentor: Jordan Metzgar (Biological Sciences, Virginia Tech)

KELLY E. CRUM

VIRGINIA TECH / WATER: RESOURCES, POLICY & MANAGEMENT

INSIGHTS INTO CRITICAL ZONE STRUCTURE AND SUBSURFACE STORAGE FROM STREAMFLOW RECESSION ANALYSIS LATENCY AND REACTIVATION

Variations in the complex structure and function of the critical zone across landscapes are very difficult to measure and predict. Specifically, the effect of the depth and structure of the critical zone on runoff generation is not well understood. However, the analysis of stream discharge records can offer some insight into how differences manifest themselves in runoff generation. For instance, the subsurface storage of a watershed, although difficult to quantify, can be compared between watersheds using recession analysis. In this study, over twenty years of discharge data from the Shenandoah Watershed Study, conducted by UVA and supported by the National Park Service and Environmental Protection Agency, were analyzed to compare the subsurface storage of the Paine, Piney, and Staunton Watersheds. Recession plots of storm events from each watershed showed that Piney and Paine Watersheds had much steeper recessions than the Staunton Watershed. Variations in topography, potential critical zone structure, soil properties, and watershed shape and size were compared with these storm recessions to explore potential drivers for the identified differences. Preliminary analysis suggests the shallower recession of the Staunton Watershed may indicate it has more available subsurface storage than the Paine and Piney Watersheds.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE GEOLOGICAL SOCIETY OF AMERICA JOINT SOUTHEASTERN AND NORTHEASTERN SECTION MEETING IN RESTON, VIRGINIA ON MARCH 20-22, 2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC.**

Mentor: JP Gannon (Forest Resources and Environmental Conservation, Virginia Tech)

RICHARD DANG

VIRGINIA TECH / BIOCHEMISTRY

SAMANTHA EDWARDS

VIRGINIA TECH / BIOLOGICAL SCIENCES

AN OVERVIEW OF THE HISTORICAL EVOLUTION OF NATURAL AND SYNTHETIC OPIOIDSLATENCY AND REACTIVATION

The opioid epidemic in the United States is a concerning issue as deaths from overdoses have increased from 16,849 in 1999 to 70,237 in 2017. Over time, the ingredients that go into these drugs have changed drastically. Now, even cold medicine has to be regulated because it can be used to make methamphetamine. The goal of this work is to collect data on the development of semisynthetic and synthetic opioids in correlation to the opioid distribution in the U.S. Within these semisynthetic and synthetic opioids, the components of heroin, methamphetamine, and fentanyl will be investigated to determine how their usage became socially accepted in regard to pharmaceutical prescriptions despite their addictiveness. These opioids all contain various chemicals that stimulate the release of endorphins and should be noted due to their influence on the accessibility of each drug. The production method was determined using online articles and journals. We also analyzed data from the Center for Disease Control and the Substance Abuse and Mental Health Services Administration in Microsoft Excel to make observations. We found that opioid overdoses are more prevalent in the industrialized regions in the U.S. which provides insight on the accessibility of opioids. Although opioid overdoses are more prevalent in industrialized regions, the accessibility of drug components nationwide suggests the need for pharmaceutical reform.

Mentor: Anne Brown (Research and Informatics, University Libraries, Virginia Tech)
Jonathan (Briganti Research and Informatics, University Libraries, Virginia Tech)
Lori Blanc (Biological Sciences & Orion Living Learning Community, Virginia Tech)

NICOLE M. DEFOOR

VIRGINIA TECH / EXPERIMENTAL NEUROSCIENCE

SOUNDIN' SOUTHERN: THE ACOUSTICS OF A FAKE ACCENTLATENCY AND REACTIVATION

Performed dialects are often times recognized by listeners as being non-native, suggesting there are linguistic differences between real and fake accents. However, while listeners appear to be aware of a dialect's authenticity, recent work in our lab has shown that there is little effect on the impact of real versus fake accents on lexical access. In this study we measure differences in real and performed southern accents to explore why the differences do not affect speech processing. Data was collected from six non-Southern actresses who read off a scripted monologue in a standard US and southern US accent. The analysis consisted of comparison of the vowels KIT, DRESS, THOUGHT, STRUT, FACE, and PRIZE, as well as voice onset time of stops. For the vowels, formant measurements were taken at 18 points throughout the vowel. Variation in (ING) realizations were categorized auditorily either as the velar [ng] or alveolar [n] variant. These productions were then compared to measurements taken from native Southwest Virginians. Preliminary results show that though the actresses are often technically accurate in producing a southern accent, they seem to be overproducing the features of the accent (using certain features too frequently, or in marked positions). This overdoing of the accent may explain why listeners are able to identify a speaker as faking an accent, but general accuracy may explain why listeners recognize words equally quickly from true and fake Southern speakers.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE SOUTHEASTERN CONFERENCE ON LINGUISTICS IN OXFORD, MISSISSIPPI (OLE MISS) ON MARCH 26-28,2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC.**

Mentor: Dr. Abby Walker (English Department, Virginia Tech)

RYAN S. D'ONOFRIO

VIRGINIA TECH / CLINICAL NEUROSICENCE

A STUTTERING ASSOCIATED MUTATION IN THE GENE GNPTAB ALTERS RAT PUP ULTRASONIC VOCALIZATIONSLATENCY AND REACTIVATION

A promising approach to understanding the mechanistic basis of speech is to study disorders that affect speech without compromising other cognitive or motor functions. Stuttering has been linked to mutations in the lysosomal enzyme-targeting pathway, but how this remarkably specific speech deficit arises from mutations in a family of general cellular housekeeping genes is unknown. To address this question, we produced a missense mutation in the gene Gnptab. This gene has been associated with human stuttering and has been shown to cause vocal abnormalities in mice. We compared vocalizations from rat pups electroporated with a DNA plasmid engineered to carry a mutation in the Gnptab gene or a scramble control that does not target any known gene in the rat. We found significant differences in the vocalizations of pups with the human Gnptab stuttering mutation compared to controls. Specifically, we found that rat pups with the mutation emitted fewer vocalizations per unit time and had longer pauses between vocalizations and that the tonality of the temporal sequence was significantly reduced. Furthermore, Gnptab mutant rats were similar to control rats on an extensive battery of non-vocal behaviors. These data establish the rat as an attractive model for studying this disorder.

Mentor: Mike Bowers (School of Neuroscience, Virginia Tech)

NATHAN VAN DUDA

VIRGINIA TECH / ENVIRONMENTAL SCIENCE

NOAH R. OSMAN

VIRGINIA TECH / CMDA

KENNY Q. NGUYEN

VIRGINIA TECH / MECHANICAL ENGINEERING

NATHAN R. RICE

VIRGINIA TECH / ACCOUNTING

A CASE STUDY ON ELEMENTARY SCHOOL STUDENTS DIETARY HABITS AND NUTRITION WITHIN MONTGOMERY COUNTRY SOUTHWEST VIRGINIA LATENCY AND REACTIVATION

Studies have been done focusing on the schools influence on childhood obesity; however, these studies conclude that there are numerous factors at elementary schools that cause an increase in childhood obesity. In our presentation we will seek to answer the question, Does access to junk food for Montgomery County elementary school students in lunches lead to less nutritional diets and higher obesity rates? Our methodology consists of randomized experiments where the sampled population ranges from children ages seven to eleven, as these students are enrolled in third, fourth, or fifth grade. The population of the sample varies from 168 and 264 students coming from diverse ethnicities and genders. The results of the experiment will depict the statistics received from the broad survey of each student in the sample. We expect to find that access to junk food leads to less nutritional diets and a greater obesity rate within the elementary schools. Information gathered from this study can influence school administration in their decision regarding the presence of snack foods in elementary schools.

Representing Class: ALS 1984

Mentor: Amanda MacDonald (University Libraries, Virginia Tech)

BROCK G. DUMA

BLACKSBURG HIGH SCHOOL

WATER SPORT HELMET STAR: SUMMATION OF THE BIOMECHANICAL PERFORMANCE AND RISK OF INJURYLATENCY AND REACTIVATION

As watersport popularity grows, the number of head injuries, including concussions, is increasing. Each year there are over 7,000 tubing related injuries treated in a hospital, of those nearly 2,000 are head injuries. For participants under 20 years old, the leading head injury mechanism is contact with another person. The purpose of this study was to evaluate the biomechanical performance of watersport helmets and to develop a system for succinctly representing all the data relative to concussion risk.

Ten helmets were selected as a representative subset of all available watersport helmets, and two samples of each helmet were tested. The helmets are from wakeboarding, kayaking, water skiing, and womens lacrosse. A custom impactor was used to test the helmets under head-to-head conditions which are known to be associated with the highest risk of concussion. The impactor consists of two NOCSAE head and Hybrid III neck configurations on 16 kg sliding masses to represent the head, neck and torso of 50th percentile participants. The struck head was instrumented with three linear accelerometers, and a triaxial angular rate sensor.

All watersports helmets reduced both linear and rotational accelerations for all test configurations. The STAR ratings for these helmets can be useful for consumers, because they summate the exposure, linear acceleration, rotational acceleration, and risk into one number that is easily comprehensible.

Mentor: Dr. Stefan Duma (Institute of Critical Technology and Applied Sciences, Virginia Tech)
Mark T. Begonia (ICTAS, Virginia Tech)

LAUREN A. DUMA

BLACKSBURG HIGH SCHOOL

EXPERIMENTAL ANALYSIS OF SKIN AND EYE SURROGATE MODELS FOR DRONE BLADE LACERATIONS LATENCY AND REACTIVATION

As the use of drones becomes increasingly popular and more widespread, the number of drone related injuries has the potential to increase. Drone accidents have caused a variety of injuries, including skin lacerations, open globe eye lacerations, and head injuries leading to unconsciousness. The objective of this study is to examine the ability of drones to cause laceration injuries in tissue surrogates including chamois, 6 month old porcine skin, fetal bovine skin (second trimester), and porcine eyes.

A total of twelve experiments were performed using two drones: the Phantom 4 Advanced and the Air Hogs Axis 200. Lacerations were created by securing each drone to a platform and then moving the skin or eye surrogate into the blades using a custom slider table.

The chamois and 6 month old porcine skin did not prove to be viable skin surrogates because the Phantom 4 Advanced drone has caused severe skin lacerations in humans, and the porcine skin and chamois did not replicate this. In contrast, the fetal bovine skin proved to be an effective skin surrogate. The lacerations caused by the Phantom 4 and the inability of the Air Hogs Axis 200 to cause skin related injuries are consistent with recorded cases in humans. The porcine eyes also proved to be a good eye surrogate as the Phantom 4 tests resulted in globe rupture while the Air Hogs Axis 200 tests resulted in minor corneal abrasions and no full lacerations.

Mentor: Stefan Duma (ICTAS, Virginia Tech)

ROSHAN J. GEORGE

VIRGINIA TECH / INDUSTRIAL AND SYSTEMS ENGINEERING

MARY PLETCHER

VIRGINIA TECH / AEROSPACE ENGINEERING

BRANDON WOO

VIRGINIA TECH / INDUSTRIAL AND SYSTEMS ENGINEERING

ARJUN NACHIAPPAN

VIRGINIA TECH / COMPUTER ENGINEERING

ALEX OWENS

VIRGINIA TECH / COMPUTER ENGINEERING

DRILLFIELD: FUNCTIONAL IN-SITU EXTRACTION LUNAR DEVICELATENCY AND REACTIVATION

Researchers extract ice cores on Earth to uncover information concerning Earth's origins and fossil history. NASA's Artemis Program, with its goal to â€œInvestigate the Moon's mysteries and learn more about our home planet and the universe,â€ [1] has decided to apply ice coring technology to study the Moon's polar ice caps. To support this objective, our team has designed DrillFIELD, the Functional In-Situ Extraction Lunar Device. The purpose of this drill is to extract and capture a 3â€ core sample using tools realistic for a space environment.

