



Undergraduate Research and Creative Scholarship Conference

April 24, 2015 Squires Student Center

Office of Undergraduate Research

www.research.undergraduate.vt.edu



Welcome to Virginia Tech's Spring Undergraduate Research and Creative Scholarship Conference. This event is a celebration of our undergraduate students' accomplishments campus-wide and features work from every academic college as well as our research institutions. Our program features the work of nearly 200 students, each of whom was mentored by faculty, staff and graduate students to whom I am most grateful. This year's conference features an expanded number of collaborative projects as well as engineering installations and the performing arts. Our university is fortunate to have so many of our undergraduates contributing to our scholarly and creative enterprises. Undergraduate research, broadly defined, is truly a signature of the Virginia Tech experience.

Many thanks for Keri Swaby and Anita Dodson for their leadership and hard work both making this conference possible and in supporting undergraduate researchers year round. Thank you for financial support to the Provost's Office, Fralin Life Science Institute, the Office of Research, and the Howard Hughes Medical Institute Sciencering program.

SCHEDULE AT A GLANCE

All day Registration Squires 2nd Floor Atrium and Poster set up in Old Dominion Ballroom(lower level)

9:00-10:15 Session I:-Poster presentations

Old Dominion Ballroom (lower level)

10:30-11:30 Session 2: Panel on presenting UG research- Room 219

10:30-11:45 Session 3:

Oral presentations

3A. History-Brush Mountain A

3B. History-Brush Mountain B

3C. Life Sciences- Room 300

3D. Liberal Arts and Human Sciences-Room 342

3E. Engineering-Room 345

11:45-12:45 Lunch Old Dominion Ballroom (lower level)

11:45-12:45 Poster set-up Old Dominion Ballroom (lower level)

12:45-2:00 Session 4:

Poster presentation Old Dominion Ballroom (lower level)

2:00-3:00 Session 5:

Oral presentation

5A. History-Brush Mountain A

5B. Liberal Arts and Human Sciences-Brush Mountain B

5C. Liberal Arts and Human Sciences-Room 219

5D. Life Sciences-Room 300

5E. Marketing and Statistics-Room 342

5F. Engineering-Room 345

3:15-4:00 Session 6:

Performances Old Dominion Ballroom (upper level)

VT Ole' -Flamenco Dance Group

4:00-5:00 Session 7:

Installations and Displays Jamestown Room

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2015 10th Annual Atlantic Coast Conference (ACC) Meeting of the Minds (MOM) Awardees

Undergraduate researchers from each ACC university each year gather at a host university to present their research. The 10th Annual Atlantic Coast Conference (ACC) Meeting of the Minds was held at North Carolina State University, April 10-12, 2015. Congratulations to those students who represented Virginia Tech.



From front to back left to right

Rachel Montague, Alexandria Hubbard, Sophia Novitzky,
Brittany Blankenship, Armand Meza and Dorian Jackson.

Missing in the photo are Andrew Barber, Derek Litvak,
Morgan Sykes and Zachary Barlow

2015 National Conference on Undergraduate Research(NCUR) Awardees

The 2015 National Conference on Undergraduate Research (NCUR) showcased nearly 4,000 students from around the country presenting their research and creative endeavors. The conference provides students a large-scale opportunity to present their research to their peers and get feedback from others in their fields. These students presented their research April 16-18, 2015 at the 29th Annual National Conference on Undergraduate Research at Eastern Washington University.



Representing Virginia Tech were twelve students. From left to right back row: David Vasquez, Emily Bell, Daniel Lee, Matthew Johnson, Sarah Spanski, and Nicholas Lucchesi. Front row left to right: An Nguyen, Michelle Oh, Ava Mohebbi, Cindy Hoang, Alexandria Hubbard and Nancy Mason

2015 ACC Creativity and Innovation Grant Awardees

Seven Virginia Tech undergraduate students have been awarded 2015 Atlantic Coast Conference Creativity and Innovation grants to pursue undergraduate research and creative scholarship opportunities in summer 2015. Selected Virginia Tech scholars receive up to a \$2,000 award that can be used as a stipend and/or to offset expenses such as supplies, travel, and use of specialized research services. While the projects are all student-led, applicants identified a faculty mentor who committed to supervise the proposed task. Students from all academic disciplines were eligible to apply to the program. The seven selected students represent five of the seven undergraduate colleges at Virginia Tech.

Zainal Ariffin Bin Abdul Rahman, a senior majoring in electrical engineering. Project title: "Toward a smartphone-based functional ophthalmoscope for next-generation mobile healthcare." Faculty mentor: Yizheng Zhu, assistant professor of electrical and computer engineering.

Alana Dudek, a senior majoring in biological sciences in the College of Science. Project title: "Suiting up: What does feather color convey in red-winged blackbirds?" Faculty mentor: Ignacio Moore, associate professor of biological sciences.

Louis Hollingsworth, a senior majoring in chemical engineering. Project title: "Synthesis of trityl-poly(ethylene glycol) oligomers for drug delivery applications." Faculty mentor: Richard Gandour, professor of chemistry.

Megan Lee Myklegard, a senior majoring in marketing management. Project title: "Bridging the gap between LGBTQ alumni and current students." Faculty mentor: David Cline, assistant professor of history.

Michelle Noceto, a junior majoring in architecture. Project title: "Researching Italian holistic approach to design." Faculty mentor: William Galloway, associate professor in the School of Architecture and Design.

Travis Whaley, a senior majoring in piano performance and music composition. Project title: "Beethoven's compositional process and the evolution of the Waldstein Sonata, op. 53." Faculty mentor: Debra Stoudt, associate dean for academic policies and procedures in the College of Liberal Arts and Human Sciences and professor of German.

James Wood, a senior majoring in architecture. Project title: "Images of the invisible: An atlas of Shaker objects, architecture, and urban planning." Faculty mentor: James Bassett, assistant professor in the School of Architecture and Design.



Session 1: Poster Presentations

9:00 am- 10:15 am

1. Brittany G. Blankenship

Lytic enzyme-assisted germination of Bacillus anthracis and Bacillus subtilis spores

The long term stability of dormant bacterial endospores makes them excellent vehicles for the application of industrial biological activities. Spore germination is required for the resumption of cell metabolic activity, and germination of natural spore populations can exhibit poor efficiency. Lytic enzymes that degrade the spore cortex peptidoglycan wall can trigger spore germination. The spore coat layers prevent lytic enzymes from reaching the cortex, but chemical disruption of the coats can render the spores susceptible to lytic enzymes. The effects of the *Bacillus anthracis* lytic enzyme SleB on the germination of spores were examined. Using spores of two mutant strains as models of poorly-germinating spores, it was demonstrated that application of SleB was able to increase colony-forming efficiency for coat-disrupted spores. SleB had no effect on native spores prior to plating, but did increase colony-forming efficiency after plating, suggesting that the SleB gained access to the cortex only upon nutrient triggering of the initial stage of germination. This finding may also explain SleB's ability to increase the colony-forming efficiency of mutant spores lacking their lytic enzymes more so than mutant spores lacking their germinant receptors. It is concluded that SleB treatment can increase germination efficiency and potentially increase spore-based product effectiveness.

Mentor(s): Dr. David Popham

2. Casey T. Braginton

Evaluation of early supplementation of probiotics as an alternative to antibiotic growth promoters in pathogen-challenged broiler

Coccidiosis has a significant economic impact on the poultry industry and probiotics and vaccines may provide an alternative method of disease control without the use of anticoccidials. This study investigated the dual effect of a commercial probiotic and a coccidia vaccine on performance and response of broiler chickens challenged with *Eimeria* parasites. Day-old Cobb 500 chicks (n=900) were separated into nine treatment groups (100 birds and 5 replicate pens per group): negative no-challenge control (NNN), positive challenge control (NNC), challenge vaccine (at hatch) without probiotic (VNC). Six groups received probiotic, with or without vaccine, via either water (VPC-W and NPC-W), feed (VPC-F and NPC-F) or both water and feed (VPC-FW and NPC-FW). The probiotic was included at 1g/kg of feed and 20 mg/bird/day via water. On day 15, all treatment groups except NNN received a mixed inoculum of *Eimeria* sp. Excreta samples were collected on days 6-8 and 14 post vaccination and post challenge, processed, and oocysts were counted microscopically. The data were analyzed using the Fit Model platform in JMP Pro 10.0. Reductions in oocyst shedding were observed in the vaccinated as well as vaccinated and probiotic-supplemented groups. NPC-FW, NPC-W, VNC, VPC-F and VPC-W shed significantly fewer oocysts in their feces than the challenged group that received no treatment (NNC). The results indicate that probiotic and vaccine may effectively decrease *Eimeria* load in poultry.

