

# Fralin Undergraduate Research Fellowship Showcase

Thursday, April 20, 2017





# Fralin Undergraduate Research Fellowship Showcase Schedule

Thursday, April 20, 2017

Fralin Life Science Institute

**6 p.m.** Reception and Poster Presentation in Fralin Hall Atrium

**7 p.m.** Fralin Hall Auditorium: Opening remarks, Dr. Dennis Dean,  
director, Fralin Life Science Institute

**7:10 p.m.** Remarks by Virginia Tech Provost Thanassis Rikakis

**7:20 p.m.** Remarks by Dennis Dean

**7:30 p.m.** Fralin Fellow Oral Presentation: Rachel Hargrave,  
"Z-Devoicing: A Feature of Southern Appalachian English?"

## About the Fralin Undergraduate Research Fellowship Program



Dennis Dean

The Fralin Undergraduate Research Fellowship program is a new, competitive award program that is open to all Virginia Tech undergraduates. The goal of the program is to increase diversity in research.

Fourteen fellowships of \$1,000 were awarded during the 2016-2017 year to individual students from eleven departments and five colleges who demonstrated academic capability and a strong interest in undergraduate research.

The fellowship enabled these students to conduct research with a Virginia Tech faculty mentor, who had already agreed to mentor them, and work on an ongoing or new project mutually agreed upon between the student and mentor. Students applied to the program during late spring or summer and began their research projects in the fall.

The Fralin Fellows program was created by Dennis Dean, director of the Fralin Life Science Institute and the university's Stroobants Professor of Biotechnology, in partnership with the Office of Undergraduate Research. Dean created the program because of the value that his own undergraduate research experience at Wabash College added to the launch of his career. Although Dean is a biochemist, a key component of the program is that it is available to students interested in all types of research, even research outside of the life sciences.

Another key component of the program is Dean's desire to fund students from underrepresented groups, including, but not limited to, ethnic minorities, first generation college students, students from low-income areas, students with disabilities, and LGBTQ students. In addition to a close mentoring relationship with their primary faculty member, fellows also met with Dean throughout the program. He was available for one-on-one meetings and hosted lunches where students could meet one another and share their findings, thus creating excitement and possible interdisciplinary collaborations.



The 2016-2017 Fellow Undergraduate Research Fellows had lunch with Dr. Dean in small, interdisciplinary groups to discuss professional development opportunities and the status of their projects.

## 2016 - 2017 Fellows

### **Marissa Boccher**

Chesapeake, Virginia

Senior

Aerospace Engineering,  
College of Engineering

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Faculty Mentor: Alejandro Salado



#### **Title: Challenging Mass Optimization of Spacecraft in Systems-of-Systems**

**Abstract:** The purpose of this research is to challenge the age-old, widely accepted design heuristic in the aerospace industry that a spacecraft's mass should always be minimized for a given mission. The idea behind this rule is to maximize the value of the spacecraft and therefore the return on an investment by decreasing the costs associated with a mission such as launch costs. This research will explore under what circumstances, if any, it is optimal for a space based System of Systems, such as a satellite constellation, to not mass optimize its satellites but instead launch an adaptable satellite with spare payload capacity. It will be analyzed whether adding flexibility to a System of Systems adds more value to the mission across the System of Systems lifetime.



**Connor Brown**

Salem, Virginia

Junior

Biochemistry, College of  
Agriculture and Life Sciences

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Faculty Mentor: Amy Pruden

**Title: Is climate fate? *Legionella* in washer fluid may be a bigger problem in some states than in others**

**Abstract:** *Legionella* species are versatile, resilient microorganisms that represent a significant burden on public health. One emergent property of their versatility is the ability to occupy strange, sometimes harsh niches. This presentation documents the occurrence of *Legionella* spp. in automobile washer fluids originating from a variety of locations in the United States representing a diverse group of climates. Our results and others' indicate that washer fluid is an important emerging reservoir for this pathogen and is deserving of further investigation.