Our user-friendly drill includes a stabilizing jig and coring bit that allows astronauts to take quick samples from the Lunar surface. The stabilizing jig allows for a core to be easily collected even on uneven or rocky surfaces, like astronauts will encounter on the moon, and is designed to be compatible with astronautâ€™s bulky suits. Our team used a modified commercial coring bit as our designs coring bit in order to achieve our sample size goal. We were then able to do proof of concept testing for our stabilizing jig and develop future steps to test our entire design on a modeled lunar surface.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE MID-ATLANTIC UNDERGRADUATE RESEARCH CONFERENCE IN BLACKSBURG, VIRGINIA ON MARCH 28-29,2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC**

Mentor: Dr. David Gray (Department of Engineering Education, Virginia Tech)

MARLEY E. GILLIAM

VIRGINIA TECH / ENVIRONMENTAL INFORMATICS

SCOTT BRAATZ

VIRGINIA TECH / ENVIRONMENTAL INFORMATICS

KELLY CRUM

VIRGINIA TECH / WATER: RESOURCES, POLICY & MANAGEMENT

SETTING UP A STREAM MONITORING STATION IN A HEADWATER CATCHMENTLATENCY AND REACTIVATION

The purpose of this project was to install a stream monitoring station on an intermittent stream located on Brush Mountain in Blacksburg to answer a suite of hydrologic questions. The stream has unique characteristics that will allow insight into how streams are affected by recreational trail building, coal mining, and seasonal wetting/drying. We installed instruments to measure stream level, turbidity, conductivity, and temperature. To measure turbidity, conductivity, and temperature, we calibrated and deployed an In-Situ Aqua Troll 500 that delivers real-time data. We also installed a pressure transducer and stream staff gage to measure the depth of the streamwater. Using these data and additional field data, we plan to address three questions. (1) The New River Land Trust plans on building recreational trails within the watershed of the stream. Will turbidity increase in the stream during storms due to soil erosion from trails? (2) There is evidence of historical coal mining in the watershed from visible spoils piles near the stream. How does the distance between the spoils piles and the stream affect the turbidity and conductivity of the stream water? (3) The stream is temporary, meaning it expands and contracts based on hydrologic conditions. How do seasonal changes such as temperature and precipitation cause the stream to expand and contract? In this poster we present our methods for set up, rationale, plans for future work, and preliminary data on our three questions.

Mentor: JP Gannon (College of Natural Resources and Environment, Virginia Tech)

JOE S. GIRGENTE

VIRGINIA TECH / WILDLIFE CONSERVATION

STONEFLIES GET LARGER AS STREAMS GET SALTIERLATENCY AND REACTIVATION

Anthropogenic salinization of freshwater streams is a growing global stressor due to activities including mining, urbanization, and road salting. While salinization generally predicts decreased taxa richness and density and local extirpations of salt-sensitive taxa, the stonefly genus, Leuctra sp., increases in abundance, suggesting favorable conditions in spite of this stressor. While they appear beneficial, the effects of salinization on Leuctra remain unknown. Our objective is to understand how salinization alters the growth and development of Leuctra sp. by modeling length-mass regressions. We measured specimen lengths and masses collected from nine Appalachian headwater streams with varying salinity (25â€“1460 Âµs/cm). We predict Leuctra sp. experience lower individual fitness measurable through a decline in mass accrual rates. However, preliminary data suggest that Leuctra in medium-salinity (402-594 Âµs/cm) conditions accrued mass at a faster rate (4.7-6.0 mg/mm) than Leuctra at lower (3.4 mg/mm)- and higher (3.1 mg/mm)-salinity conditions. We can use these mass accrual rates as a method of impact assessment to identify possible individual and population-level stress. Freshwater salinization can also reduce aquatic biodiversity and redistribute macroinvertebrate community benthic biomass creating cascading, yet currently unknown effects on stream food webs.

Mentor: Dr. Sally Entrekin (Entomology, Virginia Tech)

CARTER J GOTTSCHALK

VIRGINIA TECH / BIOLOGICAL SCIENCES

IN SILICO CHARACTERIZATION AND MUTAGENESIS OF DISABLED-2-DERIVED PEPTIDE SULFATIDE BINDING MOTIF AS A TARGET FOR ANTI-METASTASIS THERAPEUTICSLATENCY AND REACTIVATION

Metastasis is a phenomenon that often leads to lethal spread of cancer throughout the body. Disabled 2(Dab2) is a tumor suppressor protein that regulates cancer metastasis by competing with cancer cells for interactions with sulfatide, a sulfolipid coating blood platelets. The N-terminus of Dab2 responsible for sulfatide binding is called the Dab2 sulfatide binding motif (Dab2-SBM) and is a target for therapeutics to reduce cancer metastasis in the blood. This study seeks to characterize the binding properties of sulfatide to Dab2-SBM and compliment wet lab results using various computational methods. In silico mutagenesis and molecular docking were used to generate and characterize the binding properties of Dab2 mutants and wild-type. Interaction fingerprint analysis was used to analyze the key residues present in the Dab2-SBM. R42A lead to loss of sulfatide interaction, suggesting R42 is a key residue involved in Dab2-SBM association with sulfatide. In addition, mutations K49A, K51A, and K53A lead to tighter electrostatic interactions of the sulfate moiety with R42, suggesting lysine in this region competes for electrostatic interactions with sulfatide. Results were confirmed by experimental binding assays, providing rationale for future experiments that elucidate key residues on Dab2 and test new therapeutics. These in silico results identify potential target residues for novel pharmaceutical development and compliment results seen in Dab2 wet lab conditions.

Mentor: Anne M. Brown (Biochemistry, Virginia Tech)

KATHERINE M. GRANDINETTI

VIRGINIA TECH / CLINICAL NEUROSCIENCE

JILLIAN BOOTH

VIRGINIA TECH / COGNITIVE AND BEHAVIORAL NEUROSCIENCE

CECILIA, M. MARENICK

VIRGINIA TECH / COGNITIVE AND BEHAVIORAL NEUROSCIENCE

THE STUDY OF STRESS SUSCEPTIBILITY AND RESILIENCE THROUGH FOUR CORE GENOTYPE MICELATENCY AND REACTIVATION

Depression is a disease that affects more than 300 million people worldwide, and the incidence is twice as high in women. However, the biological factors contributing to the increased risk for depression in women are not fully understood, and could be due to sex hormones, genetic sex or a combination of both. Therefore, the roles of each were evaluated using Four Core Genotype Mice (FCG). FCG mice have the Sry gene removed or added to isolate effects of gonads or chromosomes. There is a behavioral sex-difference in wild-type mice following 6 days of variable stress, in which females are stress susceptible, but males remain resilient. The FCG mice were exposed to the same 6 day variable stress paradigm, blood was also collected, and behavioral tests were run to measure effects of chromosomal versus gonadal sex. In the forced swim test, karyotypically female (XX) mice with male gonads (testes) showed resilience equal to that of XY mice with proper testes development. We conducted multiplex ELISAs for more than 30 cytokines. Circulating LIX is reduced by stress in XY males, and increased by stress in XX females, independent of gonadal sex. Other cytokines followed the opposite pattern. Results suggest that sex hormones and sex chromosomes may contribute to stress susceptibility and resilience. The specific interactions of these may affect the immune system to influence an individual's stress susceptibility, which may help development of more effective and specific therapies.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION APPLIED TO PRESENT AT THE CENTRAL VIRGINIA CHAPTER OF SOCIETY FOR NEUROSCIENCE SYMPOSIUM IN ROANOKE, VIRGINIA ON MARCH 26-27, 2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC**

Mentor: Georgia Hodes (School of Neuroscience, Virginia Tech)

MACKENZI A. HALLMARK

VIRGINIA TECH / BIOLOGY

HOW IS WATER CHEMISTRY INFLUENCED BY WARMING AND DRYING THROUGH TIME? UNDERSTANDING AMPHIBIAN RESPONSES TO A MESOCOSM EXPERIMENTLATENCY AND REACTIVATION

Many organisms rely on environmental cues to signal when to grow and develop to maximize the chances of survival. In Spring 2019, we conducted a mesocosm experiment to study the effects of increased water temperatures, increased drying rates, and the interaction of both on larval wood frogs (WF) and spring peepers (SP). We examined how tadpole growth was influenced by temperature (Â°C), dissolved oxygen (DO), pH, and specific conductivity (SPC). We also examined how water chemistry varied between and within treatments (control, warming, drying, and warming + drying). We found that temperature was significantly higher in warming and warming + drying tanks for both species through time. DO was significantly higher in the WF control and drying treatments at the beginning of the experiment ($p=0.002$), but not at the end. pH did not differ among WF treatments at any point during the experiment. However, pH was significantly higher in SP warming tanks at the end of the experiment ($p=0.01$). SPC was significantly higher in warming and warming + drying tanks for WF at the end of the experiment and for SP throughout the experiment (SP beginning: $p<0.001$; WF and SP end: $p<0.001$). These results indicate that the effects of warming and drying treatments vary through time and by species. Amphibian larvae that develop later in the season could face different abiotic stressors than those that develop earlier. This suggests a need to consider abiotic cues throughout an experiment.

Mentor: Meryl Mims (Biology, Virginia Tech)
Elizabeth Shadle (Biology, Virginia Tech)

CAITLYN E. HAND

VIRGINIA TECH / ENVIRONMENTAL HORTICULTURE

JENNIFER D. GERHARD

VIRGINIA TECH / AGRIBUSINESS

HORTICULTURE COURSE DEVELOPMENT FOR VIRGINIA TECH UNDERGRADUATESLATENCY AND REACTIVATION

Hydroponic Course Development for Virginia Tech Undergraduates
To educate students where their food is sourced from is vital to a healthy society. As a by-product of the Keesee Scholarship, we proposed and designed a semester long hydroponics course that could be taught at a university like Virginia Tech. Our needs assessment revealed that the Horticulture department lacked a course that integrated hydroponics into the curriculum, so we worked with faculty to design and draft a semester long course with a classroom and lab portion. Virginia Tech is a leading agricultural university, however, we have little material on hydroponics within our agricultural classes. Hydroponics is a rapidly increasing system of discussion and innovation; as a large agricultural university we see it fitting to introduce the subject to our student body. Hydroponics are being used in a wide variety of ways (crops, ornamentals, homes) and would be relevant and applicable to every student within the Horticulture department.

Our overall goal was to work to design and propose a course that undergraduate students would want to enroll in, expand offerings in the college of agriculture and life sciences, and provide educational opportunities for students to learn about the food system. We have worked closely with faculty and staff on campus to develop our class content and feasibility of offering the class to Virginia Tech students.

Mentor: Dr. Tiffany Drape (Ag Leadership and Community Development, Virginia Tech)

MAKAYLA G. HONAKER

VIRGINIA TECH / PSYCHOLOGY

AINSLEY K. PATRICK

VIRGINIA TECH / PSYCHOLOGY

IMPULSIVITY, AGGRESSION, AND EMOTIONAL DYSREGULATION AS CORRELATES OF SUICIDAL IDEATION IN CHILDREN AND ADOLESCENTS LATENCY AND REACTIVATION

Honaker, M.G., Patrick, A.K., Breaux, R., and Ollendick, T. H.

