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Undergraduate Research Symposium

2017 Undergraduate Research Symposium

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

# 2017 Undergraduate Research Symposium: Full Program

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**Old Dominion University Undergraduate Research Symposium**  
**Saturday, February 18, 2017**  
**Learning Commons, Perry Library**

Sessions at a Glance

8:00 – 8:40 AM	<b>Registration and Continental Breakfast (Learning Commons, Northwest Atrium)</b>
8:40 – 8:45 AM	<b>Welcome and Opening Remarks (Learning Commons, Northwest Atrium):</b> David Metzger, Dean of Honors College
8:00 AM – 12:30 PM	<b>Poster Session (Learning Commons, Northwest Atrium, pp. 3-11)</b> Featuring Biological Sciences, Computer Engineering, Electrical and Computer Engineering, Electrical Engineering Technology, Human Services, Mechanical Engineering, Mechanical Engineering Technology, Modeling and Simulation Engineering, Park, Recreation and Tourism Studies, Physics, Psychology, and Women’s Studies  <b>Undergraduate Art Exhibit (Learning Commons, Northeast Atrium, p. 2)</b>
9:00 – 10:00 AM	<b>Oral concurrent session I (pp. 12-15)</b> <i>Biological Sciences</i> (Rm. 1310) Chair: Holly Gaff  <i>Art History Session 1: Bridging the Past: Morals and Customs</i> (Rm. 1306) Chair: Vittorio Colaizzi
10:15 – 11:15 AM	<b>Oral concurrent session II (pp. 16-19)</b> <i>Interdisciplinary Research in Computer Science, Biology, and Physics</i> (Rm. 1310) Chair: Jing He  <i>Art History Session 2: Persistent Symbols: Art and Meaning</i> (Rm. 1306) Chair: Jared Benton
11:30 AM – 12:30 PM	<b>Oral concurrent session III (pp. 20-24)</b> <i>Arts Engagement as a Teacher Preparation Through Service Learning</i> (Rm. 1310) Chair: Patricia Edwards  <i>Methods and Applications of Geospatial Technologies</i> (Rm. 1311) Chair: Hua Liu  <i>Art History Session 3: Reexamining Art with the Period Eye</i> (Rm. 1306) Chair: Anne Muraoka
12:30 – 1:30 PM	Lunch in Broderick Dining Commons

**8:00 AM – 12:30 PM**  
**(Learning Commons: Northeast Atrium)**  
**Undergraduate Art Exhibit**  
**Chairs: Elliott C. Jones & Alison Stinely, Art Department**

<b>Student</b>	<b>Concentration</b>	<b>Faculty Mentor</b>
William Ambrose	Drawing & Design	Elliott Jones
Sam McLean	Drawing & Design	Elliott Jones
Matthew Pierce	Drawing & Design	Elliott Jones
Rosson Allen	Graphic Design	Kenneth FitzGerald
Darius Page	Graphic Design	Kenneth FitzGerald
Mandi Vollmer	Graphic Design	Kenneth FitzGerald
Coelina Edwards	Metals	Dianne deBeixedon, Jane Ritchie
Peter Kim	Metals	Dianne deBeixedon, Jane Ritchie
Corina Clark	Painting	Elliott Jones
Laurie Kelly	Painting	Elliott Jones
Jade Pangilinan	Painting	Elliott Jones
Shakia Robertson	Painting (Drawing & Design)	Elliott Jones
Victoria Garnett	Print & Photo Media (Photography)	Greta Pratt
Hailey Porth	Print & Photo Media (Photography)	Greta Pratt
Carra Roots	Print & Photo Media (Photography)	Greta Pratt
Stephanie Buckley	Print & Photo Media (Printmaking)	Domenica Webb
Korey Jackson	Print & Photo Media (Printmaking)	Domenica Webb
Daniel Smith	Print & Photo Media (Printmaking)	Domenica Webb
Betty Gowans	Sculpture	John Roth
Sarah McDaniel	Sculpture	John Roth
Mollie Schaidt	Sculpture	John Roth

## 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 Matrevec (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. Established 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<sup>2</sup> 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<sup>2</sup> 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<sup>2</sup> 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<sup>2</sup> 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 Laser 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.