Mentor(s): Dr. Rami Dalloul and Dr. Miranda Ritz

3. Alyssa A. Brunal

Hypothalamic Urocortin 3 is a novel neuroendocrine factor in regulating reproductive hormone secretion

Urocortin-3 is a CRF family peptide which binds to the CRF2 receptor. Ucn3 is distinguished from CRF as CRF binds to CRF1 receptors. In the pituitary, CRF1 is expressed mainly in the corticotropes, while CRF2 is localized predominately in gonadotropes. In the hypothalamus, Ucn3-positive neurons are found clustered near the rPFH and then extended rostrally into the PVHap. Our previous study has shown that Ucn3 cells in the in the PVHap appear to target the VMH. To further delineate the efferent projections of Ucn3 cells in the PVHap, a conditional viral tracing was performed. An AAV expressing a Cre recominase (Cre)-regulated channelrhodopsin-mCherry reporter was injected into the PVHap of transgenic mice that express Cre in Ucn3-positive cells. Three weeks after viral injection, mice were then perfused and brains were processed to detect mCherry. Abundant mCherry-positive fibers were found in the external zone of the ME. This result raises the possibility that Ucn3 may reach the pituitary to regulate gonadotrope function. To test this hypothesis, LH secretion from L β T2 cells, a mouse clonal gonadotrope cell line, was examined. We found that basal LH secretion in L β T2 cells were significantly reduced by Ucn3 treatment. Importantly, GnRH-induced LH secretion was greatly attenuated in cells pretreated with Ucn3. Together, our results indicate that hypothalamic Ucn3 through CRF2 in the pituitary may constitute a novel neuroendocrine pathway to regulate gonadotropin secretion.

Mentor(s): Dr. Chien Li and Dr. Christine van Hover

4. Linda O. Chitayapuntagul

Breaking the Link Between Iron and Lead

Iron and lead are common plumbing materials in drinking water distribution systems. While iron is typically associated with aesthetic concerns, iron has also been linked to increase lead in water due to the sorption of lead onto iron particles. Representative lead solids that coat plumbing systems include lead phosphate, Pb(II) carbonates, and Pb(IV) oxides. However, the impact of iron on these representative lead solids is not well understood. The goal of this study was to identify the types of lead scales (lead carbonate, lead oxide, and lead phosphate) that will prevent particulate iron from producing “excess” lead in drinking water. Experimental conditions containing iron particulates had 3-4 times more lead release compared to conditions without iron. Lead phosphate scales had over 95% less lead release compared to lead carbonate and lead oxide scales in the absence of iron, and even in the presence of particulate iron lead phosphate scales still had the lowest lead release. Based on these results, the use of orthophosphate corrosion inhibitor to form lead phosphate scales is likely to be an effective engineering control to reduce lead release associated with the presence of particulate iron.

Mentor(s): Dr. Marc Edwards

5. Thomas B. Cromer

Comparing the metabolic enzyme profile in the longissimus dorsi of grass-fed and grain-fed cattle

Fresh meat quality characteristics are dictated by ultimate pH. During the conversion of muscle to meat, pH drops from 7.2 to near 5.6. However, some animals exhibit an elevated ultimate pH near 6.0 resulting in meat that is darker in color and potentially undesirable to consumers. This elevated ultimate pH is oftentimes found in muscles with increased oxidative metabolism. Because grass-fed cattle have a tendency toward producing meat with high ultimate pH, we hypothesized that the longissimus dorsi from grass-fed cattle has a more oxidative phenotype than from grain-fed cattle. To test this idea, longissimus dorsi samples were collected from multiple sources. We analyzed 18 total grain-fed cattle from Virginia Tech and Clemson University and 18 total grass-fed cattle from Clemson University and a North Carolina beef abattoir. Muscle samples were powdered in liquid nitrogen, solubilized, separated by SDS-PAGE and transferred to nitrocellulose membranes. Protein abundance was determined by immunoblotting for lactate dehydrogenase, glyceraldehyde 3-phosphate dehydrogenase, citrate synthase, myoglobin, myosin heavy chain type I and glucose transporter type 4. As expected, both groups of grain-fed beef had a more glycolytic phenotype. However, only the grass-fed cattle from the North Carolina plant exhibited a greater oxidative phenotype than the grain-fed animals. Further work is necessary to determine the differences between the two populations of grass-fed cattle.

Mentor(s): Dr. David Gerrard

6. Levi C. Gardner

Evaluation of the feeding value of various barley cultivars using a precision-fed chick assay

Barley can be grown locally here in Virginia in rotation with soy as a winter crop with an advantage over wheat of harvesting 7 to 10 days earlier allowing for more flexibility in spring planting. Harvesting a grain product from the winter barley increases efficiency and economic viability of barley production in addition to environmental benefits. In total, nine barley samples were evaluated including samples that represent traditional hulled barley and higher value hullless barley samples. The hull is the outer protective barrier of the grain that is made of various fiber components and is generally of low nutritional value for poultry. Hullless varieties of barley result in a higher nutritional value of the grain. Samples were selected to provide nutritional evaluation of a broad range of nutritional and chemical characteristics of barley to determine the best candidates to carry forward to more advanced testing and evaluation. Therefore, the objective of this experiment was to determine the ileal amino acid and protein digestibility of various barley cultivars developed at Virginia Tech using a precision-fed chick assay. The use of precision feeding will allow for a known amount of ground barley to be provided to the birds over a short-term digestibility assay to quantify the feeding value of the individual cultivars. This assay is desirable for early candidate identification due to the quick turnaround time and limited amount of sample required to generate data.

Mentor(s): Dr. Mike Persia

7. Chelsea N. Delsack

Microscopic and geochemical analysis of coal ash from the dan river spill

On February 2, 2014, an estimated 82,000 tons of coal ash and 27 million gallons of contaminated water were released into the Dan River from a leaking holding pond at the Duke Energy Steam Station in Eden, NC. Because coal ash contains elevated concentrations of trace elements, there is a concern that the ash spill could adversely impact human, aquatic and environmental health. Many geochemically reactive trace elements known to be present in coal ash can be both released and retained in river sediments. Our goal is to analyze the geochemical signatures of coal ash particles as they react with water and sediment in the river over space and time. Our first objective was to develop methods for separating ash from river sediment using a combination of physical and density separation. Afterwards, we are applying a host of microscopic methods, including light, scanning electron and transmission electron microscopy to evaluate the morphology and size of the particles. We are also using electron dispersive spectroscopy to analyze the elemental composition of the ash. Our results indicate that the coal ash contains an assortment of particles with varying morphologies, sizes, and chemistry. Chemical analysis shows evidence of significant concentrations of Fe and Ti without observable relation to size of shape. These concentrations remain approximately constant through space and time, which is important for our study since Fe minerals can adsorb trace elements such as As and Pb.

Mentor(s): Dr. Madeline Schreiber

8. Nancy M. Fowlkes

The Ideology of American Home Economists in China during the 1920s-1940s: Interactions Between Orientalism and Ideals of Domestic Science

This work is building on recent scholarship that shows how home economics was an important area of professional development for American women. This paper compares the Orientalist opinion circulating in America during the 1920s and the 1940s to the impressions of a small group of four American home economists who worked in China during that time. The motivations and views of different American Orientalist discourses were a mixed lot that underwent many shifts and transitions, but, despite their differences, they all primarily rested on ideas of American superiority in which the west was scientifically superior to the east. By reading the letters and memoirs of four home economists living in China during this time (Ava Milam, Camilla Mills-Biggerstaff, Mabel Wood, and Martha Kramer), I compared their opinions to the American Orientalist attitude more broadly in order to show how the home economists were unique in their expressions of American Orientalist culture. Home Economists who moved to China between the 1920s and 1940s diverged from the norm by prioritizing science over both Chinese and American societies. They criticized both societies and sometimes even elevated Chinese culture over Western culture based on its level of congruence with scientific principles. In this way, the home economists were an early example of a group of women who began to challenge the Orientalist norm of their time.

Mentor(s): Dr. Helen Schneider and Dr. Daniel Thorp

9. Elizabeth M. Gardiner

The Stability of Childhood Fear and Emotion-Regulating Behaviors

Understanding children's emotion regulation, or how children control their emotions, is important because of the potential long-term outcomes related to poor regulation skills. In particular, maladaptive regulation of fear in childhood has been linked to later internalizing problems such as anxiety and social inhibition (Buss, 2011; Fox, Henderson, Rubin, Calkins, & Schmidt, 2001), indicating that children who cannot learn to regulate fear early on may be at risk for problems later in life. The current study assessed the stability of children's fear and emotion regulation strategies across early childhood. Children visited the lab three times at 2.5-3 years (T1), 4.5-5.5 years (T2), and 8-9 years of age (T3). At T1 and T2, children were observed during a two minute fear-evoking task, where emotion regulation was measured by children's self-comforting behaviors and/or withdrawal from the stimulus. At T3, children provided self-report of their fear (e.g., "I'm afraid of monsters in the house."). The current study hypothesized that children who used more emotion regulation strategies in response to fear at T1 and T2 would be more likely to report lower levels of fear towards specific events at T3, indicating that they learned to regulate fear adaptively at an earlier age.