The purpose of this study was to examine the unique associations between impulsivity, aggression, emotional dysregulation and suicidal ideation in a population of children and adolescents referred for a comprehensive psychological assessment.

Data were collected from a clinical sample of 137 children and adolescents (Mean age = 10; range=6-17). Emotional dysregulation was measured using the Emotional Control subscale of the BRIEF-2. Impulsivity was measured using three items of the DBDRS. Aggression was measured on the CBCL. Suicidal ideation was measured by two items on the CBCL, which were combined to create a single variable. Analyses controlled for youth age and gender. A multiple regression analysis was run with all correlates entered into a single model.

Aggression was a unique significant predictor of suicidal ideation, ($\hat{I}^2$ = .302, p = .015), whereas impulsivity ($\hat{I}^2$ = .067, p =.505) and emotional regulation ($\hat{I}^2$ = .102, p = .362) were not significantly related to suicidal ideation. Gender was not a significant covariant ($\hat{I}^2$ = .121, p = .122), whereas age was ($\hat{I}^2$ = .217, p = .008). Specifically, older youth and youth with higher aggressive behavior, as reported by their parents, were significantly more likely to display suicidal ideation. Suicidal ideation scores ranged from 0-3 on the 4-point scale (0=81.0%, 1=13.9%, 2=4.4%, 3=0.7%). Some degree of ideation was present in about 19% of the youth.

Mentor: Rosanna Breaux (Department of Psychology, Virginia Tech)
Thomas H. Ollendick (Department of Psychology, Virginia Tech)

DEXTER W. HOWARD

VIRGINIA TECH / WATER: RESOURCES, POLICY, AND MANAGEMENT

DRIVERS OF DISSOLVED ORGANIC MATTER VARY ACROSS MULTIPLE TIME SCALES IN A DRINKING WATER RESERVOIR LATENCY AND REACTIVATION

Freshwater reservoirs play a significant role in the global carbon cycle by processing and storing large quantities of dissolved organic matter (DOM). DOM can either be buried in the sediments, mineralized and released to the atmosphere, or transported downstream. Understanding magnitude and drivers of DOM is significant to reservoir carbon cycling and management as DOM dynamics may be changing due to human activities and DOM can be a disinfection by-product precursor in the water treatment process. We determined drivers and dominant timescales of fluorescent DOM (fDOM) variability in a drinking water reservoir located in southwest Virginia. We quantified fDOM using in situ sensors sampling at ten-minute resolution over a year. We collected possible fDOM driver data on the same resolution including water temperature, dissolved oxygen, chlorophyll-a, water residence time, precipitation, and incoming solar radiation (SR). We used wavelet analysis to determine dominant timescales of variability and autoregressive time series models to determine dominant fDOM drivers. We found that monthly timescales were the dominant time scale of fDOM variability but that daily scales were significant in summer months. Temperature and SR were important drivers of daily fDOM but only temperature drove monthly fDOM. By determining the dominant time scales of variability and drivers of DOM, our study can help inform managers interested in mitigating DOM levels in drinking water reservoirs.

Mentor: Cayelan Carey (Biological Sciences, Virginia Tech)
Mary Lofton, Graduate Student (Biological Sciences, Virginia Tech)
Alexandria Hounshell, Postdoctoral Associate (Biological Sciences, Virginia Tech)

EMILY H. HURST

VIRGINIA TECH / CLINICAL NEUROSCIENCE

ANALYSIS OF MICROGLIAL COMPLEXITY IN RESPONSE TO VARIABLE STRESS IN FEMALESLATENCY AND REACTIVATION

Depression and anxiety are common, debilitating mood disorders that are more prevalent in women than men. We have reported that stress has sex-specific implications on behavior, 6 days of stress increased stress susceptibility scores in females but not in males. Stress is a trigger for many mood disorders, and has effects on plasticity in the nucleus accumbens (NAc). Microglia are implicated in regulating neuronal plasticity during development and in disease states, and our previous studies have demonstrated that microglia in the NAc become activated following 6 days of variable stress in females, but not males. The purpose of this study was to examine the behavioral effects of minocycline, a drug that blocks classical activation of microglia, in female mice to determine the role microglia may play in stress susceptibility. We found that minocycline decreased microglial complexity in the NAc in stressed female mice compared to stress without minocycline. However, in the three behavioral tests we conducted, minocycline only reduced depression-like behavior in the forced swim test, which measures passive versus active coping strategies. There was no effect in novelty suppressed feeding, and in the splash test minocycline increased depression-like behavior. These results suggest that classical activation of microglia affect specific depression-like behaviors in females, but not all. Future studies will investigate alternate microglial activation methods and behavioral effects.

Mentor: Georgia Hodes (School of Neuroscience, Virginia Tech)

ALEXIS R. JACKSON

VIRGINIA TECH / BIOLOGICAL SCIENCES

SINKS AND SOURCES: THE DYNAMIC CONTRIBUTIONS OF RIPARIAN WETLANDS TO CATCHMENT CARBON BUDGETSLATENCY AND REACTIVATION

Wetlands are important sites of catchment carbon cycling: they receive, store, and emit carbon. However, the role of wetlands in carbon emissions remains largely unquantified. As inundation levels change across stream corridors, riparian wetlands can shrink or dry completely, which may change the magnitude of CO2 and CH4 they emit. To quantify the role of wetlands and changing water levels for river corridor carbon emissions, we measured CO2 and CH4 fluxes along with changes in inundation in 4 riparian wetlands from June 2019 to August 2019 at Coweeta Hydrologic Laboratory, NC and in the Jefferson National Forest, VA. We measured CH4 and CO2 emissions using a flux chamber attached to a portable greenhouse gas analyzer. We also deployed inundation sensors to monitor the presence and absence of water across wetland transects. Coweeta wetlands were sources of both CO2 (167.47 Âµmol m-2 s-1) and CH4 (0.4850 Âµmol m-2 s-1) . Wetlands in the Jefferson Forest were sources of CO2 (175 Âµmol m-2 s-1) but sinks for CH4.(-0.010 Âµmol m-2 s-1). Though we predicted that temperature might increase CH4 and CO2 fluxes, there was no relationship between water temperature and emissions. Ongoing work is quantifying the presence of water as a potential predictor of CH4 and CO2 fluxes. Gaining insight into how much carbon is emitted from riparian wetlands and how changing inundation controls carbon fluxes is a critical next step towards recognizing their importance in catchment carbon budgets.

Mentor: Dr. Erin Hotchkiss (Biological Sciences, Virginia Tech)

MARIAMA DJELIKA KABORE

VIRGINIA TECH / MICROBIOLOGY

INVESTIGATING THE ROLE OF LDTR IN MOTILITY, CELL LENGTH, AND OSMOTIC STRESS TOLERANCE IN SINORHIZOBUM MELILOTI

Investigating the Role of LdtR in Motility, Cell Length, and Osmotic Stress Tolerance in Sinorhizobum meliloti

LdtR is a transcriptional master gene regulator that modulates motility, among other phenotypes, in the agriculturally significant bacterium Sinorhizobum meliloti. It was previously shown that an ldtR deletion strain (ΔldtR) exhibits reduced cell length and decreased osmotic stress tolerance. Additionally, we have found severe defects in swimming motility in an ΔldtR deletion mutant. Remarkably, ΔldtR suppressor mutants readily arise following prolonged incubation on swim plates and exhibit approximately 80% motility restoration. However, it remains to be shown how LdtR influences flagellar motility.

Motility gene regulation in S. meliloti occurs in a hierarchical manner, where the flagellar filament is produced last. To determine if LdtR influences flagellar motility by acting upon the motility gene regulation hierarchy, flagellar filament protein (flagellin) levels were compared for wild type, ΔldtR, and two suppressor mutants using anti-flagellin western blot analyses. These assays demonstrated that the ΔldtR strain and both suppressor mutants produce flagellin at levels comparable to wild type, indicating that LdtR is not involved in motility gene regulation. Osmotic stress assays on solid agar nutrient plates in the presence of 0.6 M sucrose showed that the deletion strain exhibits decreased osmotic stress tolerance,

Mentor:

ROBERT D. KADLEC

VIRGINIA TECH / INDUSTRIAL AND SYSTEMS ENGINEERING

SHANNON M. HICKS

VIRGINIA TECH / INDUSTRIAL AND SYSTEMS ENGINEERING

MICHAEL OTOONI

VIRGINIA TECH / ELECTRICAL ENGINEERING

THE VIRTUAL FACTORYLATENCY AND REACTIVATION

The Virtual Factory is the first part in a multipart project at Virginia Tech known as the Learning Factory. The Learning Factory is a realistically equipped production facility that includes traditional machining and assembly operations found in many current manufacturing environments. It is intended to be a hands-on educational platform to test industry 4.0 technologies and concepts, and is located at Virginia Tech in Durham 197 and 297. The Virtual Factory is the virtual component of the project that displays, in real time, what is happening in the factory. It is visualized using Unity and displays all of the components and machines of the factory. The machines themselves, as well as the rooms, were designed in Autodesk Fusion 360. The scripts for the controls in the Virtual Factory are written in C#. The finalized version of the project, when the Virtual Factory and the necessary other projects that it must connect to are completed, will allow the user to move through a 3D digitized version of the Learning Factory using controls on a computer in 297 Durham and get readings from the machines.

Mentor: Jaime A. Camelio (Industrial and Systems Engineering, Virginia Tech)

DINA A. KANDIL

VIRGINIA TECH / INDUSTRIAL AND SYSTEMS ENGINEERING

SHRIYA KOMMARAJU

VIRGINIA TECH / INDUSTRIAL AND SYSTEMS ENGINEERING

AUGMENTING SPATIAL PERCEPTION WHEN USING FULL-BODY EXOSKELETONSLATENCY AND REACTIVATION

Exoskeletons are increasingly being deployed in manufacturing and other work settings to augment physical strength and reduce injuries of workers. However, wearing an exoskeleton could impede the direct perception and natural movement of the workers, leading to more accidental collisions with surrounding people and objects. One solution is to augment the spatial perception of exoskeleton users to increase their awareness of their surroundings, thereby mitigating the risk of accidental collisions in dynamic work environments. This study investigates user interface design that would yield the best awareness of objects or scenes behind exoskeleton users for preventing accidents.

In this study, participants will be asked to play 12 rounds of the whack-a-mole virtual reality game at three levels of difficulties based on grid sizes while simultaneously detecting and protecting themselves from incoming projectiles from behind them by activating a shield. For each round, participants will be provided with a rear-view video feed, top/birds-eye view, trajectory arrows, or no visual aid. The four rearview interface designs are compared to identify the condition that most effectively promotes spatial awareness. The results of this study will identify the more effective visual aid design that can be implemented in augmented reality glasses to support the users of exoskeletons to be aware of their surroundings and would, in turn, reduce risk of collision accidents.