**9:00-10:00 AM (ROOM 1310)**  
**Biological Sciences**  
**Chair: Dr. Holly Gaff, Biological Sciences**

**Determining the Existence of a Short-term Link between Phenology and Climate Change**

Blake Steiner (Mentor: Dr. Tatyana Lobova)

The Southeastern Virginia Phenology Project (SVPP), located in Norfolk, Virginia. This project is a branch of the National Phenology Network, and its data will be combined with other projects across the United States to ascertain the connections between plant phenophases and climate change through the power of citizen science. The importance of this data is related to many environmental and ecological issues, such as the effects on pollinators and seed dispersers. Furthermore, it is potentially related to health and food concerns, such as allergies. With this data, researchers can better address ecological, environmental, and health related inquiries.

**Algal Endosymbiont Diversity in the Common Reef-Building Coral *Goniastrea* Ten Years after Experimental Bleaching**

Caroline Haymaker (Mentors: Dr. Dan Barshis, Courtney Klepac)

Symbiotic dinoflagellates (*Symbiodinium*) have a mutualistic symbiosis with many coral species because both partners receive benefit via the exchange of nutrients. The successful interaction of these partners determines the success of coral reefs. Ten colonies of *Goniastrea* spp. were collected from inshore and offshore reefs surrounding Ofu Island, American Samoa in 2006 (n=20 total). The corals were experimentally bleached and, then reciprocally transplanted to each environment, to determine how *Symbiodinium* community structure and diversity recovers and changes with time. In 2016, DNA was extracted and three diagnostic molecular markers were amplified using PCR to investigate the diversity of *Symbiodinium* within each coral sample.

**Too much sun? Growth rates of the Northern Star Coral, *Astrangia poculata*, in various light levels**

Tyler Harman (Mentors: Dr. Dan Barshis, Hannah Aichelman)

This project focuses on the growth rates of *Astrangia poculata* over time in different stressful situations based on light. The *Astrangia* colonies were collected from the JB Eskridge wreck at the Chesapeake Light Tower reef. A total of 20 nubbins, 10 symbiotic and 10 aposymbiotic, will be separated evenly under two different scenarios, an area of light that measures  $400\mu\text{mol}/\text{m}^2\text{s}$  and one that measures  $80\mu\text{mol}/\text{m}^2\text{s}$ . The methods that will be used to measure growth rates are photo *Symbiodinium* quantification from Winters et al. 2009, as well as the buoyant weight technique.

**Use of Unionized Ammonia to Control Zooplankton Grazers in Cultures of *Scenedesmus* sp.**

Blake Steiner and BRL Team (Mentor: Dr. Sandeep Kumar)

An experiment was conducted to limit *Scenedesmus* sp. grazers, as they continue to reduce biofuel yields. 2.5 L cultures of *Scenedesmus* sp. with zooplankton were inoculated in photobioreactors with 640 mg/L urea. 500 mg/L spike of  $\text{NH}_4\text{Cl}$  was used on day zero to test use of free ammonia to control grazers. Cell counts performed with hemocytometer and Gridded Sedgewick Rafter  $1 \text{ mm}^2$ . Ammonia was measured using ion chromatography. Urea may impact zooplankton by day 8 out of 14, with 24-48 hour lag time after accumulating free ammonia. This was confirmed by  $\text{NH}_4\text{Cl}$  spike.

**9:00-10:00 AM (ROOM 1306)**

***Art History Session 1: Bridging the Past: Morals and Customs***

**Chair: Vittorio Colaizzi, Art Department**

**An Ace up Her Sleeve: Leonardo's *Ginevra de' Benci***

Julia Drake (Mentor: Dr. Anne H. Muraoka)

The High Renaissance in Italy was a time of rebirth that focused on exhibiting the idealistic qualities of humanity. However, patriarchy still reigned supreme in society. It was not until a unique portrait, *Ginevra de' Benci*, painted by none other than Leonardo da Vinci, shifted away from traditional characteristics of female portraiture. What's more interesting is the patron hailed from Venice, a city with records that support the rise of a feminist movement. This essay argues that this painting opened the door towards modern feminism by investigating Venetian literature and how it could have influenced the portrait's patron, Bernardo Bembo.