Mentor(s): Dr. Cynthia Smith, Dr. Jillian Troxler

10. Zachary A. Gude

Religiosity as a Mediator for Self-Esteem in Child Abuse Survivors

Although there is tremendous benefit that can come from researching religion and spirituality, few studies examine religion after child abuse. Child maltreatment can have an everlasting impact on the individual, which is why it is important to understand factors that may exacerbate or mitigate self-esteem difficulties while coping. This study seeks to examine interpersonal problems and religiosity as mediators in the relationship between child abuse and neglect and self-esteem in adulthood. Results demonstrate that viewing god as a punishing figure mediated the relationship between child emotional abuse and adult self-esteem beyond interpersonal problems. Further, viewing god as supportive mediated the relationship between child emotional abuse, child emotional neglect, and child physical abuse. Various forms of child abuse predicted lower self-esteem and higher levels of resentment towards God. The results of this study may help in the treatment of the effects of trauma in the future by increasing awareness of the importance of religiosity in treatment to self-esteem issues in both childhood, and adulthood.

Mentor(s): Dr. Angela Scarpa And Dr. Jonathan Waldron

11. Albert W. Hinman

Aurora A Kinase contributes to correction of kinetochore-microtubule misattachments

During mitosis, the genome must be equally partitioned into the two daughter cells by the establishment of proper attachments between the sister kinetochores and microtubules from opposite poles of the mitotic spindle. Occasionally, these kinetochores can establish incorrect attachments to microtubules; if left uncorrected, these misattachments can cause mitotic defects leading to aneuploidy, a common hallmark of cancer. We investigated the role of Aurora A kinase to investigate how its normal concentration in the spindle pole acts in the correction of kinetochore misattachments. To explore this, we utilized MLN8054, a small molecule inhibitor of Aurora A kinase, on PtK1 (*Potorus tridactylus*, or rat-kangaroo, Kidney epithelial) cells and observed kinetochore positioning, microtubule attachments, and mitotic errors using confocal fluorescence microscopy on cells immunostained for microtubules and kinetochore proteins. Cells treated with 1 μM MLN8054 were shown on average to have kinetochores located more closely to the spindle poles in early mitosis than untreated cells; a significant number of these kinetochores were located in close proximity to the spindle pole, a phenotype not found in untreated cells. Furthermore, MLN8054-treated cells were found to have an increased incidence of kinetochore misattachments and chromosome segregation defects than untreated cells. Our data suggest that Aurora A kinase plays an important role in correction of kinetochore misattachments.

Mentor(s): Dr. Daniela Cimini

12. Dorian M. Jackson

Influence of Larval Nutritional Stress and Host Health Status on Blood Feeding Success of Culex restuans

Recent ecological studies have highlighted the significance of environmental stressors and their effects on arthropod vectors, host species, and disease dynamics of arthropod-borne pathogens. Nutritional stress at the larval stage of development has been shown to increase vector competence of some mosquito species including *Culex restuans*, which are the primary vectors of West Nile Virus (WNV). The transmission cycle of WNV is also maintained through songbirds, which act as reservoir hosts for the virus. Our research project was designed to better comprehend how larval nutritional stress affects some aspects of vectorial capacity in *Cx. restuans* mosquitoes. We released a controlled amount of nutritionally stressed or control mosquitoes into a cage with a house finch (*Haemorhous mexicanus*) that was treated with either lipopolysaccharide (to stimulate sickness behaviors) or a saline solution (control). Using this two-by-two factorial design, we were able to examine if larval nutritional stress and the health status of the avian host can affect blood-feeding success. We found that nutritionally stressed mosquitoes were less efficient at obtaining a blood meal from a passerine host. These results suggest that larval nutritional stress of arthropod vectors may have the capacity to influence transmission rates in vector-borne disease systems.

Mentor(s): Dr. Dana Hawley

13. Bilan Jama

Ladies and Tramps: Queen Latifah, Lil' Kim, and the Influence of Gender and Sexual Identities In Hip-Hop

Throughout hip-hop culture, the depiction of women has had a contentious history in the music industry. Even though they performed such a pivotal function in the conception of hip-hop, women were placed into categories that hindered their creative expression and expansion from blossoming into their true potential. Hip-Hop has been viewed by some scholars and media pundits as promoting and condoning misogynistic and sexist depictions of women, and has entirely decimated the role that women have played in the formation of the culture. As such, through the course of numerous decades of global expansion of hip-hop music and culture, the socio-cultural representations of women have branched off into both acceptable and unacceptable female identities. Through comparing and contrasting Queen Latifah's desexualized nature and Lil' Kim's hypersexual persona, I will examine the perception of their respective sexual and gender identities and how the different ways they construct meaning of sexuality and gender in the rap industry. This paper will include a multitude of sources to explore the gender identities expressed by Queen Latifah and Lil' Kim which include hip-hop magazine articles, news interviews, song lyrics and music videos will also be used to depict the role of explicit language and sexual images have on shaping their careers.

Mentor(s): Dr. Ryan Rideau

14. Michael R. Lazear

Towards a Cure for HIV-1: Targeting the Rev Response Element

Human immunodeficiency virus (HIV) is the primary cause of acquired immunodeficiency syndrome (AIDS), which leads to systematic and fatal shutdown of the immune system. The HIV-1 Rev protein facilitates the export and translation of viral genetic material, as well as viral maturation. Both the Rev protein and the RRE exist in reading frames that code other critical proteins, minimizing the potential for drastic mutations and resistance. Due to the highly conserved nature of the RRE and the importance of Rev's biological function, disruption of Rev could prove a valuable drug target. The scaffolding property of the RRE suggests that structural recognition plays a larger role than base-specific chemical selectivity, so small molecules remain a poor choice as drug candidates. Our approach utilizes branched peptides as a scaffold for multivalent binding to the RRE and incorporates boronic acid side chains and unnatural amino acids to capitalize on novel modes of binding. Split and pool synthesis is used to rapidly create a diverse library of branched peptides, and high throughput screening reveals peptides that bind to RRE with a high affinity. This work presents the synthesis of D-aminoproline for inclusion in a peptide library. This artificial derivative contains an additional amino group, allowing for hydrogen bonding to nucleic acids and electrostatic effects towards RNA.

Mentor(s): Dr. Webster Santos And Jessica Wynn

15. Mark J. Lenzi

Development and Testing of a Novel Mosquito

Mosquito traps have traditionally only been able to trap for either gravid or host seeking mosquitoes, but not both. For this project, we attempted to design a novel mosquito trap that could capture both simultaneously. The design started as a wooden block and PVC with just one computer fan that could set to capture either gravid or host seeking but not both. After getting an understanding for 3D design software (Rhino 3D), I modeled our design and realized with two fans and a 3D rendered box, we could trap for both. Multiple iterations went through tests in the lab, each time tweaking the 3D rendered design and reprinting it. Finally we arrived on a design that could deliver all of our lures, capture both gravid and host seeking, and had a durable, light weight, user friendly design.

Mentor(s): Dr. Sally Paulson

16. Jessica K. Li

Participation, Preferences for Program Components, Reported Barriers to Participation, and Behavioral Outcomes among Adults of Different Generations enrolled in Talking Health

Health education interventions can modify behaviors associated with poor health, such as high sugar-sweetened beverage (SSB) intake and low physical activity (PA). Participation levels influence effectiveness. Little is known about how generational values/lifestyles impact participation. This study assessed generational differences in participation, component preferences, reported barriers, and outcomes among participants in Talking Health. Participants (n=301) were 82% female, 94% Caucasian, and 33% low health literate. Most earned <\$20,000/year. Across participants, 26% were Millennials (1982-1996), 50% were GenXers (1961-1981), and 24% were BoomersPlus (≥ 1960). Age was collected at screening. SSB intake and PA were assessed at baseline and six month screenings. Participation was tracked throughout. A summative evaluation collected perceptions and barriers at the six-month screening. Open-ended responses were content coded. Descriptive statistics, one-way ANOVAs, Chi-Squares, and univariate GLMs were used. Millennials were less likely to complete classes ($p < 0.001$), automated voice response calls ($p < 0.001$), and teach-back ($p < 0.001$) than GenX or BoomersPlus. Preferences, barriers, and outcomes did not vary by generation. Although participation varied by generation, preferences, barriers, and outcomes did not. This suggests participation may be influenced by other factors and tailoring to generational values is not needed.