Mentor: Nathan Lau (Industrial and Systems Engineering, Virginia Tech)
Hsiang-Wen (Gram) Hsing (Industrial and Systems Engineering, Virginia Tech)

JULIA A. KAWAS

VIRGINIA TECH / PHYSICS

MODELING THE PATHOGENESIS OF HUMAN ADENOVIRAL MYOCARDITIS IN INDUCED PLURIPOTENT STEM CELL-DERIVED CARDIOMYOCYTES.LATENCY AND REACTIVATION

Myocarditis accounts for 42% of sudden cardiac death in young adults and involves remodeling of intercellular junctions and cardiac ion channels leading to fatal arrhythmias. Cardiac intercellular junctions encompass connexin43 gap junctions intimately associated with ion channels that together facilitate action potential propagation throughout the myocardium. Alterations in gap junction structure affects sodium channel localization and is reported in almost all forms of heart disease. Adenovirus is a leading cause of myocarditis but the impact of infection on cardiomyocyte architecture, connexin43, and sodium channel function, is essentially unexplored with species specificity hindering development of an animal model. Human induced-pluripotent stem cell (iPSC) technology provides a source of human cardiomyocyte-like cells in which to faithfully model human viral infection. Gap junctions also propagate the cell-intrinsic innate antiviral immune response and so we hypothesized that adenovirus targets connexin43 expression and function to facilitate viral replication leading to arrhythmogenic intercellular junction remodeling in the heart. Using iPSC-derived cardiomyocytes as a model we performed fixed-cell confocal microscopy, live-cell calcium flux imaging, and western blotting over a 72 hour time course following adenoviral infection. Data indicate suppression of connexin43 expression in infected cells, with significant remodeling of ion channel localization and expression.

Mentor: Dr. James Smyth (Biology/FBRI, Virginia Tech)
Patrick J Calhoun (Biology/FBRI, Virginia Tech)
Rachel Padget (TBMH/FBRI, Virginia Tech)

RYAN A. KING

VIRGINIA TECH / CONSTRUCTION ENGINEERING AND MANAGEMENT

MINGHAO DONG

VIRGINIA TECH / CONSTRUCTION EGINEERING AND MANAGEMENT

KENNY WILLIAMS

VIRGINIA TECH / GENERAL ENGINEERING

ROBOTICS IN CONSTRUCTION EDUCATION LATENCY AND REACTIVATION

The use of robotic technology has proven to be worthy components of educational resources. These technologies can be used effectively in the education environment. Also, applying robotics in construction has become critical. Construction teams started to use advanced robotics to simplify complex construction processes and improve human safety on jobsites. So, integration of robotics in construction education is becoming increasingly important. But, construction robotics has not been integrated with undergraduate studies yet. The goal of this project is to facilitate an undergraduate research initiative for the integration of robotic technology in construction education. First, with the support from VT's Office of Undergraduate Research the construction robotics team was established in Myers-Lawson School of Construction by Dr. Afsari in spring 2020 semester. Then, over the course of a semester the team of 3 undergraduate researchers from three degree levels have studied topics regarding robotic technology, construction robotics, and robotics education in an extensive literature review. The team also conducted a comparison analysis of educational robots to perform construction tasks. These include wheeled robots, armed robots, a humanoid robot, and a legged robot. The team reviewed the benefits and challenges of robotics education and have contributed to a survey of perceptions regarding education in construction robotics and competencies needed for the future careers.

Mentor: Dr. Kereshmeh Afsari (Construction Engineering and Management, Virginia Tech)

HANNA D. KIRYLUK

VIRGINIA TECH / ANIMAL AND POULTRY SCIENCES

BRUCELLA ABORTUS IS RECOGNIZED BY THE NEGATIVE REGULATOR NLRX1 OF THE INNATE IMMUNE SYSTEMLATENCY AND REACTIVATION

The bacterium Brucella abortus causes brucellosis, a disease that humans can contract from animals. Bacteria such as B. abortus have proteins that activate immune responses and are recognized by Pattern Recognition Receptors (PRRs). PRRs promote or inhibit 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 inflammatory response. Removing NLRX1 could allow for increased immune response to B. abortus, enhancing the defense against brucellosis. This suggests that PRRs such as NLRX1 are critical to brucellosis drug therapies. However, NLRX1 activation in response to B. abortus has not been determined. Thus, we investigated the immune response to B. abortus in the presence and absence of NLRX1. We used macrophages from wild type and NLRX1 knockout (Nlrx1-/-) mice to analyze inflammatory signaling protein response to B. abortus. We expected Nlrx1-/- mice to have elevated levels of inflammation compared to wild type mice because the absence of NLRX1 should increase inflammatory response. Our results aligned with this hypothesis, as Nlrx1-/- macrophages had increased proinflammatory signaling proteins. This suggests that NLRX1 recognizes B. abortus in the immune system. Further studies focusing on the absence of NLRX1 are vital to understanding the B. abortus immune response and developing brucellosis treatments.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE MID-ATLANTIC UNDERGRADUATE RESEARCH CONFERENCE IN BLACKSBURG, VIRGINIA ON MARCH 28-29, 2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC**

Mentor: Dr. Irving Coy Allen (Biomedical Sciences and Pathobiology, Virginia Tech)

ZENOBIA LEE-NELSON

VIRGINIA TECH / COMMUNICATION STUDIES

AIN'T I A WOMAN, STILL?: BLACK DIRECTED FEMICIDELATENCY AND REACTIVATION

This research highlights the often unrecorded, untimely deaths of black women in the United States. Black female bodies are constantly disappeared in a variety of ways. I address this issue through an examination of these deaths using the lens of gender based violence spanning physical, sexual, economic, structural, and social violence. Through this expanded definition of femicide, I will apply theories of critical race and gender while engaging questions related to the right to live, gendered relationships, erausre of certain bodies, womanhood and femininity in experience of black cisgender and transgender women.

Mentor: Besi Muhonja (African, American American, & Diaspora, Virginia Tech)

DJAMILA LOU

VIRGINIA TECH / RUSSIAN

TEMPERATURE DEPENDENCE OF CONFINED PROTEIN HYDRATION AND DYNAMICSLATENCY AND REACTIVATION

The function and stability of proteins in water strongly depend on temperature and environmental conditions. Temperature dependence explains the denaturation of proteins at low and high temperatures, and the specific globular structure for protein function is determined by the hydrophobic effect. However, the strength of the protein hydrophobicity is very temperature-dependent. Furthermore, measuring the precise collective vibrational dynamics of the proteins in a water solution is challenging due to the strong absorption of water. Thus, we use a very sensitive dielectric megahertz-to-terahertz frequency-domain spectroscopy system to probe lysozyme hydration shells and collective vibrational modes of lysozyme in water. Using this system, we explore the complex dielectric response of solvated lysozyme proteins over a range of 50 MHz to 1.2 THz in a wide range of temperatures. The resulting dielectric relaxation spectra reveal several polarization mechanisms at the molecular level with different time constants and dielectric strengths, reflecting the complexity of the protein-water interactions. Our precise measurements and complex dielectric analysis provide critical information on protein dynamics and protein-water interfaces with a change in temperature, which determines the biochemical functions and reactivity of proteins.

Mentor: Vinh Nguyen (Physics, Virginia Tech)

NOAH G. MAGERKORTH

VIRGINIA TECH / BIOLOGICAL SCIENCES

ZOIE N. MCMILLIAN

VIRGINIA TECH / ANIMAL AND POULTRY SCIENCE

CYBERBIOSECURITY - VT CALSLATENCY AND REACTIVATION

CyberBioSecurity - VT CALS

Mentor: Dr. Tiffany Drape (Department of Agriculture, Leadership, & Community Education, Virginia Tech)

MCKENNA R. MAGOFFIN

VIRGINIA TECH / MATHEMATICS

YUMENG LI

VIRGINIA TECH / CMDA

A MATHEMATICAL MODEL FOR ANTHROPOGENIC CARBON DIOXIDE EMISSIONSLATENCY AND REACTIVATION

The connection between CO2 levels and climate change inspired us to develop a mathematical model to describe the global CO2 cycle with an emphasis on carbon emissions in the lower atmosphere due to human activities (anthropogenic). This model can be used to make projections of future carbon levels, and it can illustrate the relationship between human interference in the carbon cycle and the amount of carbon in the lower atmosphere. Such a model will be helpful to determine guidelines for the reduction in anthropogenic CO2 emissions to reduce a global temperature rise.

We used a compartmental model to describe the relationships between the main carbon sinks and sources in the Earthâ€™s carbon cycle. This approach leads to a system of seven differential equations. The differential equation describing the CO2 levels in the lower atmosphere includes a forcing function that represents the rate of change in human carbon emissions. One approach for modeling this forcing function is guided by data observed by NOAA at the Mauna Loa Observatory in Hawaii, and another is driven by yearly human carbon output data. We implement techniques such as the Gauss-Newton method for solving nonlinear least squares problems, and regression analysis, to determine models for the forcing function and estimate the â€œbest parameters.

In this presentation, we will describe the model, our approaches to estimate parameters in the forcing function, and present a comparison of different approaches.

Mentor: Dr. Lizette Zietsman (Mathematics, Virginia Tech)

SARAH E. MALDONADO

VIRGINIA TECH / BIOLOGICAL SCIENCES

SLEEP BEHAVIORS RELATED TO AGGRESSION IN CHILDREN WITH AUTISM SPECTRUM DISORDERLATENCY AND REACTIVATION

Sleep problems are common in individuals with Autism Spectrum Disorder (ASD), which can lead to these individuals having problematic behavior during the day (Cohen, Conduit, Lockley, Rajaratnam and Cornish 2014). Sleep behaviors are related to aggression as well as other disorders (Gregory and Sadeh 2012). This hypothesized that children with ASD and clinical levels of aggression would demonstrate higher scores on sleep problems. The participants consisted of 29 individuals with ASD that were between 2-5 years old (24 males, 5 females, mean = 3.45 years). The aggression and sleep behaviors were measured by using the Child Behavior Checklist (Achenbach, T. M. ,1999). Of the participants, 10 had clinical levels of aggression on the CBCL (M=64, SD=10.45) while 19 had typical behavior (M=53, SD=5.27). The results supported the hypothesis that children with clinical difficulties with aggressive behavior as measured by the CBCL demonstrated significantly more sleep problems than those without clinical levels of aggressive behaviors (t= -3.23, p=.007). Future research could include examining what other comorbidities may contribute to aggressive behaviors.

Mentor: Angela Scarpa (Psychology, Virginia Tech)

EMI MIYAZAKI

BLACKSBURG HIGH SCHOOL

LEXI J. NUSSBAUM

BLACKSBURG HIGH SCHOOL

EPIGALLOCATECHIN GALLATE BLUNTS INFLAMMATION STIMULATED BY TUMOR NECROSIS FACTOR-Î± IN LIVER SINUSOIDAL ENDOTHELIAL CELLS UNDER VARYING OXYGEN STATESLATENCY AND REACTIVATION

Liver diseases result in over 2 million deaths annually around the world. Among such diseases, non-alcoholic fatty liver disease involves liver inflammation and fat buildup in liver cells. Nutraceutical products, such as green tea, have been researched extensively for health benefits to reduce such diseases. Epigallocatechin gallate (EGCG) is a catechin found in green tea leaves, and previous studies have shown EGCG to have potential anti-inflammatory effects. However, the effects of EGCG on inflamed cells in a low oxygen (hypoxic) state, which acts as an added stressor, are not fully understood. This experiment modeled the effects of EGCG on inflamed liver sinusoidal endothelial cells (LSECs) in both normoxic and hypoxic conditions using an in vitro technique. LSECs were put into a state of inflammation using tumor necrosis factor alpha (TNF-Î±). The effects of EGCG were analyzed in an adhesion assay to measure cell adherence and qPCR to measure VCAM-1 (an adhesion molecule upregulated by TNF-Î±) expression. EGCG decreased cell adherence and VCAM-1 expression in both normoxic and hypoxic conditions, but hypoxia was not found to have an effect on inflammation or the success of EGCG. While these results suggest the potential for EGCG to be an anti-inflammatory agent, future work to further research the hypoxia condition can be conducted by pretreating the LSECs with EGCG, analyzing a variety of adhesion genes, and assessing the effect of the duration LSECs spent in hypoxia.