**Rembrandt's *Dr. Tulp*: A Summoning for Accountability**

Betty Gowans (Mentor: Dr. Anne H. Muraoka)

Through formal decisions in *The Anatomy Lesson of Dr. Nicolaes Tulp*, Rembrandt is able to show to the viewer his stance on the morality of dissecting an executed criminal, as well as insert an inquisition of the viewership. Clear theatrics are employed to bring the viewer into the staged lesson, but to also compel them as active participants. By inserting his opinion of the anatomy lesson into his work, giving the viewer a near omniscient role, as well as painting a guild member as if he is staring out upon the viewer, Rembrandt brings the viewership into this moral debate.

**The Statues of Robert Mapplethorpe**

Olivia Settlemyre (Mentor: Professor Sharon Dilustro)

Robert Mapplethorpe is best known for the controversy he garnered with his sexually explicit photos, but his later work of the 1980s reveals the reverence he held for classical aesthetics. The forms of interest are muscular, reminiscent of ancient Greek and Roman statuary. This fascination is especially prevalent in his photos of *Thomas*, *Lisa Lyon*, and *Derrick Cross*. While his photos of people seem to resemble statues, Mapplethorpe is also able to bring actual statues to life in the way the photos are framed. Mapplethorpe's clear interest in Greek and Roman art affected the compositions and subject matter of his photos.

## **Modern Antiquity**

Emily White (Mentor: Dr. Robert Wojtowicz)

Having a rich cultural history connected to the ancient Roman Empire, Merida, Spain was once titled Augusta Emerita and that history is apparent in local architectural ruins. Attracting numerous historians and archaeologists, it became the perfect site for the National Museum of Roman Art. The task of marrying ancient Rome and modern Merida went to Spanish architect Rafael Moneo, who was already renowned for his designs. His final product was a grand three-story structure with a lower crypt that incorporated local ruins. By drawing on the Roman road and amphitheater nearby as inspiration, Moneo forms a connection between Merida's past and present.

## **Calatrava's Restoration of Hope and Pride for the City of Milwaukee**

Joshua Strasshofer (Mentor: Dr. Robert Wojtowicz)

Santiago Calatrava is an architect and engineer who is known for his energetic bridge designs and flowing building compositions that challenge normal architectural practices. Tasked with an extension of the Milwaukee Museum of Art, Calatrava designed the Quadracci Pavilion as a new identity for the museum and an extension for the city of Milwaukee. The client wanted "a new urban landmark" for an area that contains fairly pre-modern architecture. Calatrava's extension defied "form follows function" by complementing Lake Michigan with its organic forms and melding with the existing additions leaving people with a priceless feeling of hope for their city.



**10:15-11:15 AM (ROOM 1310)**

***Interdisciplinary Research in Computer Science, Biology, and Physics***

**Chair: Dr. Jing He, Computer Science**

**Comparing an Atomic Model or Structure to a Corresponding Cryo-EM Image at the Central Axis of a Helix**

Stephanie Zeil & Devin Haslam (Mentor: Drs. Jing He, Willy Wriggers, and Julio Kovacs)

Three-dimensional density maps of biological specimens from cryo-electron microscopy (cryo-EM) can be interpreted in the form of atomic models that are modeled into the density, or they can be compared to known atomic structures. When the central axis of a helix is detectable in a cryo-EM density map, it is possible to quantify the agreement between this central axis and a central axis calculated from the atomic model or structure. We propose a novel arc-length association method to compare the two axes reliably. This method was applied to 79 helices in simulated density maps and six case studies using cryo-EM maps at 6.4-7.7Å resolution. The arc-length association method is then compared to three existing measures that evaluate the separation of two helical axes: a two-way distance between point sets, the length difference between two axes, and the individual amino acid detection accuracy. The results show that our proposed method sensitively distinguishes lateral and longitudinal discrepancies between the two axes, which makes the method particularly suitable for the systematic investigation of cryo-EM map-model pairs.

