Undergraduate Research Symposium 2017 Undergraduate Research Symposium

Feb 18th, 8:00 AM - 12:30 PM

Poster Session

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8:00 AM-12:30 PM (Learning Commons: Northwest Atrium)
Poster Session

The Unseen Role Of Shrews In Transmission Of *Borrelia burgdorferi:* Range Expansion Of *Ixodes affinis* Contributes To Pathogen Reservoir Maintenance
Rachel Matrenec (Mentors: Drs. Holly Gaff and Wayne Hynes)
Biological Sciences

Lyme disease remains a persistent threat to residents of Virginia. According to the CDC, there were nearly 1000 confirmed cases of Lyme disease in Virginia in 2014. Lyme disease is a vector borne illness caused by the spirochete *Borrelia burgdorferi* transmitted via ticks. Many of the host animals on which a tick feeds can function as reservoirs of this pathogen; this relationship is important in controlling human disease. An increase in *B. burgdorferi* infected reservoirs may manifest as an increase in Lyme disease incidence in humans. While the role of white-footed mice (*Peromyscus leucopus*) and blacklegged ticks *(Ixodes scapularis*) in the transmission of *B. burgdorferi* is well characterized, this study investigates the short-tailed shrew (*Blarina* spp*.*) and another blacklegged tick *(Ixodes affinis*) as additional potential reservoirs for *B. burgdorferi. Blarina brevicauda* tail snips (n=8) and *Ixodes* spp. ticks (n=31) collected from the shrews in Virginia during 2015-16 were tested for *B. burgdorferi*. Shrew tissue samples from Minnesota (n=41), Kansas (n=19), and North Dakota (n=4) were also tested. High prevalence rates of *B. burgdorferi* were detected in both ticks and shrews Further investigation is necessary to fully explore this possibility.

Assessing the Ability of Two Tick Species to Survive Underwater
Lindsey Bidder, Kristine Asmussen, Katerina Goffigan, and Sean Campbell (Mentor: Dr. Holly Gaff)
Biological Sciences

To assess the ability of ticks to survive underwater, adult *Amblyomma americanum* (lone star ticks) and *Amblyomma maculatum* (Gulf Coast ticks) were submerged in three water types: freshwater, brackish water, and saltwater. For the first 30 days, ticks were examined every other day for survival, and those surviving past 30 days were returned to the water and checked for survival weekly. The results indicate there is a significant difference in survival between species for all three types of water with *A. maculatum* ticks having a higher mortality than *A. americanum* ticks. Within the *A. americanum* ticks, there is a significant difference in survival between types of water with the highest mortality in saltwater and the lowest mortality in freshwater.

***Amblyomma maculatum* Tick Hunt 2016, Seeking the Mother Ship**
Kirsten Young, Angeline Sandor (Mentor: Dr. Holly Gaff)
Biological Sciences

Studies of *Amblyomma maculatum* (Gulf Coast tick) have shown its importance as a vector for *Rickettsia parkeri*, which causes Tidewater Spotted Fever in humans. Establish populations of this tick species have recently been found in the mid-Atlantic region. This field survey was conducted to find the source of *A. maculatum*. Ticks were collected by flagging from multiple sites on the barrier islands of Virginia and the Outer Banks of North Carolina. All collected *A. maculatum* ticks were tested for *Rickettsia rickettsii*. The results indicate that this tick species has established populations on every sampled barrier island with an average prevalence of 58% positive for *Rickettsia sp*.

Capture-Mark-Recapture of Ticks in Southeastern Virginia
Armin Bahrani, Alexis White, Laura Bitzer, and Alexander Suarez (Mentor: Dr. Holly Gaff)
Biological Sciences

In southeastern Virginia, the rise of tick-borne pathogens threatens human and animal health. Surveillance methods are necessary to better understand tick abundance and phenology. Past ecological studies have utilized a capture-mark-recapture (CMR) technique. The goal of our study was to use CMR to estimate tick population size and longevity at two field sites in Portsmouth, Virginia. Ticks were collected using flagging techniques. Captured ticks were marked with finger nail polish prior to release. Marks were distinct colors during each capture event to track individuals over the study period. Organized by species and life stage, recapture rate calculations include newly marked ticks and ticks recaptured one or more times. Population size estimates were calculated using Lincoln-Peterson calculations. The longevity calculations provide information about the maximum period a tick is questing.