## Marcellus Creighton

North Chesterfield, Virginia

Junior

Human Nutrition, Foods, and Exercise,  
College of Agriculture and Life Sciences

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Faculty Mentor: Samantha Harden



### **Title: Will improved preparatory material increase agent adoption rates?: Using a Research-Practice Partnership to Develop Relevant Program Materials**

**Abstract:** Community-based physical activity interventions are essential to improve the proportion of individuals meeting the physical activity recommendations. These programs can be scaled and sustained when adopted by individuals from targeted community settings. LIFT (Lifelong Improvement Through Fitness Together) is an evidence-based strength-training program for older adults, which is delivered by qualified Virginia Cooperative Extension (VCE) agents. All VCE Family and Consumer Sciences agents (N =52) were eligible to deliver LIFT. In 2015- 2016, 13 (25%) agents attended the preparatory training required to adopt the program, and six of the agents that attended the training followed through and delivered LIFT (11% of total possible agents; 46% of trained agents). Qualitative data collected as part of a larger study indicated that one reason for the low adoption rate related to agents' lack of confidence in delivering physical activity programming. The focus of this study was to develop materials that may improve the adoption rates of LIFT. To improve adoption rates for 2017, agents were equipped with an updated version of the LIFT Program Manual and additional instructional videos for each functional workout included in the class plan. These videos included voiceovers describing the mechanics of each movement and effective ways to verbalize the instructions to the elderly population. In addition, one video was developed as a mock LIFT class so that agents would be familiar with the way each class would run. The overall results pertaining to adoption rates are still to be determined.



**Ahmed Elnahas**

Kuwait City, Kuwait

Junior

Mechanical Engineering,

College of Engineering

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Faculty Mentor: Shima Shahab

**Title: Experimental Investigation of Acoustic Energy Transfer Systems in Open Air**

**Abstract:** Wireless sensors have broad applications in several engineering devices, such as medical implants where wired electrical contact is dangerous or impractical. In many cases it becomes dangerous and expensive to replace the battery of sensors, especially when they are placed in inaccessible locations. This research focuses on experimental investigation for wireless transfer of energy using ultrasonic acoustic waves generated and received by piezoelectric transducers. The effects of the distance between the transmitter and receiver, the input voltage to actuate the transmitter, the excitation frequency, as well as the barriers between transducers on receiver electrical power output are quantified experimentally. Electroelastic analytical models are presented and verified experimentally. Furthermore, the presence of barriers between the transducers introduces impedance mismatch effects and reduces the power output from the receiver. However, the porous media-based barrier does not decrease the amount of transferred energy substantially. In addition, various scenarios of acoustic energy transfer are presented for open-air options.

A portrait of Jessica Fitzpatrick, a young woman with dark curly hair, smiling. She is wearing a blue and pink tie-dye t-shirt. The background is a blurred indoor setting with large windows and metal frames.

**Jessica Fitzpatrick**

Chesapeake, Virginia

Junior

Wildlife Conservation, College of  
Natural Resources and Environment

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Faculty Mentor: Verl Emrick

**Title: Recovering a Federally Endangered Species (Michaux's Sumac) Through Field and Greenhouse Research**

Abstract: My research focused on the recovery of a federally endangered plant species, Michaux's sumac (*Rhus michauxii*). Michaux's sumac primarily reproduces through vegetative or asexual reproduction. My research involved collecting data on the population density and soil nutrient status in the field and using this data to help propagate Michaux's sumac in a greenhouse setting. The research team I worked with found that Michaux's sumac favored soils with a neutral pH and abundant soil cations. Michaux's sumac rhizomes were planted in the appropriate soils to begin the propagation of new individuals. I found that soil temperature and size of the rhizome influences the success of propagation in the greenhouse thus providing key information for future propagation and recovery efforts.