**Modelling Beta-sheets using Iterative Bézier Surface Fitting on Cryo-EM Density Maps**

Michael Poteat (Mentor: Dr. Jing He)

Cryo-electron microscopy is a powerful technique to produce 3-dimensional images for large molecular complexes. When the resolution of 3-dimensional images is not sufficient to derive atomic structure directly from the image, it is still challenging to interpret the image. In order to model  $\beta$ -strands from medium-resolution images, we propose the use of Bézier surface iteratively to fit a  $\beta$ -sheet image. The proposed method shows improved accuracy in fitting when it was tested using eight cases.

**Challenges in Matching Secondary Structures in Cryo-EM – An Exploration**

Devin Haslam (Mentors: Drs. Mohammed Zubair, Desh Ranjan, and Jing He)

Cryo-electron microscopy is a fast emerging biophysical technique for structural determination of large protein complexes. While more atomic structures are being determined using this technique, it is still challenging to derive atomic structures from density maps produced at medium resolution when no suitable templates are available. A critical step in structure determination is how a protein chain threads through the 3-dimensional density map. A dynamic programming method was previously developed to generate  $K$  best matches of secondary structures between the density map and its protein sequence using shortest paths in a related weighted graph. We discuss

challenges associated with the creation of the weighted graph and explore heuristic methods to solve the problem of matching secondary structures.

### **Development of a Software Tool for Protein Secondary Structure Detection from Electron Density Maps from Cryo-Electron Microscopy**

Christopher Spillers (Mentor: Drs. Jing He, and Willy Wriggers)

The accuracy of the secondary structure identification from volumetric protein density maps is critical for de-novo backbone structure derivation in electron cryo-microscopy (cryoEM). It is still challenging to detect the SSE automatically and accurately from the density maps at medium resolutions. Various computational methods exist in secondary structure detection with strengths and weaknesses. The goal of this work is to combine two computational methods *SSETracer* and *Voltrac* in one software tool for enhanced detection. A framework of a user-interactive software tool has been established incorporating the strength from the above two methods.

### **Improving the Efficiency of Compton Scattering Calculations**

John Rattz (Mentor: Drs. Balsa Terzic, Mohammed Zubair, and Desh Ranjan)

Compton or Thomson scattering can be used in constructing sources of high energy photons. In recent years there has been a revival of activity in the subject driven by the desire to produce several keV X-ray sources from relatively compact relativistic electron accelerators. Such sources are attractive due to the narrow bandwidth generated in the output radiation. We have developed a calculation method yielding the energy spectral distribution of the radiation produced by the scattering event, and extended it so that the radiation from a group of relativistic electrons may be obtained. The heart of the project was a program that performed an adaptive 2D integration. The goal was to improve the program's performance by translating it from Python to C++. There were several differences between how the two implementations performed the same task, with these differences being relevant to the program's performance.

**10:15-11:15 AM (ROOM 1306)**

***Art History Session 2: Persistent Symbols: Art and Meaning***

**Chair: Dr. Jared Benton, Art Department**

**Mining the Middle Paleolithic: The Emergence of Early Neanderthal Art**

Kerry Kilburn (Mentor: Dr. Jared T. Benton)

An increasing body of evidence supports the conclusion that Neanderthals were not only capable of, but actively engaged in a wide range of symbolic and artistic activities. This evidence begs important questions, including whether or not such behavior was independently developed in Neanderthals and anatomically modern humans or inherited from a common ancestor, and why, if Neanderthals were capable of the same kinds of art-making as were anatomically modern humans, they never seem to have developed representational forms of art. The answers to these questions may lie in the deep history of hominid symbol-making and Neanderthal ecology and demographics, respectively.

**Do you see what I see? Titian's *Poesie* and the Visual Polemics on Religion**

Holli Turner (Mentor: Dr. Anne H. Muraoka)

The Venetian painter Titian is widely known for his *poesie*—visual representations of classical poems and literature. Scholars have largely focused on his unique interpretation of these mythological stories and his bravura handling of his brush. This paper argues, however, that Titian's *poesie* for Philip II of Spain, functions beyond retelling a story from mythology, by serving as a visual representation of the contemporaneous tragedy of the conflicts between the Catholics and Protestants through the themes of exposure, change, and execution.