Mentor(s): Dr. Jamie Zoellner And Dr. Kathleen Porter

17. Taylor Littleton

*A fight for survival: Tail loss among red-backed salamanders (*Plethodon cinereus*) completing for cover objects*

Plethodontid (or lungless) salamanders are terrestrial amphibians that occur at high abundance in mature forests of the Appalachian Mountains. Cover objects are important for terrestrial salamanders because they provide a source of prey and retain moisture for cutaneously respiring salamanders. Many salamanders such as red-backed salamanders (*Plethodon cinereus*) are territorial, defending cover objects from other individuals. The tail is an important part of the body; it serves as a means for fat storage, courtship, and defense. Tail loss is detrimental to red-backed salamander reproductive success. The objective of our study was to test whether the density of cover objects influences the percentage of red-backed salamanders in the population with tail damage. We used data from 538 red-backed salamanders that were previously captured at two sites in Virginia and two sites in West Virginia. We used multiple linear regression models to test the relationship between different cover objects (logs, rocks, and stumps) and tail damage. An average of 25.3% of the animals captured had tail damage. Log count was the best predictor of tail damage, with less tail damage occurring on plots with more logs. This study demonstrates how habitat can impact the competitive environment in which salamanders live.

Mentor(s): Dr. Carola Haas

18. Megan M. Lopez

Teacher Efficacy on Integration of the Next Gen Science Standards in Agriculture Education Courses: A Qualitative Approach

The purpose of this case study was to examine the phenomenon regarding how agriculture education teacher's efficacy affected integration of Science, Technology, Engineering, and Math (STEM) and the Next Gen Science Standards (NGSS) into their classroom teaching. This case study consisted of agriculture education programs in the Eastern United States who taught in a state that provided input and resources on the design and writing of the NGSS with hopes that it would be implemented in the future. Participants took part in monthly-recorded audio interviews using a semi-structured interview guide and provided artifacts for the researchers to examine. Data was coded using an open and then focused coding scheme using Atlas.ti©. The analyzed data showed two major themes: teacher efficacy and support from others. Specifically, if the teacher lacked confidence in the implementation of STEM concepts, they were less likely to want to integrate the NGSS in their classroom. Teachers also reported that they needed to feel supported from their administration, state agriculture education organization, and land-grant institution. The researchers recommend that ongoing professional development from the school and professional development organization to be more deliberate. In addition, the integration of other subjects is necessary to keep agriculture education programs competitive as a valuable curriculum within the pre-k-12 system.

Mentor(s): Dr. Tiffany Drape

19. David Mackanic

Ionic Polymer Carbon Composites as Artificial Muscle Actuators

Ionic Polymer-Carbon Composites as a New Design for Electroactive Actuators and Sensor Electroactive polymers (EAPs) provide an exciting method of creating next-generation smart materials. EAPs demonstrate a change in size or shape upon application of a voltage, and conversely generate a voltage upon deformation. One common manifestation of an EAP consists of an ionically conductive polymer membrane (e.g., Nafion) sandwiched between two electrodes. Typically, these electrodes consist of precious metals such as platinum or gold. Upon the application of an electric field, these ionic polymer-metal composites (IPMCs) demonstrate significant bending. In this work, we demonstrate the first ionic polymer composites incorporating electrospun carbon nanofibers. These devices, referred to as ionic polymer-carbon composites (IPCCs), utilize easy to manufacture, low-cost electrodes. The electrospun carbon nanofibers demonstrate high surface area (45-450 m²/g), porosity (96%) and electrical conductivity (0.8-6 S/cm). To create the IPCC, two carbon fiber electrodes are impregnated with Nafion and melt-pressed into a multi-layer composite. We demonstrate actuation properties of ± 1 cm under an alternating 5V amplitude square wave with a 0.2 Hz frequency. Upon manual mechanical bending, the IPCCs demonstrate a piezoelectric response of 1.3 mV/mm of thickness.

Mentor(s): Dr. Bob Moore

20. Charley E. Martin

Student Volunteer Hours Influence Participant Engagement at VT ADS

Adult Day Services (ADS) programs are a community resource for families caring for a growing aging population. Quality programs provide valuable social opportunities in addition to supervision. However, required ratios of participant to RN or CNA do not allow for a great deal of one-on-one attention. Volunteers assist staff by facilitating engagement in group and one-on-one programming. I investigated the association between number of volunteer hours and participant engagement at VT ADS. Participant engagement in group and individual activities is assessed daily. I expected that higher student involvement in field study, service-learning, or research roles would correlate with higher levels of participant engagement in group activities and higher engagement in individual activities. Alternately, more student hours may be associated with greater engagement in individual but not group activities. I calculated total weekly student hours at ADS for eight consecutive semesters (F2009-S2013) and tested the relationship between total hours and average participant engagement. Results show that number of volunteer hours positively correlates with overall participant engagement. Practitioners and Researchers should consider volunteers as critical components in creating exemplary centers.

Mentor(s): Dr. Shannon Jarrott

21. Alec J. Masella

Name Out There: Contrasting the Social Networking Environments of New York City and London

Though typically unnoticed, interpersonal connections underpin workforce economics. This networking is key to success in business, but the ways in which it exists differ from one region of the world to another. Learning how to navigate this socioeconomic maze is important for how to get one's name out there, and it can be done by analyzing certain components of an area's culture. In this paper, I dissect the intercommunal cultures of two of the world's largest job market hubs: New York City and London. To do this, I contrast each city in terms of human development, membershipism, urban entertainment, public forums, political influence, networking incentive, and gentrification. Throughout, I introduce original sociological concepts such as "iris inclusion," "ship and resource networking," "funhouse development," and the "umbrella effect." These, too, are factors that go into differentiating the two cities in terms of gaining social capital. In the end, New York City bears an economically-driven and communalistic atmosphere, while London is a space of niche appeal and public forum interest. With these results, individuals of the workforce become aware of a city's socialization tendencies. This way, salmoming the way upstream to economic success is made less of a daunting task and more of a cultural effort.

Mentor(s): Dr. Jane Wemhoener

22. Fiorella Mazzini

High molecular weight supramolecular polymers from AB macromonomers

Goals: To prepare AB monomers for use in a supramolecular polymerizations Purpose: To study and characterize the physical properties of the synthesized polymers Methods/Processes Used: Chemistry used include Williamson Ether reactions, click reactions, SN2 reactions Product verification via 1H NMR, 13C NMR, mp and HRMS for the monomers and GPC, DSC, TGA for the polymers Summary of Results/Description: Convergent synthesis of crown ether based pyridyl cryptand and the 4,4'-bipyridium containing linker to produce the AB monomer. Synthesis of materials so far is comparable to materials reported in the literature.

Mentor(s): Dr. Gibson

23. Justine E. Miller

Molecular Docking of PPAR α to Identify Potential Therapeutic Agents for Cardiovascular Disease

The global expansion of hypertriglyceridemia makes cardiovascular disease (CVD) the leading cause of death worldwide. Given that CVD afflicts increasingly larger portions of the worldwide population and current drug therapies have been found to have toxic side effects, the development of pharmacological therapies that target triglyceride levels has universal significance. The involvement of PPAR α in fatty acid catabolism has given rise to its recognition as a potential pharmaceutical target for hypertriglyceridemia. Identifying novel agonists to activate PPAR α is therefore useful. By utilizing molecular docking, a cost-effective and broad screening approach, we have analyzed multiple PPAR α crystal structures and their agonists to determine the orientation in which each agonist binds each crystal structure. Estimation of IC₅₀ values from molecular docking results and determination of important ligand interactions led us to select 1K7L, 2NPA, 2P54, 3ET1, and 3KDU as the PPAR α receptors into which we docked thousands of compounds to determine receptor sensitivity and selectivity. Elucidation of active site selectivity will guide screening of unknown agonists into selected receptors during virtual screening. This investigation will therefore direct the design of novel pharmacological agents to lower triglyceride levels. The development of such therapeutics will have direct application as treatment for CVD and will consequently serve to decrease the threat CVD poses globally.

Mentor(s): Dr. David Bevan And Dr. Anne Brown

24. Ashley E. Muskett

Aggression and delinquency in children and adolescents following a residential fire.