**Saalehah Habeebah**

Centreville, Virginia

Junior

International Studies, College of  
Liberal Arts and Human Sciences

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Faculty Mentor: William Taggart

**Title: This Survey Supports Terrorism: Muslim American Women, the Hijab, and Schematic Biases in Blacksburg, Virginia**

**Abstract:** Muslim American women are often portrayed in American news and entertainment media as victims of a patriarchal society dominated by conservative Islamic forces. The hijab, a head covering worn by some Muslim women, is often viewed as a representation of oppression, and a symbol of opposition to American values. This study investigates Muslim American women who wear the hijab, and the development of schematic biases towards them. The study focuses on the attitudes, treatment, and experiences towards and of Muslim women in Blacksburg, Virginia, home to one of the largest public research universities in the United States, Virginia Polytechnic Institute and State University.

## **Rachel Hargrave**

Weddington, North Carolina

Sophomore

Creative Writing, College of  
Liberal Arts and Human Sciences

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Faculty Mentor: Abby Walker



### **Title: Z-Devoicing: A Feature of Southern Appalachian English?**

**Abstract:** Linguistics is the scientific study of natural language, and one of the goals of the field is to document and describe different dialects and languages, for the insights it gives us into how language works, how our minds work, and how language and social factors interact. In our project, we investigate a particular linguistic feature - z-devoicing - in a local and relatively stigmatized variety of American English: Southern Appalachian English. Studying Appalachian English is especially interesting because we're in an area with Appalachian speakers, and it's a relatively under-studied variety in linguistics. Using the recorded speech of various speakers from Virginia Tech, we attempted to answer our research question: is z-devoicing a feature of Southern Appalachian English?



**Joanna Kania**

Blacksburg, Virginia

Senior

Animal and Poultry Sciences,  
College of Agriculture and Life Sciences

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Faculty Mentor: Sally Johnson

**Title: Hepatocyte growth factor (HGF) stimulates proliferation of equine satellite cells via a PKC (Protein kinase C) -dependent pathway**

**Abstract:** The overall goal of this project is to elucidate the dynamics of myogenic stem and progenitor cells in response to pro-myogenic growth factors in young and old horses. The aim is to determine the effects of HGF and IGF-1 on activation, proliferation, and differentiation of equine satellite cells. Additionally, we want to elucidate the mechanisms by which HGF and IGF-1 exert effects on those equine satellite cells.

A portrait of Haley Meade, a young woman with brown hair tied back, wearing black-rimmed glasses and a blue lab coat. She is smiling at the camera. The background is a laboratory setting with a white wall and a power outlet with a black cord plugged into it. A red biohazard sign is partially visible behind her.

## Haley Meade

Pound, Virginia

Junior

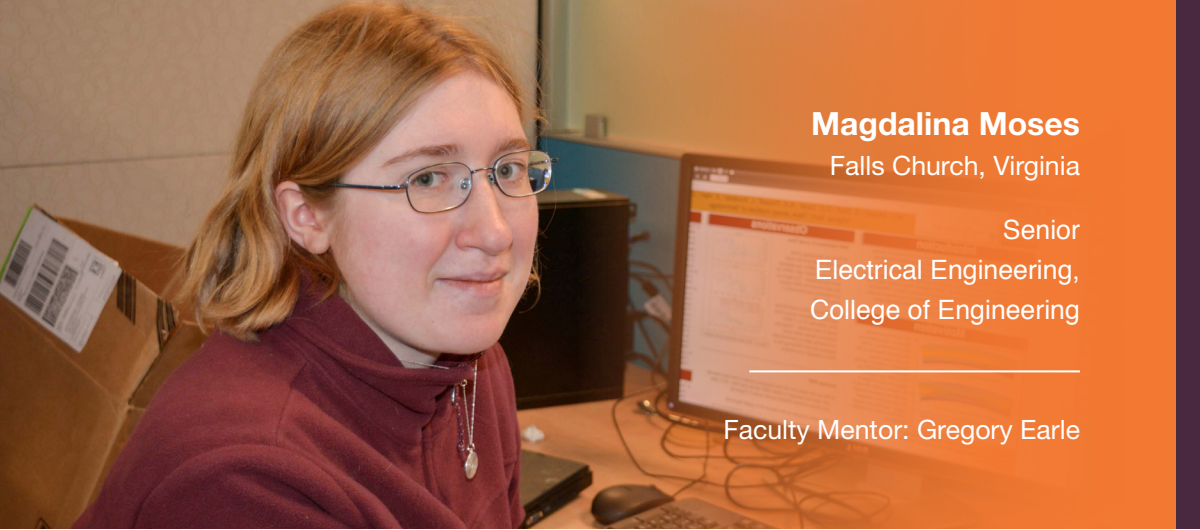
Biochemistry, College of  
Agriculture and Life Sciences