Investigating the Broad Host Range of Bacteriophage in Different Mycobacterial Species
Delilah Hahn (Mentor: Dr. Nazir Barekzi)
Biological Sciences

Bacteriophages are ubiquitous and usually infect a specific bacterial strain. Typically, phages are confined to a single host capable of infecting a specific genus and species of bacteria. In order to determine if bacteriophage have more than one host, a panel of phages have been investigated to determine if these phage have a broad host range. Originally, the phages were isolated with *Mycobacterium smegmatis* mc^2 155. The goal of this project was to determine if the phage have a broad host range by testing each phage on different bacterial hosts within the Actinobacteria phylum. In total, thirty phage and eight different bacterial hosts were investigated: *Mycobacterium smegmatis* mc^2 155, *Mycobacterium smegmatis* NSC 3240, *Mycobacterium fortuitum* M5, *Mycobacterium fortuitum* M6, *Mycobacterium chelonae* M3, *Mycobacterium chelonae*

324-818, *Mycobacterium marinum* ATCC 927 , and *Mycobacterium marinum* M30-01. The experimental protocol entailed preparing serial dilutions of each isolated bacteriophage (10^{-2}, 10^{-4}, 10^{-6}, and 10^{-8}) followed by spotting of each dilution on a nutrient agar plate containing a bacterial lawn made from each strain. Subsequently, the plates were incubated at 30°C and observed for the presence of plaques or zones of killing. The results revealed that in addition to infecting *M. smegmatis* mc^2 155, eleven phage were able to also infect *M. smegmatis* NSC 3240, two phage infected *M. fortuitum* M5, and one phage infected *M. fortuitum* M6. The titers of the phage and the efficiency of infection was calculated using the phage titers from *M. smegmatis* mc^2 155 as the control. These findings indicate that some bacteriophage actually have a broader host range than originally thought. However, the range of hosts may be limited due to the genomic composition and evolution of each distinct phage.

Differential Gene Expression in Chondrocytes Exposed to Simulated Microgravity
Sarah Nelson (Mentor: Dr. Michael Stacey)
Biological Sciences

Human articular cartilage responds to mechanical load through the extracellular matrix (ECM) components proteoglycans, glycoproteins, collagen fibers, and water. The extracellular matrix is produced by chondrocytes that metabolically regulate the synthesis and degradation of matrix for homeostasis. When astronauts are exposed to microgravity mechanical unloading occurs increasing the likelihood of cartilage degeneration. Currently, mechanisms of cartilage degeneration due to loss of gravity are unknown. The objective of this project is to determine differential expression of cartilage related genes in chondrocytes in order to identify mechanisms of cartilage degeneration. Knowledge of these mechanisms is important for determining factors initiating cartilage damaging diseases.

Molecular Examination of DNA in Rodlet Cells of Teleost Fish
Brandon Hamel (Mentor: Dr. David Gauthier)
Biological Sciences

Rodlet cells are an unusual cell type found only in the tissues of teleost fish. While their cellular morphology initially lead researchers to classify them as a distinct parasitic species, observations of their behavior and function have demonstrated characteristics less of a typical invader and more of an endogenous or symbiotic cell. This has created a debate around the evolutionary origin of this unique cell type. This experiment seeks to explore this mystery by using molecular techniques to sequence DNA directly from a rodlet cell and compare it to that of its host. In normal circumstances the quantity of host DNA vastly outnumbers any rodlet cells present, making isolation of rodlet cell DNA difficult. Using Lase Capture Microdissection we were able to isolate and extract rodlet cells from the surrounding tissue. LCM is a technique that utilizes an infrared laser to adhere target cells to a synthetic polymer and remove them from the surrounding

tissues. This method allows us to extract a more rodlet cell rich sample for genetic amplification and sequence analysis.

Non-lethal Assay for Detecting Mycobacterial Exposure in Striped Bass (*Morone saxatilis*)
Austin Adkins (Mentor: Dr. David Gauthier)
Biological Sciences

Mycobacterium (M.) marinum is a known pathogen that infects a number of aquatic species. This pathogen is greatly affecting the Chesapeake Bay fisheries. In this study, we looked at *Morone saxatilis* (striped bass) that were infected with *M. marinum* species (spp) to detect an immune response against *M. marinum*. In previous studies, the only means to detect if striped bass were infected with *M. marinum* that did not express clinical signs, such as visible lesions or granulomas, was by euthanizing and dissecting their spleens. This study aims to prevent future lethal sampling of fishes to detect infection by taking blood samples. To do so, we test the sera of their blood to detect immune antibody responses to proteins of *M. marinum* by Western Blot analysis.

**Survey of Parasites in Back Bay Largemouth Bass (*Micropterus salmoides)*
Jonathan Blubaugh (Mentor: Dr. David Gauthier)
Biological Sciences

Largemouth bass, *Micropterus salmoides*, are a top predator in the Back Bay ecosystem of south-eastern Virginia and are affected by a variety of parasites that may be negatively impacting their health and population growth. My project aims to perform, for the first time, a comprehensive survey of parasites infecting these ecologically and recreationally important fish using DNA sequencing and morphological study.