Approximately 78% of children and adolescents have experienced at least one traumatic event according to the National Child Traumatic Stress Center (Greeson et al., 2014). Several studies show that there is a connection between childhood PTSD and later aggression or delinquent behaviors (Marsee, 2008; Swopes, Simonet, Jaffe, Tett, & Davis, 2013). Based on this research the current study hypothesizes that PTSD disorder severity will be associated with later aggression and delinquent behavior in children who have experienced a house fire. Participants included 135 children and adolescents who participated in an NIMH funded investigation assessing the impact of residential fires on children and their families (Jones & Ollendick, 2005). One child and one caregiver (e.g., parent) from each family were interviewed approximately 4 months after they experienced the residential fire and at two follow-up interviews approximately 11 and 18 months after the fire. Measures administered at these interviews included the Child Behavior Checklist (CBCL; Achenbach, 199) and the Child Reaction to Traumatic Events Scale (CRTES; Jones, 1994, 1995, 2002). Preliminary data analyses suggest that intrusive symptoms associated with PTSD may be predictive of aggressive and delinquent behaviors.

Mentor(s): Dr. Russell Jones And Dr. Thomas Ollendick

25. Grace A. Parker

Pancreatic Glucose Regulatory Gene Expression During the First Two Weeks Post-Hatch Differs Between Lines of Chickens Selected for Low or High Body Weight

Chickens from a common founder population, selected for low (LWS) and high (HWS) body weight (BW) for 55 generations, differ in BW by a factor >10. There are also high (HWR) and low (LWR) weight relaxed (random-bred since 46th generation). The objective was to evaluate the developmental regulation of pancreatic mRNA abundance in the genetic lines. At day of hatch (DOH) and days 1, 3, 7, and 15 (D1, 3, 7 and 15, respectively) post-hatch, pancreas was collected (n=12/line), total RNA isolated, and real time PCR used to measure mRNA abundance of pancreatic and duodenal homeobox 1 (PDX1), pre-proinsulin (PPI), pre-proglucagon (PPG), and glucose transporter 2 (GLUT2). Glyceraldehyde-3-phosphate dehydrogenase was the control. The statistical model included effects of line, age, and the 2-way interaction. Significance was assigned at $P < 0.05$ and Tukey's used for pairwise comparisons. There was an interaction of line by age on expression of all four genes ($P < 0.02$). Expression of PPI decreased from DOH to D1 and then increased to D15 in all lines, with greatest expression in LWS and LWR at D7. PPG expression decreased to D1 and then plateaued, with greatest expression in LWR at DOH, D3, and D15. For GLUT2, expression was greatest at DOH in all lines and decreased to D1. PDX1 expression was lowest at hatch and greatest at D15, with greatest expression in LWS and LWR at D3 and D7. Expression of all genes changed with age and was greater in the low weight than high weight lines.

Mentor(s): Dr. Elizabeth R. Gilbert

26. Kaitlin M. Ranger

Assessing Effects of Elevated Major Ion Concentrations in Juvenile Freshwater Mussel, *Villosa iris*.

The Powell River system, originating in northeastern Tennessee where it eventually flows into southeastern Virginia is a critical habitat for the freshwater mussel, *Villosa Iris*. However, as surface mining occurs within the river's watershed, an increase in concentrations of TDS (total dissolved solids) and major ions such as Ca^{2+} , Mg^{2+} , SO_4^{2-} , and HCO_3^- , has exhibited an increasing trend, raising the question of whether this increase has led to the depletion and decreased density of this native mussel in areas of the Powell River. In order to test this, four different testing environments were set up so that juvenile mussels (*Villosa iris*) are exposed to concentrations characteristic of the Powell River. In addition, a difference in the use of natural water versus deionized water for the testing environment will be investigated. Survival and average growth are measured weekly for eight consecutive weeks where data analysis will assess the effects of major ion stressors on juvenile mussels.

Mentor(s): Dr. Serena Ciparis

27. Erick C. Sadler

Efficient Hybrid Bulk Heterojunction Solar Cells: Understanding Polymer Diffusion within Metal Oxide Nanostructures

Solar energy is an expanding area of interest to both chemists and the world at large. To this end, different methods of building solar cells are being explored including all-organic cells, inorganic perovskite cells, and hybrid devices. Hybrid bulk heterojunction solar cells, comprised of metal oxide nanostructures and organic polymers, emerged in the late 90s as a promising next generation solar cell architecture, but have not yet achieved efficiencies of note only reaching ~1-2%. This research specifically focuses on learning more about the effectiveness of elucidating the mechanism of absorbance poly(3-hexylthiophene-2,5-diyl) (P3HT) adsorption of P3HT into TiO₂ nanoparticles and nanotubes. Historically, polymer has been deposited on these nanostructures by spin-coating techniques from various solvents. Herein, we explore the effect of deposition solvent, polymer crystallite size, and metal oxide nanostructure (size, morphology) on the efficacy of polymer diffusion. Material size was probed with various techniques such as dynamic light scattering, absorbance, and scanning electron microscopy. This was then correlated to polymer uptake and diffusion rates measured by time-resolved uptake absorbance measurements and pulse gradient NMR. The goal is to determine the optimum solvent for polymer/metal oxide integration and demonstrate record efficiencies from hybrid bulk heterojunction solar cells.

Mentor(s): Dr. Amanda Morris

28. Christopher D. Sibley

Synthesis of Allenates for Copper (II)-Catalyzed β -Silylation Reaction in Aqueous Solution: A Regio- and Chemoselective Silicon Transfer

Our project involves evaluation of the substrate scope for β -silylation on α,β,γ -unsaturated esters (allenoates) utilizing Cu(II) catalyst under aqueous conditions to afford β -silyl- β,γ -unsaturated intermediates. β -silyl- β,γ -unsaturated carbonyl compounds are valuable synthetic intermediates and can be used in the synthesis of biologically significant compounds. Our main objective is to develop an efficient, environment friendly, synthesis of enantiopure organosilicon intermediates. In development of this method, we envision a catalytic cycle wherein, amine deprotonates a nucleophilic water molecule in a manner analogous to the activation of a diboron¹³ to form an sp³ -hybridized boronate (i), which in turn activates the Si-B bond. In the presence of a CuII complex, transmetalation can occur to afford CuII-Si complex (ii). The resulting nucleophilic Si undergoes a chemoselective 3,4 addition on allenoate in a regioselective fashion to afford β -silyl- β,γ -unsaturated cuprate species (iii). Protonation by water molecule affords β -silyl- β,γ -unsaturated carbonyl compound (iv). Optimized conditions will be implemented towards investigation of substrate scope involving chemo- and regioselectivity.

Mentor(s): Dr. Webster Santos

29. Nicole R. Smith

Proteomic Profiling of Proliferative Signaling in SKBR3 Breast Cancer Cells

Protein phosphorylation represents an important post-translational modifications (PTM) that occur in a biological system. For example, phosphorylation of tyrosine kinases activates signaling pathways that lead to cell proliferation, invasion or metastasis in breast cancer cells. In eukaryotic cells, protein phosphorylation affects mainly polar amino acids such as Serine, Threonine and Tyrosine. The epidermal growth factor receptor (EGFR) is an example of a tyrosine kinase receptor that autophosphorylates tyrosine residues by the binding of epidermal growth factor (EGF) ligand. EGFR activates signaling pathways including PI3 kinase, Ras-Raf-MAPK and JNK. The activation of these pathways leads to cell survival, proliferation, differentiation, migration, invasion and angiogenesis. For this reason, EFGR is an ideal target for antitumor therapies. However, previous studies proved ineffective when targeting EFGR and HER2 because of multiple pathway activation and cross-talk. For example, studies have shown that an interaction between EGFR, Axl RTK and cMET RTK phosphorylation provides a tumor promoting pathway which is unaffected by mono-specific receptor inhibitors but shows promise for bi-specific inhibitors. By using MS technologies, we aim at the proteomic profiling of breast cancer cells to find EGFR stimulated signaling pathways that can lead to the identification of novel drug targets and the development of therapeutic drugs that suppress the growth of HER2+ tumor cells.

Mentor(s): Dr. Iuliana Lazar

30. Sarah E. Steinke

Macrophage differentiation using Keratin biomaterial in two cell models

Macrophage phenotype and dynamics play complex roles in wound healing and the resolution of inflammatory diseases. Tissue remodeling can become complicated in diseased states when an imbalance in the dynamic pro-inflammatory macrophages (M1) and anti-inflammatory macrophages (M2) occurs. Restoring the proper ratio of M2-to-M1 macrophages may be a potential treatment for these diseased states. Establishing good in-vitro models of macrophage differentiation is vital for developing targeted therapeutics to drive macrophage differentiation. Human hair-derived keratins have demonstrated their ability to shift macrophages towards an M2 phenotype with a human monocytic cell line (THP-1 cells). However, the THP-1 cell line may not be the best model to study these dynamics. In this study, we compared the ability of THP-1 and primary human immune cells to differentiate under established induction protocols and in the presence of keratin biomaterial. After targeted differentiation, we found that THP-1 cells produced the general macrophage marker (CD14) and the M1 macrophage marker (CD86) after induction, but did not produce the M2 macrophage marker (CD206). Unlike THP-1 cells, primary cells produced CD206 after cytokine treatment. Primary cells plated on keratin coatings expressed an alternate M2 marker (CD163). We concluded that primary cells may be a better model for evaluating macrophage differentiation in-vitro, this appears to be the case for studies involving keratin biomaterials.