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Faculty Mentor: Terry Hrubec

### Title: **Effects of Quaternary Ammonium Compounds on Neural Stem/Progenitor Cells**

Abstract: Quaternary Ammonium Compounds (QACs) are a common class of chemicals found in cleaners, disinfectants, and cosmetics. Exposure to Alkyl Dimethylbenzyl Ammonium Chloride (ADBAC) and Didecyl Dimethyl Ammonium Chloride (DDAC), two QACs commonly used in disinfectants, has been linked to an increase in the occurrence of neural tube defects (NTDs) in mice and rats. The goal of the study was to further analyze the toxicity of QACs to neural development using NSPCs by studying how exposure to QACs affects the timing of differentiation and the distribution of cell types derived from the NSPCs. It was hypothesized that exposure to ADBAC+DDAC would decrease the number of differentiated cells and disrupt the ratio of cell types present. The results of the study may shed light on the formation of structural and functional birth defects of the nervous system. Because QAC exposure is prevalent, it is important to understand the repercussions of the widespread use of QACs, including the embryo toxicity of this class of chemicals.



**Magdalena Moses**

Falls Church, Virginia

Senior

Electrical Engineering,  
College of Engineering

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Faculty Mentor: Gregory Earle

**Title: Characterizing the Ionosphere Using a Commercial Off the Shelf Software Defined Radio System**

**Abstract:** Solar eclipses offer a way to study the dependence of the ionospheric density and morphology on incident solar radiation. Unique ionospheric responses may be witnessed during eclipses, reflected by changes in radio frequency (RF) propagation. In order to study these changes, we will establish four temporary field stations using software defined radios (SDRs) along the path of totality during the eclipse. As a validation test prior to the eclipse, we established two sites along the east coast to confirm that the SDRs are capable of inferring ionospheric conditions. The preliminary results characterize the effects of the sunrise/sunset terminator on our system's measurements as well as the change in foF2 during different seasons and under different geomagnetic conditions.

## Hannah Parker

Emporia, Virginia

Senior

Animal and Poultry Sciences,  
College of Agriculture and Life Sciences

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Faculty Mentor: Alan Ealy



### **Title: Investigating Leptin as a Mediator of Placental Adhesion, Invasion and Implantation in Ruminants**

**Abstract:** Leptin is a hormone of adiposity that originated from white adipose tissue. Numerous involvements of leptin exist, some of which consist of regulating homeostasis, energy intake, placental development and fertility. Recently, leptin has been linked to obesity in humans and other mammals. With increasing obesity, an increase in leptin production occurs. The purpose of this work was to determine the endocrine link between cattle nutrition and reproduction by examining nutritional status on pregnancy at the molecular level. The first goal was to examine the effect of leptin supplementation on bovine trophoblast (CT1) cell adhesion. In four leptin supplemented adhesion assays, we expected adhered CT1 spheres to increase with supplementation. Results varied, suggesting that no conclusions can be made supporting our hypothesis. If leptin increased adhesion rates, this would mean it has positive effects on maintaining pregnancy in cattle. The second goal is to examine leptin's effect on placental implantation via CT1 migration assays. A transwell migration assay will be used to study the migratory response of leptin-treated CT1s (at various doses). Because CT1 migration is a good indicator of conceptus development and elongation, we hypothesize that leptin treated cells will migrate more quickly and efficiently. Learning how leptin impacts early placental development and function in cattle may lead to evidence that will improve production efficiency and reproductive potential.