**It's Not What it Looks Like, I'm Just Sleeping**

Nicholas Goodman (Mentor: Dr. Anne H. Muraoka)

Giorgione can be considered one of the most influential painters in the Venetian Renaissance. Venice was a bustling merchant city always striving towards dominance and control. In order to achieve this goal, Venice crafted a myth that separated them from the rest of the world. Giorgione's *Sleeping Venus* is a perfect example of this myth creation in action. This image is typically seen as specifically designed for the male viewer. By taking into consideration the formal elements and social context at the time, this painting can be seen as a depiction of Venice and the Virgin Mary.

**A Devout Balance: Vermeer's Use of Catholic Symbols in *Woman Holding a Balance***  
Cassidy Crockett (Mentor: Dr. Anne H. Muraoka)

It is known that Vermeer's conversion to Catholicism had a profound effect on his life. However, his work *Woman Holding a Balance* is widely ignored in this respect. My paper addresses this gap with attention to the symbolism as a story. I will be looking at the pearls, the scene of the Last Judgment and the female figure. I argue that these specific symbols, along with others, create a story of a woman's life. In conclusion, by closely examining the symbols in this painting, I hope to shed new light on *Woman Holding a Balance* in relation to Vermeer's Catholicism.

**11:30 AM -12:30 PM (ROOM 1310)**

***Arts Engagement as a Teacher Preparation Through Service Learning***

**Chair: Patricia Edwards, Art Department**

Art Education students embarked on a research pilot program at the Early Childhood Learning and Research Center, through service-learning. The research teams observed, planned, team-taught and reflected on their own teaching strengths and challenges; gaining hands-on experience in the pre-K classroom. This research in arts education was rooted thematically in children's literary works by illustrator/author Eric Carle. The project fostered relevant research, teachers as "choice-makers," and the development of 21st century skills-sets of collaboration, creativity, critical thinking, writing of lesson plans and community connections through art and student engagement within our university campus.

**Lesson Plan 1: Shapes**

Keyochia Majors (Mentor: Prof. Patricia Edwards)

In this lesson the students will know how to use their auditory and visual skills to interpret the idea of imagination; understand that the art making process is fun and requires a playfulness and imagination; and create a picture based in imaginary ideas using their hands to arrange and glue shapes and add color.

**Lesson Plan 2: The Mixed Up Chameleon**

Teresa Cabon (Mentor: Prof. Patricia Edwards)

This lesson will focus on using primary colors to create secondary colors; students will get an opportunity to use their hands to mix two primary colors.

**Lesson Plan 3: S is for Snake**

Ariel Hall and Callie Ward (Mentor: Prof. Patricia Edwards)

Instructional objectives/enduring understanding: The student will engage while reading the book and making the art craft. The student will understand what the letter is and the sound it makes.

**Lesson Plan 4: Little Cloud**

Adonika Williams and Jasmina Berber (Mentor: Prof. Patricia Edwards)

Objectives included that students will be able to: Follow a sequence of steps when making the art sample; make predictions about what types of clouds may appear in the sky; and make predictions about: What will "Little Cloud" become next in the story?

## **ABC Through the Chrysler Museum of Art**

Carlie Kinzey (Mentor: Prof. Patricia Edwards)

The students collaborated by creating a collection of alphabet images; relevant to the museum, for student engagement in art.

**11:30 AM -12:30 PM (ROOM 1311)**  
***Methods and Applications of Geospatial Technologies***  
**Chair: Hua Liu, Political Science and Geography**

**Motorcycle Accident Concentrations in Southern Hampton Roads**

Jason Lee (Mentor: Dr. Hua Liu)

Motorcycle Accidents in the Hampton Roads area have increased due to their increasing popularity for recreation and commuting use. This study attempts to identify accident rate time frames and hot spots over a five year period (2011-2016). The study area includes Suffolk, Chesapeake, Portsmouth, Norfolk, and Virginia Beach. Several factors are studied with geo-statistics and compared to the total rate, to provide understanding of various causes of motorcycle accidents and identify their hotspots and directional distribution. Using time classification techniques, the risks of commuting with a motorcycle is compared against multiple temporal patterns. The study aims to improve motorcycle safety by illustrating the cause and time frame where risk of accidents are greatest.