Mentor(s): Dr. Mark Van Dyke

31. Nathan T. Rogers and John Burton

Control of Orthogonality and Crosstalk Between Two Protein Degradation Pathways

Organisms cope with limited resources by recycling building materials such as peptides. A specific coping mechanism is the degradation of proteins. Proteins are targeted to degradation via proteases, one such protease being the ClpXP protease. ClpXP selectively degrades proteins tagged with LAA, this aspect is utilized in synthetic biology to study queuing theory and to construct synthetic oscillators, for example. However, using solely ClpXP limits the variety in which synthetic circuits can be constructed and the uses of orthogonal circuits. We hypothesize, using queuing theory, that two orthogonal degradation pathways can be made non-orthogonal if they share a common machinery. To test our hypothesis and increase the scalability of synthetic circuits we are developing two orthogonal degradation pathways, afore mentioned ClpXP along with ClpAP, which share common machinery ClpP. ClpAP selectively degrades RepA70 tagged proteins. We have constructed synthetic gene circuits that enable us to selectively induce fluorescent proteins tagged with RepA70. We have demonstrated in *Escherichia coli* that RepA70 tagged proteins are target to degradation by ClpAP. Based on our observations, there is no apparent crosstalk between LAA and RepA tagged proteins when they are produced at low to medium levels. At higher levels of production, the orthogonal pathway becomes non-orthogonal, supporting our queuing hypothesis.

Mentor(s): Dr. Will Mather and Dr. Nicholas Butzin

32. Joseph B. Dietrich, Steven Brown, Erica Roesel, and Samantha Phanthanousy

Investigation of the Effect of Packaging Geometry on Pallet Strength

Pallets are essential components used globally to efficiently transport and store goods. Pallets are often over-designed because the interaction between the packages and pallet is not considered. In practice, pallets are designed with the assumption that the weight of the packages will be uniformly distributed on the pallet surface. However, package geometry varies and packages tend to bridge between each other on top of the pallet. This load bridging phenomena can affect the deflection of the pallet which influences its load carrying capacity. This study determined the influence of packaging geometry on pallet strength. Multiple bending tests were performed that simulated a warehouse racking system. While varying packaging geometry during the bending tests, the deflection of pallets of different stiffnesses were measured. The results of the bending tests provided information on the amount of load bridging that occurred in the package system. The results concluded that packaging geometry has a significant effect on pallet strength and that the load bridging phenomena can reduce the over-designing of pallets.

Mentor(s): Dr. Laszlo Horvath and Dr. Jay Park

33. Julie M. Clements, Grace Hemmingson, Scottie Lynch, and Nancy Fowlkes

History of Tuberculosis

Our goal in this project was to see how the fear of tuberculosis influenced the culture of advertisements and to understand who they were trying to reach. In 1880, the death rate from consumption in Virginia accounted for 14% of all deaths in the state, leading all other causes of death. The methods that were being used in the late 19th century to advertise cures for tuberculosis are still used in advertising modern cures for colds and prescription medications. Even though we don't see tuberculosis in America, the disease is still a major problem in developing countries, especially places like India, where multidrug-resistant tuberculosis is a pertinent issue. To better understand current events, we analyzed the narratives of the obituaries to determine the public perception of consumption and investigated how advertisers capitalized on the fear and urgency for a treatment. Within the advertisements, we analyzed the images, language, testimonies and promises being made to society. Through studying the overall culture surrounding tuberculosis and the advertisements that emerged out of that culture, we found that advertisements had specific demographic targets in mind, but all capitalized on the overarching fear of tuberculosis prevalent in society.

Mentor(s): Dr. Tom Ewing

34. Donovan L. Buterakos and Kyle Stewart

Numeric Metrics on Calabi-Yau Manifolds

The mathematical models of heterotic string theory require six additional compactified dimensions. In order to satisfy Einstein's equations, these dimensions must form a Calabi-Yau manifold with a Ricci-flat metric. A simple nontrivial Calabi-Yau manifold can be written as an embedding in complex projective space formed by requiring a particular fifth degree homogenous polynomial to vanish. A theorem proved by S. T. Yau demands the existence of Ricci-flat metric on this space, but no explicit solution has been found. We attempt to implement a method proposed by Headrick and Nassar in order to obtain a numeric approximation of this metric. This method makes use of cleverly contrived energy functionals to recast the problem of solving Einstein's equations as an optimization problem. We define a Kahler potential as the logarithm of a homogenous polynomial with variable coefficients. Minimizing the energy functional over these coefficients will give the approximate Kahler potential, from which the metric easily follows. Once an approximation of a metric is found, we will make predictions and calculations about particle physics. Examples include calculating masses of fundamental particles and Yukawa couplings.

Mentor(s): Dr. Lara Anderson and Dr. James Gray

35. Bud Koontz and Caleb Liptrap

Implementing a Rotational Grazing System at the Catawba Sustainability Center

It has been proven that implementing a rotational grazing system “extends the amount of time that livestock can meet their needs through grazing, reduces the need for harvested feedstuffs and lowers the feed costs, which then adds to profitability (Blanchet et. al, 2003). However, the benefits and application of rotational grazing is still not well understood by some producers. A working showcase of rotational grazing in this locality is an effective means to educate these producers. Productivity of the soils after implementation of the grazing plan will be analyzed as well as fall forage requirements, potential for expansion, health, condition and estimated yield of pasture. The students will also work with the Catawba Sustainability Center personnel to plan a program to showcase the rotational grazing system to local producers. Paddock sizes, animal units, dry matter requirements and grazing days have been calculated. A forage stick has been used to calculate approximate forage capacity of the field and types of forage have been determined. Due to the Center’s requirements to go through a bidding process for digging water lines and other various paperwork, the crossfencing that was purchased last fall has yet to be installed.

Mentor(s): Dr. Rachel Kohl

36. Lauren Furtner, Elizabeth Graviano, and Qirrat Jessani

Hear ME- Hear My Emotions; Child Focus Group

Socially challenged children often don't recognize their emotions. To improve this skill, the HearME team is developing an auditory feedback system that links children's changing arousal to sounds. Research questions were: Can preschoolers identify emotional quality in music like adults? What musical adjustments (in pitch, volume, tempo, timbre) are easiest for children to notice? The study is based in Russell's (1980) Affect Circumplex Model. Method: 12 children (seven male) ages 3-5 were recruited from a local childcare center with parent consent. The Institutional Review Board approved the project. Data was collected in empty classrooms. All sessions were videotaped. Experiment 1: After a warm-up exercise reviewing 5 emotions (happy, sad, mad, scared, calm), small groups of children listened to 8 music clips without lyrics. After each excerpt, participants were asked, "What feeling was the music playing?" An observer took notes and helped children's engagement. Experiment 2: Participants were asked to close their eyes and raise their hands to identify when they detected a change in volume, pitch, tempo, and timbre in music clips presented. Results: Participants identified an array of emotions that reflected quadrants represented in the circumplex affect model, similar to adults. Results from the second condition will be also presented.

Mentor(s): Dr. Isabel Bradburn

*37. Madison K. Lanier, Emma Nadia Dosky-McQuade,
Christine Heyward, Sara Lepley, and Kate Monick*

No Business For a Lady? A Systematic Content Analysis of Audience Responses to Online Performances by Male and Female Competitive Video Game Players

As the video game industry has grown in its commercial and social impact over the course of decades, one increasingly high-visibility, high-dollar element of the video gaming landscape of late has been the advent of serious competitive and professional gaming. Competitive video game players can earn lucrative incomes from prize monies and sponsorships, and live and online performances of competitions and daily casual matches involving prominent players garner massive audiences in person and online. Given existing research has found disparities in the way male and female participants in other prominent competitive arenas (such as professional sport) are covered by mass media and received by audiences, and given that existing research has also found disparities in the way gender is portrayed in video games and handled in interactions between video game players, this study explores whether similar disparities exist in audience comments about competitive video game players' online "streamed" performances. Guided by previous research on gender and sport, a systematic content analysis investigates comments in response to online performances from male and female competitive players to assess whether or not there are disparities by gender in the way audiences discuss and evaluate male and female competitive players' skill, personal characteristics, personality, and other traits. Results will inform an understanding of gender roles and expectations in competitive video game culture.