Mentor: Siobhan Craige (Human Nutrition Foods and Exercise, Virginia Tech)
Sarah Donnelly (Human Nutrition Foods and Exercise, Virginia Tech)

JONATHON M. MONROE

VIRGINIA TECH / BIOLOGICAL SCIENCES

STREAM INTERMITTENCY ALTERS MICROBIAL METABOLISM AND FUNCTIONAL DIVERSITYLATENCY AND REACTIVATION

Heterotrophic microbes, with their high abundance and diversity of metabolic strategies, regulate biogeochemical processes in streams. Intermittent streams may favor microbes who can adapt to extreme fluctuations in hydrology (i.e., transitions from persistent flow to isolated pools and dry beds), but we still know little about how microbial function may change over space and time in dynamic ecosystems. Thus, our objective was to understand how changes in hydrology affect microbial functional diversity and community metabolism. From Spring to Fall 2019, we sampled sediment and water from an intermittent headwater stream in Jefferson National Forest, VA. We analyzed microbial metabolism and functional diversity by incubating samples in Biolog EcoPlates, which contain 31 carbon substrates and develop color changes that directly relate to metabolism. Community metabolism was higher in isolated pool and dry bed sediments compared to persistent flow sediments ($p<0.0001$). Further, water microbial metabolism in isolated pools was higher than in persistent flow ($p=0.04$). Season and hydrology uniquely affected metabolism of specific substrate groups (e.g., carbohydrates). The diversity of metabolic enzymes was positively related to microbial metabolism in sediment ($R2=0.73$) and water ($R2=0.72$) communities. By measuring changes in the functional diversity of microbial carbon metabolism, these data increase our understanding of carbon cycling in intermittent headwaters.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE ASSOCIATION FOR THE SCIENCES AND LIMNOLOGY AND OCEANOGRAPHY-SOCIETY FOR FRESHWATER SCIENCE JOINT MEETING IN MADISON, WISCONSIN ON JUNE 7-12,2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC**

Mentor: Erin Hotchkiss, PhD (Biological Sciences, Virginia Tech)

JESSIE M. MONTGOMERY

VIRGINIA TECH / APSC

ANTIMICROBIAL RESISTANCE IN ENTERIC BACTERIA ISOLATED FROM CHICKEN LINEAGES REARED WITHOUT THERAPEUTIC USAGE OF ANTIBIOTICSLATENCY AND REACTIVATION

Escherichia coli is a significant cause of morbidity and mortality in poultry, recently becoming an issue in laying hens by causing reduced egg production. In the past, E. coli infections were treated by therapeutic administration of antibiotics to affected flocks, resulting in a tolerance of these antibiotics by the bacteria. Many have tried to link antimicrobial resistance to specific antibiotics but have been unsuccessful due to the significantly high level of resistance in Gram-negative enterics. Four chicken lineages that have been reared without antibiotics were developed at Virginia Tech and perpetuated for 50 plus years. This study was designed to determine base-line antimicrobial resistance in chickens that have been reared for multiple generations without antibiotics. We determined the level of resistance to ampicillin, tetracycline, and streptomycin; antibiotics commonly used for treating E. coli infections in poultry; in cecal Gram-negatives isolated from Virginia Tech chicken lineages. Cecal droppings were serially diluted 10-fold and plated on MacConkey agar alone and with various antibiotics. Preliminary results do not show any significant trends; however, it was observed that most of the light body weight birds were resistant to most antibiotics, except ampicillin. The heavy weight birds showed the most variation. In future studies, these chicken lines will prove useful in understanding evolution of antimicrobial resistance following antibiotic use.

Mentor: Dr. Maurer (APSC, Virginia Tech)

SARAH E. MORGAN

VIRGINIA TECH / MATH

SPARSE WAVELET TEMPLATE MATCHINGLATENCY AND REACTIVATION

Template matching, a technique used in a variety of fields such as seismic detection, has recently been used to vastly improve our small earthquake detection sensitivities, bringing out weak events from continuous seismic recordings by cross-correlating them against known template events. Earthquake catalogs are often dominated by small events occurring much more often than larger events but are still missing even smaller magnitude events. These missing events could be due to a lack of equipment or signal fidelity issues. We are focused on developing fundamentally new cross-correlation algorithms operating on data stored in compressed forms without decompression. This study uses data provided by the Fiber Optics for Environmental Sensing (FORESEE) Project. This dataset provides a wide variety of signals from 2137 channels set across the Penn State University campus collecting 500 samples per second. We first pick out noticeable events from this data and compute a time-lagged cross-correlation to find similar events within a certain time frame. We can then use the Wavelet toolbox in Matlab to compress the signal over the given time frame. With this compression, we investigate the wavelet coefficient thresholding and the level of wavelet decomposition to obtain an acceptable compressed form. Using this compressed version of the signal should result in significant speedups for the cross-correlation computations and a more efficient method of template matching.

Mentor: Eileen Martin (Math, Virginia Tech)

CLAIRE M. MORTON

BLACKSBURG HIGH SCHOOL

THE DIVISION DECISION: THE CDC13 PROTEIN AND CELL SIZE CONTROLLATENCY AND REACTIVATION

How cells regulate and maintain their size is fundamentally unknown. Failure to maintain a consistent cell size has been associated with cardiac disease, brain disease, musculoskeletal disease, and cancer. The objective of this research is to understand whether the Cdc13 protein in fission yeast is an indicator of cell size. The concentration of Cdc13 decreases at cell division but rises as cells grow. This project addresses whether Cdc13 accumulates as time passes (time-dependent accumulation) or directly responds to cell size (size-dependent accumulation). Predictions about time- and size-dependent accumulation were made using a computational model and experimentally tested using live cell imaging and western blot procedures. The live cell imaging demonstrated increasing concentrations of Cdc13 with cell size and time. The western blot indicated a short protein half-life which, according to the model, suggests size-dependent rather than time-dependent accumulation. This project concludes that Cdc13 concentration increases dependent on cell size. Because Cdc13 is increasing in concentration as the cell grows and is known to induce cell division, it has the potential to act as a sensor to measure cell size and trigger division at the correct size. Many fission yeast proteinsâ€™ functions are conserved in complex organisms, which may suggest similar size control mechanisms in human and animal cells.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE INTERNATIONAL SCIENCE AND ENGINEERING FAIR (ISEF) IN ANAHEIM, CALIFORNIA ON MAY 10-15, 2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC**

Mentor: Katharine Davis (Blacksburg High School AP Research Teacher)
Dr. Silke Hauf (Department of Biological Sciences, Virginia Tech)

EMILY N. NOLEN

VIRGINIA TECH / APSC

DETERMINATION OF NUTRIENT DIGESTIBILITY IN BEEF CALVES CONSUMING A FORAGE-BASED RATION AND SUPPLEMENTED WITH INCREASING LEVELS OF CORN GLUTEN FEED LATENCY AND REACTIVATION

Corn gluten feed is a co-product of the corn wet milling industry and is composed of highly digestible fiber, a moderate crude protein content and a relatively low starch content. The objective of this experiment was to determine the effects of various levels of supplemental corn or CGF on total tract digestibility of organic matter, fiber, and crude protein. Twelve purebred Angus or Simmental heifers were stratified across treatments by BW and breed in a 2 x 2 factorial arrangement of treatments with two periods. Treatments included either corn or CGF fed at 0.25% BW or 0.75% BW. Each period consisted of an 18 d adaptation period followed by 3 d of fecal sampling. During the second period heifers were stratified by previous treatment and no heifer received the same treatment twice. Hay was fed ad libitum throughout the experiment. Daily feed was offered and refusals were recorded daily, and animals were weighed at the beginning and end of each period to determine ADG and feed efficiency. A 9.5 g bolus of titanium dioxide was given daily during the final 11 d of each period as an external marker to estimate digestibility. Data was analyzed using lmer in R and the model included the fixed effects of supplement type, level, their interaction, and breed, and the random effect of period. Significance was defined at P â‰¤ 0.05 and means were separated using LSD. No significant interactions were noted for any of the variables measured. Average daily gain and G:F were not different.

Mentor: Bain Wilson (APSC, Virginia Tech)
Chuck Zumbaugh (APSC, Virginia Tech)

TAYLOR N. OLSON

VIRGINIA TECH / RESIDENTIAL ENVIRONMENTS AND DESIGN

HAENYEO HOUSE: AGING-FRIENDLY & SUSTAINABLE CONTAINER HOMELATENCY AND REACTIVATION

The main goal of this project is to identify and reflect the cultural aspects of the South Korean Jeju women divers, or Haenyeo, to the home's design by using sustainable features, materials, and finishes with affordability in mind. The purpose of this project is to provide affordable and sustainable housing for the Haenyeo (who are known to go through extreme work conditions to provide for their families until they are physically unable to work) to age in place comfortably. The process of creation includes taking an Implicit Association Test, in-depth research on the topics of Aging-in-Place and Multiculturalism, an in-person interview with Dr. Seung Koh, Director of Jeju Aging Society Research Center, creating an inspiration collage, design concept/goals, schematic plans, choosing materials and features, and lastly, finalizing floor plans, elevations, and 3Ds. In conclusion, I successfully maximized the usage of the small space by featuring flexible, multi-use furniture in an open concept floor plan, all while continuing the main design goals of sustainable coexistence with the natural environment and by balancing the modern and traditional aspects of Jeju culture.

Mentor: Eunju Hwang (AHRM, Virginia Tech)

NATHAN OTTO

VIRGINIA TECH / BIOCHEMISTRY

LIGHTING UP TRANSCRIPTION SITES TO REVEAL MECHANISMS OF CELLULAR HOMEOSTASIS

As cells grow and divide, their mRNA concentrations remain relatively constant. This is important for maintaining constant protein concentrations, and therefore for cellular homeostasis and viability. The exact mechanism is unclear. The prevailing hypothesis is that cells increase the rate of transcription as they grow, so that the RNA numbers can keep up with cell growth. My projectâ€™s goal is to test this hypothesis for a suite of genes in fission yeast. This can be accomplished by visualizing â€˜nascentâ€™ mRNA molecules that are currently being transcribed in individual cells and relating their number to cell size. A powerful method to visualize RNA molecules in individual cells is single-molecule mRNA-FISH (smFISH). However, smFISH cannot distinguish the nascent mRNA molecules from those that have been transcribed in the past. To overcome this problem, I will fluorescently label the DNA near genes of interest â€“ which will mark the transcription site. This will be a powerful supplement to smFISH experiments and will support several current projects in the lab that aim to understand mRNA concentration homeostasis as well as variability. However, initial testing of a commonly used DNA labeling system revealed that our smFISH protocol drastically reduces the signal from the DNA label. Hence, I am currently exploring how to resolve this issue by modifying the smFISH protocol. I have narrowed down the problem to the fixation step of smFISH, and will be optimizing this step.