**Andrew Pregnall**

Annandale, Virginia

Junior

Microbiology,

College of Science

Faculty Mentor: Monique Dufour

**Title: Priorities, Perceptions, Knowledge: Queer and Trans Healthcare Policy at Virginia Tech**

Abstract: Organizations like the Human Rights Campaign and the American College Health Association have established clear guidelines for standards of LGBTQ patient care in a college environment. However, how well are college campuses doing in meeting these standards? In my Fralin Undergraduate Research Fellowship project, "Priorities, Perceptions, and Knowledge: Queer and Trans Healthcare Policy at Schiffert Health Center," I examined this issue at Virginia Tech through the use of a gap analysis of current Virginia Tech policy and a student survey. The purpose of my research was twofold: (1) to understand how healthcare policy at Schiffert Health Center impacts the care received by queer and trans students at Virginia Tech and (2) to understand how healthcare policy can be used as a tool for the improvement of care received by queer and trans students at Virginia Tech. Ultimately, the information gained in this research process will be used to design an action plan for Virginia Tech to improve its healthcare system for queer and trans students and to educate other healthcare providers on important considerations to keep at the forefront of thought when redesigning their healthcare system to better serve the queer community.

A portrait of Amina Rahimi, a young woman with dark hair tied back, smiling at the camera. She is wearing a dark blue jacket over a grey hoodie. The background is a laboratory with shelves containing various equipment and supplies.

**Amina Rahimi**

Burke, Virginia

Junior

Biochemistry,  
College of Science

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Faculty Mentor: Caroline Jones

**Title: Development of a Biosensing Platform to Decipher Leukocyte Dynamics During Allergic Airway Disorders and Sepsis**

**Abstract:** Exposure and sensitivity to ubiquitous airborne fungi such as *Alternaria alternata* have long been implicated in the development, onset, and exacerbation of chronic allergic airway disorders. Specifically, *A. alternata* is one of the most frequently found species as a causative agent of type I, IgE-mediated, hypersensitivity in indoor and outdoor environments. Here, we have developed a microfluidic device to visualize and quantify the effects of exposure to allergenic *A. alternata* spores co-cultured with human bronchial epithelial cells (BEAS-2B) on neutrophil recruitment. Additionally, levels of the chemoattractant interleukin-8 (IL-8) were measured by enzyme linked immunosorbent assay (ELISA). We found that co-culture of BEAS-2B cells with *A. alternaria* resulted in a significantly higher percentage of migration of neutrophils to supernatant collected from the co-culture than when known concentrations of commercially-available IL-8 were attempted. This is likely due to the synergistic effects of multiple chemoattractants and factors in the co-culture supernatant. Percent migration of neutrophils towards the co-culture supernatant exhibited a positive correlation with the amount of IL-8 produced by BEAS-2B exposed to *A. Alternaria* spores. Future experiments will incorporate detection of various other neutrophil chemoattractants by ELISA and investigation of primary neutrophil samples from asthma patients to determine genetic heterogeneity contributing to chronic airway disorders. Furthermore, we will expand this platform to incorporate neutrophils from human septic samples combined with biosensing elements for detecting reactive oxygen species (ROS) and neutrophil extracellular traps (NETs). Insights from our asthma-on-chip platform will be critical for expanding into sepsis due to sepsis being characterized as a systemic malfunction of organs including the lungs.



**Dalia Rakha**

Blacksburg, Virginia

Senior

Biological Systems Engineering,  
College of Engineering

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Faculty Mentor: Andrea Dietrich

**Title: Relationship between Brominated Trihalomethanes and Bromide in River Water**

**Abstract:** When water is disinfected with chlorine, a side-reaction occurs with the existing organic matter creating disinfectant-by-products. One of the most commonly analyzed and regulated are trihalomethanes (THMs), of which there are four compounds including chlorinated and brominated species. This research analyzed the relationship between bromide levels in river water (often a cause of anthropogenic factors) and the percentage of the more toxic brominated THMs in treated water. A positive correlation was found between these two variables, suggesting that reducing bromide discharges into the river could decrease the levels of brominated THMs in the drinking water.