Mentor(s): Dr. James Ivory

*38. Madison K. Lanier, Emma Nadia Dosky-McQuade,
Christine Heyward, Sara Lepley, and Kate Monick*

Customized Virtual Reality as a Potential Tool for Anti-Bullying Interventions

Bullying is a widespread problem in U.S. schools, with 1 in 4 students reporting to have been bullied at school according to the National Center for Education and Bureau of Justice. Bullying occurs across all demographics and contexts, and it can have negative outcomes on victims including impacted mental health, substance abuse, and suicide. Although anti-bullying campaigns have increased awareness in the general public, bullying remains common and now also takes place in new arenas such as social media. Prevalent strategies to combat bullying include targeting and educating bystanders because they can play a key role in a bullying situation and because their attitudes and behavior may potentially be more influenced by interventions than those of bullies and victims. Although these strategies often include visual and print media campaigns, another strategy that this study investigates is the use of virtual reality. Virtual reality is an immersive experience that involves vivid interaction, and may thus be uniquely effective as a tool for anti-bullying interventions. The present study compares effects of four conditions (virtual reality with customization, virtual reality without customization, campaign video, and written essay) on a range of anti-bullying outcome measures. The anticipated results are expected to provide insights about the effects of virtual reality interventions on participants' attitudes and beliefs about their role as a bystander in bullying situations.

Mentor(s): Dr. James Ivory

39. Ashley Meier

Student Physical Activity and Health at a Local Elementary School

The purpose of this study was to determine a possible correlation between higher weight/lower physical activity in children and lower school achievement/attendance. Childhood obesity has staggered in rates in the past few decades, which is why the topic is so pertinent. Our project addressed the following questions: 1. What are the health patterns of students in kindergarten and grade 3, (using Body-Mass Index (BMI) as a proxy for health)? 2. Do health patterns change from kindergarten to third grade? 3. Do children who appear less healthy attend less school? We collected student data from a local elementary school from health, fitness and attendance records. Information was collected in an Excel document, which was stored on a USB drive and kept at the school. Statistical analyses were then done through the program SPSS. Results showed 72% of kindergarteners and 69% of third graders were a healthy weight for their height. It was also found that most children retained a healthy weight across both grades, but those overweight in kindergarten tended to remain so in third grade; slightly more children were overweight in 3rd grade than in Kindergarten. Children who were underweight or overweight were also no more likely to attend less or more school than other children.

Mentor(s): Dr. Isabel Bradburn

40. Emma G. Strickland and Emma Stowe

Can We Build A Bone? Osteoblastic Differentiation on Micro-Fibers

This study examines healing bone tissue through stem cell differentiation as opposed to traditional bone graft procedures. The purpose of this investigation was to determine the ideal environment to induce stem cell differentiation into osteoblasts (bone cells). This research will contribute to the larger goal of the development of an engineered tissue construct where a patient's own stem cells can be implanted into the human body to replace damaged or lost bone tissue. In this study, stem cells were grown on two types of electrospun scaffolds, differing in their chemical compositions. Unmineralized scaffolds contained the polymer polycaprolactone (PCL), while mineralized scaffolds contained this polymer with the addition of the mineral nano-hydroxyapatite (nHAP). This mineral was used to mimic the structure and mineral composition of bone, and these two groups were compared to a control group of cells grown without a scaffold. The rate and extent of stem cell differentiation towards osteoblastic cells was analyzed using PCR and histological stains. Data was collected every 7 days throughout the 21 day study. Results from histology images and gene expression concluded that the cells grown on the mineralized scaffolds had a changed pattern of differentiation when compared to the cells grown on unmineralized scaffolds and without a scaffold. However, there was not enough evidence to support a direct correlation between mineral addition and increased rate of differentiation.

Mentor(s): Dr. Aaron Goldstein

41. James E. Taylor and Jaime Simon

Virginia Tech SailBOT

SailBOT is an ambitious project aimed at making a fully autonomous sailboat for competition. The project is spread across a variety of sub-teams that focus on building an efficient boat, designing sails, and making the electronic components which drive the autonomous onboard systems. The goal of the project is to integrate principles of aeronautics with fully automated and remote controlled computerized systems. The boat moves to certain latitude and longitude coordinates, in accordance with sailing practices, through utilizing an onboard Raspberry Pi, GPS, wind sensor, and servo motors. Although the scope of the project is directly tailored for an annual competition date, SailBOT can be seen as a long-term application and development of the best sailing and fluid dynamics practices. Truly, this project is a learning endeavor for all parties involved and could potentially evolve automated sailing technologies, as the project's code is completely open source. The project is continuously tested on the water and through algorithmic and procedural tests of the various components. Testing is one of the most important facets to the project. Although this project is still under development, various stages in circuit design and algorithm design have quantifiable test results.

Mentor(s): Dr. Daniel Stilwell

42. Marisa L. Mosier and Taylor Breeding

The Impact of Mercury Exposure on the Volume of the Hippocampus and Telencephalon of a Bird

Wildlife research has shown that exposure to harmful metals can have a negative impact on the reproductive fitness and survival of many animals. For example, in birds exposure to mercury can reduce successful fledging, therefore negatively impacting overall population viability. In the current study, mercury exposure was experimentally manipulated in captive zebra finches. Individuals reared under control and mercury dosed conditions were compared to better understand the effects of this environmental contaminant on underlying physiology. Specifically, the volumes of two brain regions, the telencephalon and hippocampus, were quantified to understand the impact of mercury on brain structures that are known to relate to brain function. Results are consistent with previous studies showing negative effects of mercury exposure on the brain and physiology. Deficits in telencephalon volume could result in impaired 'executive' function and generalized cognition while smaller hippocampal volumes are associated with poor spatial learning and memory. Ultimately, these sub-lethal effects of mercury exposure on brain structure and cognition could result in lower fitness and survival in wild birds.

Mentor(s): Dr. Kendra Sewall

43. Grace A. Herrick, Diane Opeikun, Carson Baldwin, Wayne Stafford, and Kyle Woisard

Sex Differences in Laterality through Motor Function and Concurrent Cerebral Regulation of Autonomic Nervous System Tasks

Williamson & Harrison (2003) found differences in right frontal lobe functioning between high- and low-hostile males. However, these differences have not been explored in female populations. This study investigates sex differences in the influence of hostility levels on verbal and nonverbal fluency, and the concurrent cerebral regulation of the autonomic nervous system. Based on recent research, the anterior right cerebrum is associated with regulation of sympathetic activity while the anterior left cerebrum is associated with regulation of parasympathetic activity (Holland, et. al., 2014). Furthermore, neuropsychological tasks mediated by the left and right anterior cerebral systems will be used. Fluency and perseverative errors will be analyzed and physiological measures will be taken, including blood pressure, respiration, and E.K.G. It is predicted that high-hostile males will show a greater number of perseverative errors as well as more interference in cardiovascular regulation concurrent with the neuropsychological measure of right frontal lobe function in comparison to low-hostile males. However, research suggests that there are more interhemispheric connections in the brains of females while there are more intrahemispheric connections in the brains of males (Baron-Cohen, 2005). This leads to the hypothesis that there will be no statistically significant differences in cardiovascular regulation or perseverative errors between low-hostile and high-hostile females.

Mentor(s): Dr. Kelly Harrison

44. Asmaa Wariaghli and Con-Ning Yen

Mitochondrial abundance in the AMPK γ 3R200Q mutant pigs might participate in the development of acid meat

Fresh pork quality is greatly influenced by the rate and the extent of postmortem pH decline. Low ultimate pH adversely impacts meat color, texture, water holding capacity, and protein content. Porcine AMPK γ 3R200Q or RN- mutation carrier pigs produce meat with low ultimate pH (acidic meat). The negative effects of this mutation on pork quality result in economic losses for the pork industry. The AMPK γ 3R200Q mutation is associated with elevated mitochondrial content and oxidative enzymes activity in glycolytic muscles. We hypothesize that the elevated levels of mitochondria may result in extended postmortem metabolism which cause further decline in ultimate pH. To test this hypothesis, mitochondrial protein was incorporated into an in vitro bioassay that mimics postmortem skeletal muscle metabolism. Aliquots were removed at 0, 30, 120, 240 and 1440 minutes to determine pH, glycogen, glucose 6-phosphate, and lactate concentrations. Mitochondrial addition accelerated pH decline and lowered ultimate pH. Greater lactate and glucose 6-phosphate production and glycogen degradation was also observed in the mitochondria treated group. This data shows that mitochondria can alter the extent of pH decline and suggest that mitochondria might participate in the development of acid meat. Key words: Acid meat, postmortem metabolism, mitochondria

Mentor(s): Dr. David Gerrard

45. Megan Fok, Madeline Taylor, Jessie Butler, Niral Patel, and Alex Manikas

Student Perceptions of Gender, Appearance, and Roles of Professors

Studies have shown that physical appearance, gender, and gender roles play important factors when forming impressions of others. However, present research has not fully examined impression formation as a function of interactions among these variables. The hypotheses for the current study are that in a professional context stereotypical appearance norms are both stronger for females than for males and stronger for male gender roles than for female gender roles, and the target stimulus person will be judged as more efficacious when target gender matches gender role expectations than when target gender does not match gender role expectations. The dependent variable is perceptions of competencies. The experimental context examines students' impressions of professors based on profile-vignettes. This study is conducted online and participants are two profiles from a pool of 32 possible profiles. Each profile contains a vignette of either a female gender role class (Human Development) or a male gender role class (Chemistry). The profile is accompanied with a photo of a male or female professor either in casual or more professional dress. This study is currently in progress and the authors anticipate data collection (n=60) and data analysis to be completed by the time of the presentation.