Mentor: Dr. Silke Hauf (Biological Sciences, Virginia Tech)

AINSLEY K. PATRICK

VIRGINIA TECH / PSYCHOLOGY

MAKAYLA G. HONAKER

VIRGINIA TECH / PSYCHOLOGY

THE RELATION BETWEEN EMOTION REGULATION AND RULE-BREAKING BEHAVIOR IN YOUTH WITH ADHDLATENCY AND REACTIVATION

Emotion regulation is a central deficit for many psychological disorders (Aldao et al., 2016); one disorder often characterized by difficulties in emotion regulation is attention-deficit/ hyperactivity disorder (ADHD; Mullin & Henshaw, 2006). There is evidence to suggest that emotion regulation may be associated with different ADHD presentations (Bunford et al. 2015).Â The purpose of this study was to examine if the association between parent-reported emotion regulation and parent-reported rule-breaking behavior differed across ADHD presentations. Data were collected from a clinical sample, totaling 51 individuals with ADHD (age range = 7-17). Emotion dysregulation was obtained from maternal report on the BRIEF emotion control subscale. Rule-breaking behavior was obtained from maternal report on the Child Behavior Checklist. To investigate the relations between emotion regulation and rule-breaking behavior across ADHD presentations (35=ADHD-C, 16=ADHD-I), a moderation analysis was conducted using PROCESS macro (Hayes, 2012) in SPSS.Â The interaction between emotion regulation and ADHD diagnosis was statistically significant (b=.152, SE =.056, 95% CI =.038 - .265, p=.009). Emotion regulation was significantly associated with rule-breaking for youth with an ADHD-C presentation (b=.313, SE=95% C.I.=.179 .447, p<.001). The relation between emotion regulation and rule-breaking was not significant for youth with an ADHD-I presentation (b=.010, SE=.091, 95% C.I.=-.173 -.193, p=.193).

Mentor: Dr. Rosanna Breaux (Psychology, Virginia Tech)
Dr. Thomas Ollendick (Psychology, Virginia Tech)

CAROLINE PONTICELLI

VIRGINIA TECH / HNFE

EXAMINING PURCHASING PATTERNS FOR SNAP PARTICIPANTS USING A FINANCIAL INCENTIVE FOR FRUIT AND VEGETABLE PURCHASESLATENCY AND REACTIVATION

This study's purpose is to characterize purchases by Supplemental Nutrition Assistance Program (SNAP) participants using Virginia Fresh Match (VFM) point of purchase incentives. The VFM project is intended to increase access to and consumption of fruits and vegetables (F&V) for consumers on SNAP by providing a half off incentive for produce purchases. Sales data, in the form of receipts of SNAP transactions, have been collected from two food cooperatives participating in the program. This will be compared over time, in 1, 3, 6 and 12 month intervals. The data presented here represent the first month and are a relative baseline of SNAP participantsâ€™ current purchasing habits. Of the total SNAP customers 51% used the benefit and those that did, saved a combined $544.22. Customers using the incentive bought an average 2-3 F&V items per transaction. Miscellaneous bulk produce was bought over 3x more than other items, followed by bananas, onions and watermelon. On average, 24.76% of SNAP was spent on F&V, an average of $8.74. Participants saved an average of $4.19 using the incentive. A social marketing campaign will be implemented to increase incentive awareness and use, to allow SNAP participants to afford fresh produce. These baseline results will inform the campaign development. From this point, the study will continue to track the receipt data, to better understand habits of SNAP participants, and how to better serve them.

Mentor: Sarah Misyak (HNFE, Virginia Tech)

AMBER R. REANEY

VIRGINIA TECH / BIOLOGICAL SCIENCES

THE EFFICACY OF OYSTER MUSHROOM (PLEUROTUS OSTREATUS) HYDROPONICS IN REDUCING FECAL COLIFORMS IN STAGNANT SYNTHETIC WASTEWATERLATENCY AND REACTIVATION

Modern subsistence and commercial agriculturalists have begun to utilize hydroponic systems as sources of sustainable substrate recycling. Bacterial contamination from fecal material is a concern in water-based soil recycling from farms that house livestock. Our experiment sought to create a unique hydroponics system that could produce a harvest of blue oyster mushrooms (Pleurotus ostreatus) while utilizing the antimicrobial secondary metabolites produced by these mushrooms to reduce fecal coliform contaminants. To test the efficacy of the mushrooms, water samples were taken from the housing tanks at 72 hours for a total of 15 days and plated on MacConkey agar. Growth counts were taken manually. The mushrooms themselves were tested for coliform contaminants to determine edibility after harvest. The major findings of this study suggest that oyster mushrooms have the capacity to reduce fecal coliforms by a max of 2.3 log compared to that of the control. Though oyster mushrooms can reduce overall fecal coliform contaminant load, the mushrooms themselves evidently uptake bacteria at a rate of 2.25 log per 10 g mushroom. Hence, the mushrooms are not edible after harvest without risk of fecal-borne disease. This study is a steppingstone in discovering the potential dangers in novel agricultural substrate recycling. Data from this study can be utilized to inform agriculturalists who use hydroponic cleaning systems of their potential options with regards to choice of treatment mode,

Mentor: Dr. Monica Ponder (Food Science & Technology, Virginia Tech)
Kim Waterman (FST, Virginia Tech)
Jian Wu (FST, Virginia Tech)
Jennifer Acuff (FST, Virginia Tech)

JAKE RINEY

VIRGINIA TECH / COMPUTER SCIENCE

COMPARING SEASONAL CHANGES IN DAILY RATES OF METABOLISM OF TWO ADJACENT STREAMSLATENCY AND REACTIVATION

Net metabolism in a stream is the collective amount of carbon fixed (gross primary productivity (GPP)) and organic carbon converted to CO2 (ecosystem respiration (ER)). Metabolism is influenced by both upstream pressures, such as nutrient and sediment pollution, and the immediate surrounding environment through controls such as canopy cover and leaf litter input. These environmental controls differ across a stream network and can change across seasons, leading to vastly different patterns in GPP and ER between streams. Metabolism's link with water quality and environmental changes makes it crucial to understand how these rates can vary across streams and seasons. To better understand this spatial and seasonal variation, we compared daily rates of metabolism of two adjacent streams, Stroubles Creek (SC) and Walls Branch (WB), located in Blacksburg, VA, during three separate periods from 2018 to 2019. Metabolism was modeled from oxygen sensor data measured just above the confluence of the two streams and over one week for each deployment. We found that metabolism rates were higher in SC (GPP from 0.48 g to 5.62 g O2 m-2 d-1; ER from -10.69 to -1.65 g O2 m-2 d-1) than in WB (GPP from 0.01 g to 0.46 g O2 m-2 d-1; ER from -4.80 to -0.07 g O2 m-2 d-1), varied more across seasons in SC than in WB, and were most similar between both streams in the mid-summer deployment. Currently, we are comparing how the mixing of these two streams at the confluence affects downstream metabolism.

Mentor: Erin Hotchkiss (Biological Sciences, Virginia Tech)

KATHERINE A. ROTH

VIRGINIA TECH / BIOLOGICAL SCIENCES

AN ANALYSIS OF CHRONIC REGULATORY FOCUS MEASUREMENT INSTRUMENTS LATENCY AND REACTIVATION

Regulatory Focus (RF) is a motivational theory rooted in approach and avoidance (Higgins, 1997). Individuals tend to have a chronic preference for one of two RF orientations: a prevention focus that is driven by safety and responsibility or a promotion focus, which is driven by accomplishments and aspirations. There are multiple measures of chronic regulatory focus; these instruments tend to be implemented in experimental designs interchangeably (Haws et al, 2010). However, the extent to which these instruments capture the same latent construct needs to be established. The current study seeks to compare three chronic measures of chronic regulatory focus: Regulatory Focus Questionnaire (RFQ), Regulatory Focus Questionnaire Proverbs Form (RFQ-PF), and General Regulatory Focus Measure (GRFM). Using factor analysis, the current study will examine whether these three instruments of chronic regulatory focus can be used interchangeably and interpreted the same way. Implications for researchers and RF theory itself will be discussed.

Mentor: Dr. Roseanne Foti (Psychology, Virginia Tech)
Jessica Gladfletter (Social Cognitive and Industrial Psychology Lab, Virginia Tech)

RYAN SHAW

VIRGINIA TECH / BIOLOGY

BEAT THE HEAT: HOW CULEX QUINQUEFASCIATUS REGULATES ITS BODY TEMPERATURE DURING BLOOD FEEDING LATENCY AND REACTIVATION

Mosquitoes are regarded as one of the most dangerous animals on earth. As they are responsible for the spread of a wide range of both human and animal diseases, research of the underlying mechanisms of their feeding habits is critical to the maintenance of global health. One such mosquito, Culex quinquefasciatus, which are known carriers of West Nile virus and Western Equine Encephalitis, remains relatively unstudied in terms of blood feeding. As blood feeding insects, adaptations (either at the molecular or physiological level) while feeding on warm blood is crucial to their survival, as overheating can result in death due to heat stress. Our research aims to study how Cx. quinquefasciatus cope with heat associated with the ingestion of a warm blood-meal and to possibly uncover the adaptations they use to avoid thermal stress. Through the use of thermographic imaging, we will be analyzing the temperature of the head, thorax, and abdomen of Cx. quinquefasciatus while blood feeding. Infrared thermography also allows one to identify a multitude of biological cooling strategies, such as evaporative cooling via the production of fluid droplets. Understanding Cx. quinquefasciatusâ€™ adaptations and various strategies that they might employ to reduce their body temperature while blood-feeding constitute the first step towards the discovery of potential targets of opportunity for their control.

Mentor: Chloe Lahon’re (Biochemistry, Virginia, Tech)
Joanna Reinhold (Biochemistry, Virginia Tech)

ALYSSA R. SMITH

VIRGINIA TECH / PSYCHOLOGY

DEPRESSION IN CHILDREN WITH AUTISM SPECTRUM DISORDERLATENCY AND REACTIVATION

Autism Spectrum Disorder (ASD) is characterized by persistent deficits in social communication, restricted, repetitive behavior, interests, or activities, seen in the early developmental period (American Psychiatric Association, 2013). ASD related deficits can look similar to other disorders such as depression. Current studies highlight research on anxiety and ASD but there is little research on depression in children with ASD. This makes it difficult to understand if children are experiencing ASD deficits or depression. It was hypothesized that children exhibiting more severe characteristics of ASD will positively relate to levels of depressed mood in a sample of minimally verbal children diagnosed with ASD. Participants consisted of 13 minimally verbal children ages 2-10 (M=5; SD=2.35; 12 males, 1 female) and at least one parent. Depressed mood was measured using scores from Depressive Problems and Affective Problems scales on the Child Behavior Checklist (CBCL; Achenbach, & Edelbrock 1983). Severity of Autism was measured using the Autism Diagnostic Observation Schedule-2 (ADOS-2; Gotham, Risi, Pickles, & Lord,2007). No significant correlation was seen between depressive symptoms and ADOS-2 comparison score (r=.29, p=.17). Although there is no correlation, the positive slope suggests that children with moderate ASD may have better success regulating their emotions, resulting in lower depressive symptoms. Further research is needed with a larger sample size.