**Site Selection of New Supermarket in Norfolk, VA**

Cody Ryan (Mentor: Dr. Hua Liu)

GIS can be a powerful tool for business decision-making. Site selection allows decision makers to find locations that will best meet their goals. With a list of criteria for desired locations a series of spatial analysis can be executed that will show the areas that meet your needs. A food desert is a low-income census tract where a considerable number of citizens have low access to a supermarkets or large grocery stores. This project will perform site selection analysis with GIS to identify locations for a new supermarket/grocery store company to build new location. The business would like to address the food desert problem in Norfolk VA by locating the new facility in a food desert.

**Predicting Potential Legionnaires' Outbreaks Using GIS**

Stephen Grassia (Mentor: Dr. Hua Liu)

Legionnaires' disease is a severe form of pneumonia that is caused by the bacteria *Legionella*. It is not contagious by touch but is from breathing in the bacteria. The elderly, especially living in nursing homes, are the most at-risk for contracting the disease. The disease grows in moist climates and in the city, air conditioning serves as the petri dish. The elderly is at the most risk for contracting the disease with frequent usages of air conditioning and cooling towers. By using GIS, we can study hot spots and 100-yard buffers of cooling towers in New York City, and compare the hot spots and buffers to nursing homes to determine which nursing homes are most at risk for its residents being exposed to the disease.

**11:30 AM -12:30 PM (ROOM 1306)**  
***Art in Context: Reexamining Art with the Period Eye***  
**Chair: Dr. Anne H. Muraoka**

**Will the Real Venetian Master Please Stand Up? Tintoretto's Swift Brush, Saint Mark, and Venetian Identity**

Daniel Madison (Mentor: Dr. Anne H. Muraoka)

Tintoretto is frequently overshadowed by more prominent Venetian artists such as Titian. However, his work displays unique characteristics which merit further examination. Previous research focuses on analysis of individual works, rather than how his overall style meshes with his Venetian heritage. Tintoretto's swift completion of commissions and energetic compositions parallel the dynamic wording of Saint Mark's Gospel and the Venetian empire's focus on swift transportation of goods. Additionally, his choice to feature Mark in *Miracle of the Slave* reveals a profound connection with Venice's patron saint. These factors establish Tintoretto, rather than Titian, as the artist who exemplifies Venetian mythology.

**Mary, Mary: Artemisia's Magdalenes**

Kerry Kilburn (Mentor: Dr. Anne H. Muraoka)

Mary Magdalene has been an important Catholic saint since the early days of Christianity and was a favored symbol of the Counter-Reformation Church. Artemisia Gentileschi painted three narrative and/or devotional images of the saint. Although the first two have received critical attention, no scholar has examined the series as a whole. The three paintings taken together provide insights into Artemisia's perceptions of the saint, which informed the narratives and iconography of each painting. In each image, and across the series as a whole, Artemisia presents the Magdalene, not merely as a penitent, but as a heroic figure as well.

**Nothing is Sexier than Our Origins**

Nicholas Goodman (Mentor: Dr. Anne H. Muraoka)

Gustave Courbet was an innovative painter who challenged what the French Academy deemed appropriate for paintings. Even though it is intended as a private commission, Courbet's *Origin of the World* seems to be an attack on what is appropriate to depict in painting. This paper will argue that Courbet's depictions of woman are not only beautiful, but address the roles of woman during his time. Looking at sources of social philosophers of his time and his own words, via his letters, will lead to a more in depth understanding of what these sensual images of woman could mean.



## **Some (Un) holy War**

Holli Turner (Mentor: Dr. Anne H. Muraoka)

Guernica was known as The Holy City of the Basque people. The Nationalists bombed the town during the Spanish Civil War. Picasso captured this tragic event in his monumental *Guernica*. The painting has largely been read by viewers and scholars as simply an anti-war work, but what if it was more than that? This paper argues that Picasso's *Guernica* serves a critical religious function. The display of religious symbols were intended to strike a sentimental chord with viewers, and would have helped in their understanding, and healing.