Real-time Simultaneous Recurrent Neural Network Implementation for Robot-mediated Intervention in Autism Spectrum Disorders
Megan Witherow (Mentor: Dr. Khan Iftekharuddin)
Electrical and Computer Engineering

Children with Autism Spectrum Disorder (ASD) face challenges in social communication and interaction that may be helped through computer-based intervention. The Vision Lab at Old Dominion University has been developing a novel adaptive intervention paradigm targeting facial oddity biomarkers following the Lab's previous study of the spontaneous facial responses of children with ASD. As a part of this paradigm, the Simultaneous Recurrent Neural Network (SRN) developed by the Vision Lab is implemented in Python for real-time facial expression recognition in a novel, robot-mediated intervention platform for children with ASD.

The Use of Steady State Visually Evoked Potentials as a Predictor for Inattentional Blindness
Taylor Bobrow (Mentor: Dr. Dean Krusienski)
Electrical and Computer Engineering

Inattentional blindness - the failure of a person to perceive an unexpected event occurring in their visual field can cause individuals in critical environments to be at risk. The objective of this research is to further the understanding of the effects of subject attention on recorded Steady-State Visually Evoked Potential (SSVEP) signals, a brain response observed in the electroencephalogram (EEG) to flashing stimuli. Once the effect of attention on SSVEP is further characterized, it may be used as a real time predictor of international blindness in order to improve awareness of potential risks in critical environments.

Wireless Network System with Arduino and Raspberry Pi Processors
Federico Minelli (Mentor: Dr. Otilia Popescu)
Electrical Engineering Technology

The goal of the project is to study a low cost alternative to data collection from wireless sensors networks that also satisfies limited space requirements as might be necessary in environments such as manufacturing machines, medical rooms, or cockpit of an aircraft or drone. The project interfaces an Arduino processor collecting sensor data with a Raspberry Pi microcomputer at the receiver, through XBee wireless communication modules. The setup has the advantages of low price, compact size and portability, flexibility of the application areas. The mini sensor network can be easily adapted for different sensors or expanded for more network nodes.

Utilizing Mixed Method Research to Evaluate Substance Abuse Treatment Agencies
Cheyenne James (Mentor: Dr. Narketta Sparkman-Key)
Human Services

This study focused on evaluating the effectiveness of group outpatients substance abuse programing in providing tools to maintain sobriety. Researchers utilized objective based model and mixed methods to determine effectiveness.

Objective Based Evaluation of Adult Day Services
Laura Schoenborn (Mentor: Dr. Narketta Sparkman-Key)
Human Services

This study utilizes qualitative methods to examine adult day services to address the effectiveness of the services in providing caregivers relief.

Effectiveness of Program Evaluation in After School Programs
Erin Cuff (Mentor: Dr. Narketta Sparkman-Key)
Human Services

This study evaluates a local after school program utilizing mixed methods and objective based model of program evaluation.

3D Electrotaxis of Chondrocytes
Joshua Bush (Mentor: Dr. Michael Stacey)
Mechanical Engineering

Electric fields have been shown to induce changes within chondrocytes. The migration of chondrocytes in an electric field is monitored via electrotaxis assays. We have developed a 3D printed portable assay that allows us to apply an electric field to chondrocytes in a 3-Dimensional collagen matrix. This will allow for further investigation into the potential benefits of electric fields for enhancing cartilage production and quality.

Effects of Platelets Addition on the Microstructure and Uniaxial Compressive Response of Ice-Templated Porous Alumina
Kang Hyungsuk (Mentor: Dr. Dipankar Ghosh)
Mechanical Engineering

This presentation will describe the effects of grain-level anisotropy on the microstructure and compressive response of the ice-templated ceramic scaffolds. Highly porous scaffolds were fabricated from alumina powders of equiaxed morphology as well as from powder mixtures containing equiaxed and platelet particles. Presence of the platelets led to formation of the lamellar bridges and significantly enhanced the compressive strength of the scaffolds. Measured improvement of the mechanical response is rationalized based on the stiffening and strengthening effects exhibited by the platelets. Research findings are pivotal to bio-inspired design of hierarchical materials for structural, biomedical and energy storage applications.

Improving the Efficiency of Drones
Vrund Gosai (Mentor: Dr. Onur Bilgen)
Mechanical Engineering

The research pertains to improving the efficiency of Unmanned Aerial Vehicles (UAV), or commonly referred to as Drones. In addition, the research aims to show the feasibility of smart materials in UAVs. The research is conducted to improve the efficiency, stability and control of a Quadcopter using piezoelectric materials. A senior design team from the Mechanical and Aerospace Engineering department is working on the design and implementation of smart materials to the propellers. A flight controller is being coded using Simulink. A generator is being designed using electromagnetic induction.