Mentor: Angela Scarpa (Psychology, Virginia Tech)

ELIJAH R. SOCASH

VIRGINIA TECH / COMPUTER ENGINEERING

MANAV SHETH

VIRGINIA TECH / INDUSTRIAL SYSTEMS ENGINEERING

LF19-05 - OPERATOR MOVEMENT TRACKINGLATENCY AND REACTIVATION

The goal of LF19-05 is to create a system that can track an operator's (x,y) coordinates in a floor space using only cameras. Such a system could help manufacturing managers keep tabs on energy and equipment usage throughout an assembly line, or simulate the operators' locations. Originally, this system was to incorporate a server (The Digital Factory) that would organize the camera images to be processed into coordinate data. Working off-campus has forced us to compromise without the server, but it has helped us focus on converting the image pixel coordinates into the floor space coordinates. The human tracking software we used is Open Pose, a real-time system designed to estimate keypoints of the human body. It uses these keypoints to draw 2-D human figures, similar to connecting the dots. If we extract the pixel coordinates of the feet keypoints, we can find the operator's virtual location in the photo. Since the floor is at an angle to the camera, the camera's coordinate plane needs to be converted into the plane on the floor space. This is achieved with a homographic transformation, which will map our image coordinates to the floor's (x,y) coordinates, resulting in the operator's real position. While our system is capable of tracking one operator, we hope to expand its capabilities in the future. Plans are to increase the max operators that can be tracked at once, the inclusion of the server, and using processed coordinates in a real-time simulation of the floor space.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE ISE UNDERGRADUATE RESEARCH SYMPOSIUM IN BLACKSBURG, VIRGINIA ON APRIL 28, 2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC**

Mentor: Jaime Camelio (Industrial and Systems Engineering, Virginia Tech)

SARAH G. TARTABINI

VIRGINIA TECH / BIOCHEMISTRY

A BIOINFORMATIC APPROACH TO CHARACTERIZING AND ANALYZING G-PROTEIN-COUPLED RECEPTORSLATENCY AND REACTIVATION

Many diseases, including cancers, obesity, and Alzheimer's disease are linked to G-protein-coupled receptors (GPCRs). GPCRs make up the largest group of receptors, and serve as targets for many drugs. The role of GPCRs cell communication pathways make them ideal for drug development. While studies have been conducted to understand these receptors, there is a lack of knowledge on generalized classification. Additionally, olfactory receptors (ORs), a common GPCR, are not well understood. This work seeks to utilize databases and bioinformatic approaches to characterize commonalities and probe a specific OR, OR2T7 for targeting. Results from in silico studies on known, modeled ORs activated by rhodopsin appeared exhibiting tighter coupling between the pocket and extracellular domain, and had larger pocket volumes. Furthermore, the volume of the ligand confirmed the pocket fits the ligand and location. Bioinformatic analysis revealed key mutations in OR2T7 for future studies. The intent behind studying classification at the biochemical level is to analyze these proteins as there is limited knowledge. The purpose focused on providing characterizable features by measuring volume of the binding sites and ligands, investigating OR2T7 by performing uniport BLAST, pharmacophore, and multiple sequence alignment (MAFFT). Bioinformatics can be used to investigate foundational characteristics to gain understanding of the biochemical level of activity to improve drug development.

Mentor: Dr. Anne Brown (Biochemistry, Virginia Tech)

TYLER TEMME

VIRGINIA TECH / MECHANICAL ENGINEERING

ON THE DESIGN OF A FIREBRAND GENERATOR AND TESTING FACILITYLATENCY AND REACTIVATION

Wildfire spread is largely dependent on the production and transportation of burning embers, known as firebrands, usually lofted through the air. Understanding how these firebrands travel with convective currents and how they ignite natural and artificial materials will help better predict how wildfires spread and how to engineer for greater fire resilience. The first step in analyzing these processes is designing and building a system that creates and then disperses firebrands in a controlled and consistent manner. Once this system is fully operational, firebrand activity can then be studied. Design work began by analyzing other existing firebrand generators, referred to as â€œDragonsâ€ , to better understand previous work in this field. A novel design was created using a propane jet burner to simultaneously heat firebrands to ignition temperatures and propel them into an enclosed wind tunnel. Computational Fluid Dynamic analysis was used to determine how to configure the testing area for firebrand analysis. This research mainly focused on designing the firebrand generator and then how to incorporate this into a testing facility for studying the generation, transport, and heat transfer of firebrands. This experimental setup should prove helpful for the analysis of firebrand behavior and allow for a greater understanding of wildfire spread.

Mentor: Brian Lattimer (Mechanical Engineering, Virginia Tech)

ANURADHA G. TRIVEDI

VIRGINIA TECH / MATHEMATICS

FAST TOMOGRAPHIC IMAGE RECONSTRUCTIONLATENCY AND REACTIVATION

Tomographic imaging is a very common imaging technique used in a wide variety of fields such as medicine, geophysics, and materials science. The goal of tomographic imaging is to generate a high resolution 2D reconstruction of an object being imaged while minimizing structural and statistical noise. As higher resolution images are obtained, increasingly large amounts of data need to be processed. A drawback to processing more information is that the reconstruction is computationally expensive, requiring the implementation of higher performance image processing techniques. The motivation for our work is to achieve fast, high quality reconstructions by reducing noise as much as possible. We developed a Python implementation of a Fourier grid-based reconstruction algorithm (gridrec) to compare our performance improving methods to pre-existing image reconstruction packages. We utilize this gridrec implementation to investigate parallelizing the reconstruction process by distributing the tasks over 8-64 central processing unit (CPU) nodes. We also investigate how the reconstruction time decreases when certain operations are performed on a graphics processing unit (GPU) instead of on a CPU. These tasks are distributed over 1-8 GPU nodes to determine the scalability of our implementation.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE STANFORD RESEARCH CONFERENCE AT STANDORD UNIVERSITY ON APRIL 10-12, 2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC**

Mentor: Eileen Martin (Mathematics, Virginia Tech
Talita Perciano (Computational Research Division, Lawrence Berkeley National Laboratory)

TAYLOR C. TUHY

VIRGINIA TECH / BIOCHEMISTRY

LAUREN E. FRITSCH

VIRGINIA TECH

ALICIA M. PICKRELL

VIRGINIA TECH

AGING DAMPENS THE IMMUNE RESPONSE AFTER TRAUMATIC BRAIN INJURY

Traumatic brain injury (TBI) is a leading cause of death and disability, occurring mainly in young adults and elderly. Injuries occur in two phases: the primary injury, which consists of mechanical damage, and a secondary biochemical injury that includes inflammation. Precautions are in place to reduce the risk of sustaining a TBI, 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 after injury in young mice (2 months) or aged mice (6 months) to reflect the human populations susceptible to TBI. When evaluating the immune response in older mice, our data shows a blunted response in production of inflammatory molecules after injury when compared to 2-month-old mice. Our previous work has shown that inhibiting an immune regulatory protein called STING (stimulator of interferon genes) may be beneficial in 2-month-old mice and is responsible for the inflammatory molecules produced after injury. However, we did not see a difference in STING protein levels in the brains of 2-month and 6-month-old mice. Future studies with mice lacking a functional STING protein will test whether STING is neuroprotective in aged mice. By understanding inflammatory events after TBI in aged mice versus young adult mice, this preclinical data will ai.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE MID-ATLANTIC UNDERGRADUATE RESEARCH CONFERENCE IN BLACKSBURG, VIRGINIA ON MARCH 28-29, 2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC**

Mentor: Alicia Pickrell (Neuroscience, Virginia Tech)

TAYLAN TUNCKANAT

VIRGINIA TECH / BIOCHEMISTRY

IN VITRO CHARACTERIZATION OF LYSINE-2,3-AMINOMUTASE FROM METHANOCOCCUS MARIPALUDISLATENCY AND REACTIVATION

Lysine-2,3-aminomutase (LAM) catalyzes the conversion of L-Î±-lysine to L-ÃŸ-lysine. This enzyme plays a role in combating salt stress in methanogenic archaea by carrying out the first step in the biosynthesis of NÎµ-acetyl-ÃŸ-lysine, a well-studied osmolyte synthesized and accumulated in methanogens. LAM is of special interest as it belongs to the radical S-adenosyl-L-methionine (SAM) superfamily of enzymes which perform diverse and complex chemistry that produce essential biomolecules. Although the bacterial LAM involved in lysine degradation in Clostridium subterminale has been well-characterized, the archaeal LAM involved in osmolyte biosynthesis has never been studied in vitro. Here, we report on the recombinant expression, purification, and enzymatic properties of LAM from Methanococcus maripaludis. The gene encoding LAM from M. maripaludis C7 (MmarC7_0106) was cloned and the his-tagged protein was overexpressed in Escherichia coli. After purification by metal-affinity chromatography under strictly anaerobic conditions, the [4Fe-4S] cluster of the protein was characterized via UV-Vis spectrometry and amounts of Fe and S present per monomer were determined. Finally, the kinetic parameters for the enzyme reaction in the presence of L-lysine, SAM, and dithionite at optimum conditions were established. Taken together, this work successfully characterized the first methanogenic LAM and sets the stage for future investigations of other diverse radical SAM aminomutases.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE AMERICAN CHEMICAL SOCIETY NATIONAL MEETING IN PHILIDELPHIA, PENNSYLVANIA ON MARCH 22-26, 2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC**

Mentor: Kylie Allen (Biochemistry, Virginia Tech)

WILLIAM VAUGHN

VIRGINIA TECH / CHEMISTRY

BIOINSPIRED POLYMERS FOR SEQUESTRATION OF DOXORUBICIN DURING CHEMOTHERAPY TREATMENTLATENCY AND REACTIVATION

Liver cancer remains the third leading cause of cancer mortality in the United States. Liver cancer treatment often involves administering a chemotherapeutic agent, such as doxorubicin (DOX), during a transarterial chemoembolization (TACE) procedure. In this procedure DOX is released via a catheter in the tumor maximizing the amount of chemotherapy that reaches the tumor; however, DOX still enters systemic circulation, causing off target toxicity. We are developing polymers with pendant nucleobases to bind to DOX in the bloodstream before it leaves the liver and causes off-target side-effects. Nucleobase-containing polymers were prepared via free radical polymerization of acrylates with pendant adenine and thymine. The monomers and polymers were characterized by 1H NMR, 13C NMR, and size-exclusion chromatography. The binding efficiencies of the polymers and DOX were analyzed via DOX capture experiments were run. The nucleobase-containing polymers will also be attached to a polymer film for analysis of DOX capture. The polymers bound to surfaces will be tested in water, buffer solution, and human serum. After the analysis of thymine and adenine polymers, guanine and cytosine monomers will be synthesized and tested similarly. Finally, combinations of polymers will be tested.

Mentor: Michael Schulz (Chemistry, Virginia Tech)

COURTNEY M. WALLS

VIRGINIA TECH / CROP AND SOIL SCIENCE

OVER WINTERING SUCCESS AND THE BUSINESS SIDE OF BEEKEEPINGLATENCY AND REACTIVATION

Virginia Beekeepers are often faced with overwintering losses of honey bee colonies in excess of 40% year-over-year. Working with the Extension Apiculturist to monitor VT's Extension and Teaching apiaries for the 2019/2020 winter season, a undergraduate research project was developed to see where costs occur when overwintering a hive successfully. This project had of two main parts, the first was management with on-the-ground decision making based on the needs of each colony. The mechanisms to overcome winter successfully include fall preparation of colonies, integrated pest management of pest of honey bees, and management to ensure that colonies have adequate food reserves. The second part of the project includes data collection and analysis, with comparison of the costs of management techniques and recovery efforts. Through the data analysis we calculated the average cost for feeding one hive through the 2019/2020 winter season was $72.92 . This option will be compared to the average cost of acquiring new hives $100, either through the purchasing of nucleus colonies (most expensive option), buying packages of bees, or the splitting of existing hives (least expensive option) in an effort to recover hive numbers. These efforts can be supported by the proceeds from harvesting honey and costs can be reduced by the reuse of existing equipment. All of these expenses will be compared in a fact sheet to support beekeeper management decisions that are cost effective and sustainable.