Quantitative Assessment of Secondary Flows and Erosion of Single-phase Fluid through Pipe Bends
Zachary Kaldy (Mentor: Dr. Orlando Ayala)
Mechanical Engineering Technology

There are many processes in industry where a fluid has to be transported through pipelines. Maintenance due to erosion is one of the major causes of financial losses in industries such as shipbuilding, maritime, and power plants. Using Computational Fluid Dynamics (CFD), we plan to study bend configurations to reduce erosion under the light of the interaction between the particles and the flow along the main axial direction of bend and the secondary flows occurring in the cross sectional area of bend. The idea is to eventually propose elbow configuration standards to minimize erosion for which external funding is required.

Visualization of Event Execution in a Discrete Event System
Nathan Gonda (Mentor: Dr. Jim Leathrum)
Modeling and Simulation Engineering

The underlying event model is largely hidden during the development and execution of a discrete event simulation. It is often difficult to understand the connection between the event model, the system model, and the software implementation. This project develops the capability to visualize the behavior of the underlying event model during the execution of a discrete event simulation. The capability is unique in being able to interface with a discrete event simulation software and tools and to interactively step through its execution. The visualization capability presented supports simulation software development, validation and verification, and education.

Collaboration between Secondary Schools and Universities for Outdoor Camps: Using the ACA Youth Outcome Battery
Abigail Evans (Mentor: Dr. Eddie Hill)
Park, Recreation, and Tourism Studies

The American Camp Association has been integral in supporting youth development by identifying outcomes associated with participation in camp. The current study used the ACA Youth Outcomes Battery. The YOB provides youth programs with measures that focus on common outcomes. During the summer of 2015, we assessed a university outdoor day camp that partnered with a local private school (3rd-8th grade). Large percentages (i.e., 68%) of campers learned "a little" or "a lot" about the desired outcomes.

Addressing Well-being and Adjustment to College: Examining the Impact of a First-Year Outdoor Orientation Program
Cienna Gabriele (Mentor: Dr. Eddie Hill)
Park, Recreation, and Tourism Studies

The current study sought to examine the impact of an outdoor university orientation program on participants' level of resilience, mental health and institutional attachment. These are all areas of interest in young adults successful transition to college and retention. By understanding these impacts outdoor orientation program facilitators can better position themselves with university administrators. A mixed method approach was used to assess the impact of a first-year orientation program.

The Jefferson Lab Large Acceptance Detector (LAD)
Juan Rodriguez (Mentor: Dr. Lawrence Weinstein)
Physics

The Large Acceptance Detector (LAD) will be used at Jefferson Lab to study the quark-gluon structure of neutrons in the atomic nucleus. The LAD will be built from 20-year-old scintillator detectors that need to be tested and refurbished. This poster will describe the procedures for testing the scintillators, replacing the necessary parts, and characterizing the time resolution and energy response of the refurbished scintillators.

Changes in STEM Majors'; Motivation and Post-Graduation Goals Over Senior Year
Shannon LaSala and Adrian Helms (Mentor: Dr. Debra Major)
Psychology

Undergraduate STEM students persist in their majors for a variety of reasons, which can change over time. Moreover, STEM majors' post-graduation plans can also change. In two interviews at the beginning and end of their senior year, STEM students recounted reasons they persisted in their majors and their post-graduation career/educational plans. Most students interviewed maintained at least one of three top reasons given for remaining in STEM over their final year. On the other hand, there were significant changes in students' post-graduation plans over their senior year, including elaborating on initial post-graduation plans and pursuit of employment/graduate school acceptance.

Gender Stereotypes in STEM Toy Advertisement
Lauren Ashley Robinson (Mentor: Dr. Brooke Schaab)
Psychology

Women are significantly outnumbered by men in STEM (science, technology, engineering, and mathematics) fields, and the gender stereotype of STEM toys perpetuate this gap. STEM toys, which introduce children to spatial and mathematical skills needed to succeed in STEM careers, are marketed directly to boys, denying girls early opportunities to develop an interest in STEM. The purpose of this study was to examine holiday toy catalogs to determine if this stereotype still existed. Researchers found that STEM toys were still not advertised equally, but, surprisingly, they are now being advertised with no models at all.

Engineering Equity
Carrie Parsons (mentor: Dr. Erika Frydenlund)
Women's Studies

There are disparities in access to emergency care services across the divides of class, race, gender and disability. Not everyone can afford to purchase and maintain a car, yet everyone needs fair access to resources like emergency care. In this paper, the authors present evidence for the effect that access to transportation has on these disparities, while focusing on the Hampton Roads region. This study offers an analysis of inequality and injustice as it relates to patients receiving emergency care services. We will demonstrate that intersecting systems of power and privilege function to reinforce lack of transportation options for people in need of emergency care in Hampton Roads.