Mentor: Dr. James Wilson (Department of Entomology, Viirginia Tech)

JACKIE WANG

BLACKSBURG HIGH SCHOOL

EFFECTS OF INOSITOL PYROPHOSPHATES ON THE GROWTH AND PHYSICAL CHARACTERISTICS OF ARABIDOPSIS THALIANALATENCY AND REACTIVATION

Inositol pyrophosphates (PPx-InsPs) play an important role in sensing cellular levels of phosphate and regulating the phosphate starvation response (PSR) in plants. The PSR regulates the phosphate uptake for plant development and growth. However, how PPx-InsPs affect plant growth and development is still unclear. The focus of this study is to examine plant growth parameters in specific mutants of the model plant Arabidopsis thaliana with varying levels of PPx-InsPs. These mutants either have higher levels of an enzyme (ITPK1-OE & VIP2-KD) or are missing an enzyme (itpk1-) that is involved in PPx-InsPs synthesis. I hypothesized that the levels of PPx-InsPs influence plant growth and development. The features of these mutants such as the rosette diameter, bolting percentage, and growth rate, were examined and were compared to those of wild-type plants. Student t-tests were used to confirm the statistically significant differences between each mutant and wild-type plant. The experiment was duplicated with similar results. A reverse correlation was observed between the growth rate and levels of PPx-InsPs. In mutants (ITPK1-OE & VIP2-KD) with high levels of PPx-InsPs, compared to wild type, plants had a slower growth of rosettes and reached the flowering stage later. For the mutant with a lower level of PPx-InsPs (itpk1-), plants had smaller rosettes and reached the flowering stage earlier. The data supports that the PPx-InsPs play a critical role in plant growth and development.

Mentor: Glenda Gillaspy (Biochemistry, Virginia Tech)
Janet Donahue (Biochemistry, Virginia Tech)
Mrs. Katherine Davis (Blacksburg High School)

EMILY E. WARWICK

VIRGINIA TECH / INTERNATIONAL RELATIONS

BORDERS IN ANGLOPHONE AFRICA: A COMPARATIVE STUDYLATENCY AND REACTIVATION

This project explores how the dynamics of borders shape the interactions between the people of the Anglophone regions of Africa and the governments that exert control over them. As borders and national citizenship are non-indigenous concepts to Africa, they have created very unique challenges and dynamics in Anglophone Africa since their introduction by colonial powers in the late 1800s. Borders have restricted and defined the regions surrounding them in many ways, just as the people living along ethnically-partitioned borders have responded uniquely to the challenges that they face. This research project presents both a top-down and bottom-up view of borders and how people and governments have responded to the issues pertaining to labor, trade, migration, and cultural identity that borders create.

Mentor: Dr. Paulo Polanah (Sociology, VIrginia Tech)

CARLY R. WESTERMANN

VIRGINIA TECH / BIOLOGICAL SCIENCES

SOCIOECONOMIC AND INSURANCE DISPARITIES IN SARCOMA IN CHILDREN AND YOUNG ADULTSLATENCY AND REACTIVATION

Background: The presence of socioeconomic status (SES) and insurance disparities in the presentation and survival of cancer patients is well-documented in adults, but less in pediatric patients. Identifying disparities in care is critical for improving outcomes. This study examines the association between SES, insurance status, and disease presentation among children and young adults with sarcoma.
Methods: This is a retrospective cohort study of patients ages 0-25 years diagnosed with sarcoma with data from the National Cancer Database. Patients were grouped into three SES categories based on income and education. Patient demographics and clinical factors were compared by SES. Logistic regression models were fitted to determine adjusted odds ratios of SES and insurance status on of the presence of metastatic disease, lymph node involvement, and tumor size >5cm.
Results: A total of 9,419 patients were included in the study. Compared to those with high SES, patients with low SES were more likely to have metastatic disease (OR=1.17, p=0.02), positive lymph node involvement (OR=1.31, p<0.01), and increased tumor size (OR=1.31, p<0.01). Non-private insurance was also significantly associated with these measures of advanced disease.
Conclusions: SES disparities exist among children and young adults with sarcoma. Low SES and non-private insurance are associated with more advanced disease upon presentation. Further studies are needed to understand the basis of these disparities.

Mentor: Daniel Rhee (Department of Surgery, Johns Hopkins University School of Medicine)

CALVIN K. WOEHRLE

VIRGINIA TECH / AEROSPACE ENGINEERING

COLIN O'LEARY

VIRGINIA TECH / AEROSPACE ENGINEERING

IAN HARRINGTON

VIRGINIA TECH / GENERAL ENGINEERING

AUTONOMOUS DRONE CONTROL SYSTEMSLATENCY AND REACTIVATION

The goal of this research project is to make headway into the creation of autonomous, fixed-wing drones designed for infrastructure inspection. The end goal of the project is the development of a drone airframe capable of manual and autonomous flight control, as well as an attachable inspection payload (e.g. multi-sensory inspection pod with visible, infrared, magnetometric, etc. inspection capabilities). To enable advanced fly-by-wire, the craft is equipped with flight monitoring sensors, data loggers, and a remote communication system capable of linking to a ground station for instructions.

Our research is focused around the integration of a complete system of hardware and software. Through the use of ArduPilot, an open source autopilot environment, we can remotely monitor and control any RC airframe. We have fine control over various surveying patterns as well as automatic sensor activation and terrain avoidance capabilities.

ArduPilot also allows us to run SITL simulations to test flight parameters without having physical access to flight hardware. This helps prevent expensive crashes while allowing remote development by team members.

We have successfully assembled our drone and designed a sensor payload. Components have been selected and flight simulations have validated our prototype. Although flight testing has been stalled this semester, we plan to begin final validation soon.

Mentor: David Gray (Engineering Education, Virginia Tech)

HANNAH E. WOJTYSIAK

VIRGINIA TECH / WILDLIFE CONSERVATION

QUANTIFYING ADAPTATIONS IN THE DEHISCENCE BEHAVIOR OF EPIPETRIC FERNS TO INCREASE DISPERSAL SUCCESSLATENCY AND REACTIVATION

Epipetric ferns face a potential disadvantage relative to woodland taxa. Rock-dwelling ferns must ensure their spores make contact with suitable habitat. This is a more calculated risk for obligate epipetric species as adjacent ecosystems are typically far more dominated by woodland habitat than rock outcrops. Recent research suggests that a Spanish rock-obligate fern, Asplenium celtibericum, may have developed an adaptation to increase dispersal success by developing annuli that only partially dehisce. Here, we sampled sporangia of two congeners, the woodland Dryopteris intermedia and the facultatively epipetric Dryopteris marginalis. We then sampled a woodland and rock-dwelling species pair in the Pteridaceae, Adiantum pedatum and the apomictic Pellaea atropurpurea, respectively. We used three categories to describe their sporangial dehiscence: fully dehisced, partially dehisced, or never dehisced. We expect to see a higher mean proportion of partially dehisced sporangia in Pellaea atropurpurea and Dryopteris marginalis, the rock-obligate ferns, than in Adiantum pedatum and Dryopteris intermedia, the woodland ferns. Should a significant difference in sporangial dehiscence success be observed between the woodland and epipetric species, this may suggest that rock-dwelling ferns are adapting to limited access of suitable habitat with a change in the mechanical functions of their annuli.

Mentor: Jordan Metzgar (Biological Sciences, Virginia Tech)

ROWAN S. WOOLDRIDGE

VIRGINIA TECH / BIOCHEMISTRY

IN VITRO CHARACTERIZATION OF METHYL ACCEPTING CHEMOTAXIS PROTEINS MCPW AND MCPZLATENCY AND REACTIVATION

Medicago sativa (alfalfa) forms a symbiotic relationship with Sinorhizobium meliloti resulting in the fixation of atmospheric nitrogen. Alfalfa roots release specific exudates into the surrounding soil to attract S. meliloti through a process known as chemotaxis. S. meliloti possesses genes coding for 8 chemoreceptors, called Methyl-accepting Chemotaxis Proteins (MCPs), five of which remain uncharacterized. This project investigated the specific ligand(s) that bind to two of the uncharacterized chemoreceptors: McpW and McpZ. To study their function, the genes coding for the ligand binding domain (LBD) of these MCPs were cloned into different vectors, overexpressed within Escherichia coli cells, and purified using affinity column chromatography. Once purified, both proteins were to be analyzed using differential scanning fluorimetry (DSF) to determine specific ligand(s). Using capillary assays, the potential ligands would then be tested by comparing their attracting ability of S. meliloti wild type versus the mcpW and mcpZ deletion strains. Purified McpWLBD resulted in protein concentrations too low to be analyzed by DSF. The Purification of McpZLBD yielded in sufficiently high protein concentrations, however, several DSF tests have not identified any ligand(s). McpZLBD is currently being examined using X-ray Crystallography to gain insight into its structure and ligand interactions. A better understanding of this process could lead to a reduction in chemical fertilizer use.

Mentor: Dr. Hiba Baaziz (Department of Biological Sciences, Virginia Tech)

TAYLOR WYNNE

VIRGINIA TECH / BIOLOGICAL SCIENCES AND CLINICAL NEUROSCIENCE

DISRUPTION OF CONNEXIN43 INTERACTION WITH B-CATENIN IN GLIOMA STEM CELLS

With current chemotherapy and irradiation treatments, glioblastoma (GBM) has a median survival time of 12 months following diagnosis. GBM tumors have high cellular heterogeneity and contain glioma stem cells (GSCs). These less proliferative GSCs are able to survive current available treatments that specifically target proliferating cells and can then differentiate into glioma cells to recapitulate the tumor following treatment. Our preliminary data found that Connexin43 (Cx43) interaction with β-catenin increases during GSC differentiation. It has been shown that β-catenin directly interacts with Cx43 at its carboxy-terminus domain and their interaction can be disrupted through Src phosphorylation of Cx43 residues Y265 and Y313. In this study, we generated a Cx43 Y265E/Y313E mutant that mimics Src-dependent phosphorylation on Cx43 using site-directed mutagenesis. We will then assess the interaction of the Cx43 Y265E/Y313E mutant with β-catenin, and analyze the effects in glioma stem cell differentiation.

Mentor: Dr. Samy Lamouille (Virginia Tech)

JESSIE S. YU

VIRGINIA TECH / PSYCHOLOGY

LILY G. CARROLL

VIRGINIA TECH / COGNITIVE AND BEHAVIORAL NEUROSCIENCE

EXPLORING SENSITIVITY TO NEGATIVE-LAG VOICING IN SOUTHERN US ENGLISH LISTENERSLATENCY AND REACTIVATION

English contrasts stops with [aspiration]: short-lag VOT /p/ contrasts aspirated, long-lag VOT /ph/. Other languages contrast stops with [voice]: voiced, negative-lag VOT /b/ contrasts short-lag VOT /p/. Negative-lag VOT has been seen in Southern US English speakers. There is debate about whether this signals that Southerners actually contrast [+voice] with [+aspiration]. We designed a perception study to test if Southerners show comparable sensitivity to negative-lag VOT as speakers of Spanish, which does contrast [+voice] with [+aspiration].

Stimuli were created from recordings of four Southern-accented speakers and one native Spanish speaker. We took /b/-initial (voicing) and /p/-initial (aspiration) English words and created one version with voicing/aspiration intact and one cut to short-lag VOT. Participants listened to pairs of words that were either the same (match condition) or included a word with voicing/aspiration removed (mismatch condition) and indicated if the pairs were identical. To date, 45 participants have been recruited from three groups: 16 monolingual English speakers from the Southern US, 20 monolingual English speakers from Northern Virginia, and 9 native speakers of Spanish.

Early results show poor performance by all groups on voicing-mismatch conditions compared to aspiration-mismatch conditions. This suggests that voicing in stops is a less salient contrast than aspiration, and increased usage by Southerners does not impact their perception.

**** NOTE: WE WOULD LIKE TO RECOGNIZE THAT THIS PRESENTATION WAS ACCEPTED FOR PRESENTATION AT THE 87TH SOUTHEASTERN CONFERENCE ON LINGUISTICS IN OXFORD, MISSISSIPPI ON MARCH 26-28, 2020 WHICH WAS CANCELLED DUE TO THE COVID-19 PANDEMIC**

Mentor: Abby Walker (English, Virginia Tech)