Mentor(s): Dr. Neil Hauenstein

46. Joseph C. Tise, Mark Hinson, Amanda Scarangella, Deon Brown, and Kristin Austin

How you feel vs. Who you are: The impact of emotion regulation on self-concept

Our goal is to understand what factors may contribute to self-concept in undergraduate college students. Previous research has suggested that emotion regulation is related to academic success in kindergartners (Graziano et al., 2007). Specifically, they found that students feel good when they succeed and bad when they fail, suggesting that academic self-concept may be affected by emotion regulation. We hypothesize that younger students and worse emotion regulation skills will be related to decreased self-concept. The participants were recruited as part of a larger study assessing the impact of ASD traits and ADHD symptoms on social competency. Although enrollment for this study is ongoing, data have been collected on 29 participants (17 female; mean age 20.25; 22 Caucasian). Participants' self-concept was determined using the Problems with Self-Concept T-score from the Conners' Adult ADHD Rating Scale - self report (CAARS; Conners et al., 1999). Participants' emotion regulation was measured using the Barkley Deficits in Executive Functioning Scale (BDEFS; Barkley, 2011). Preliminary results of regression analyses indicated that emotion regulation was a significant predictor of self-concept ($p < .001$) such that emotion regulation deficits predicts decreased self-concept. Age was not a significant predictor of self-concept ($p = .07$). Additional analyses will include more participants and investigate the potential role of school performance on self-concept.

Mentor(s): Dr. Thomas Ollendick and Dr. Kristin

47 . Caitlin Van Wicklin, Elyse Hammond, Haleigh Hutcheson, Matthew Reynolds, and Annette Yoo

Sex Differences in Laterality in Emotion Specific Autonomic Nervous System Activity

The goal of this research is to investigate brain laterality by looking at the differences in how males and females differ in their autonomic nervous system response to emotional stimuli. Though similar research done by Dr. Paul Ekman has been previously documented, his experiment did not look at the differences in males and females. This research will give new insights into laterality differences between the sexes and gain further insights into laterality in emotion. This is observed by measuring the response of distinct emotions through the coordination of specific facial expressions. Through verbal directions in the emotions of anger, disgust, fear, happiness, sadness and surprise participants are then asked about which emotion(s) that they felt and the intensity of the emotion. Physiological measures such as heart rate, skin conductance, and respiration will be obtained using BioPac. Thermistors and electrodes will also be used to obtain finger temperature and forearm flexor muscle tension, respectively. It is expected that though both males and females will have a physiological response, but only the females will effectively communicate the emotions that were felt.

Mentor(s): Dr. Kelly Harrison

Session 2
Panel on
Presenting
Undergraduate
Research

Earl Cherry
Albert Hinman
Alexandria Hubbard
Matthew Johnson
David Mackanic
Nancy M. Fowlkes
Amanda Parmiter
David Vasquez

Session 3

Oral

Presentations

Earl K. Jr. Cherry

With All Deliberate Peace: Integration and Resistance West of the Blue Ridge.

The 1954 decision in the matter of *Brown v. Board of Education* had made public school integration the law of the land. A subsequent order demanded it be done “with all deliberate speed.” In Virginia, things seemed to move at a pace made deliberately slow. As the issue began to come to a head, two southwestern districts integrated without violence. Two districts seemed to simply give up the fight. This project shows, however, it was not quite so simple. In many Southern states, school districts shut down and violence hindered the process of integration. In Virginia, the Roanoke City and Grayson-Galax Public School systems each integrated without violence, but not without resistance. Discrimination and segregation directed toward African-Americans was a way of life dating back over 300 years across the South and would not die easily. These districts made it a point to eliminate violence from the process entirely by refusing to bow to it. However, there was definitely resistance to their attempts to integrate. Some came from outside the system, in the form of the Pupil Placement Board, some came from inside the system in the form of broken contracts, and some came in the form of coercion, but none of it came in the form of violence. As Massive Resistance began to die, different authorities commanded that schools in Galax City, Grayson County, and Roanoke City all be integrated, and they did so without violence, resistance would still be present throughout the process.

Mentor(s): Dr. Peter Wallenstein and Dr. Marian Mollin

Dara M. Green

The Jeffrey T. Wilson Diary

Today, little is known of Jeffrey T. Wilson's remarkable life outside of the community of Portsmouth, where he lived almost a hundred years ago. Despite his relative obscurity Wilson found himself again and again at the epicenter of events, which transformed the political and ideological landscape of the United States, between the mid nineteenth and early twentieth century. My purpose in studying Wilson has been to understand these monumental political and ideological changes. In utilizing Wilson's recollections of slavery, impressment into the Confederate war effort, the racial politics of Reconstruction, and later Jim Crow, I hope to ground my work within an experiential narrative that lends depth and humanity to the broader discussion of race relations in this country. My research reveals the development of continually shifting, and often contradictory, American policy and opinions on race and citizenship in the United States.

Mentor(s): Dr. Brett Shadle

Seth A. White

What You Can't Escape, You Must Embrace: The Rise and Integration at the University of Missis

This paper examines the racial progress the state of Mississippi, in particular, the University of Mississippi has undergone since the race riots in 1962. This article interrogates how slow and difficult racial progress was for arguably a state that has one of the most in depth histories regarding American racism. I attempt to show how racial progress was achieved through the sport of football, as the football program did not become integrated until 1972. Football gave the University of Mississippi an opportunity to showcase its racial progress. The tragic and uplifting story of Roy Lee "Chucky" Mullins in 1989 illustrates how the University of Mississippi embraced integration and opposed the old white tradition of segregation. This article draws from a series of twentieth and twenty-first century professional literature, magazines, letter, and newspapers, in addition to commentaries, and accounts from students, faculty, and administrative entities. The finished result was 32 pages and a B+ for my final grade at the end of the semester.

Mentor(s): Dr. Peter Wallenstein

Danielle Ingalls

Drivers Seeking Diversity: NASCAR's attempts to attract gender and race minorities

My project, "Drivers Seeking Diversity: NASCAR's attempts to attract gender and race minorities" was conducted to disprove the racial stereotypes connected to the sport of NASCAR. In my findings, I concluded that NASCAR has made significant efforts to diversify their white male-dominated sport. In the future, we will see the continuation of more young minority drivers competing in NASCAR. My project, "Drivers Seeking Diversity: NASCAR's attempts to attract gender and race minorities" was conducted to disprove the racial stereotypes connected to the sport of NASCAR. In my findings, I concluded that NASCAR has made significant efforts to diversify their white male-dominated sport. In the future, we will see the continuation of more young minority drivers competing in NASCAR.

Mentor(s): Dr. Peter Wallenstein

Delia Tomlinson

The War on Poverty in Appalachia: "Which Side Are You On?"

President Lyndon B. Johnson launched the War on Poverty in 1964, targeting both urban and rural poverty, primarily within the Appalachian region. This project explores both the opinions of the nation at large and insiders' perspectives on the War on Poverty in southern Appalachia. I argue that by the end of the decade, the War on Poverty in Appalachia had influenced some important changes in the region, but pessimism toward the Great Society left its Appalachian supporters hopeless. Using national and local newspapers, interviews, and government documents, I examine changing sentiments on the program from 1964 to 1971. The federal government, by way of the Appalachian Regional Commission, tackled Appalachian regional poverty with fervor and optimism at the beginning of the War on Poverty. Similarly, Appalachian residents looked forward to the possible eradication of poverty and approached the War energetically. As the decade progressed, these residents realized that the Appalachian Regional Commission's actions under the federal government, never fully appreciating the input of their constituents, closely resembled the historical paternalism that had plagued the region for since the late 1800s.

Mentor(s): Dr. Marian Mollin

Derek J. Litvak

Publius v. Brutus: A Ratification Debate Over The Federal Courts and Judicial Review

The purpose of this project was to examine two key players in the ratification debates over the Constitution, Publius and Brutus, in respect to their opinions on the proposed federal judiciary. In particular, this project set out to show how the arguments of these two men showed the existence of judicial review from the very onset of the Constitution. With the amount of attention the Supreme Court, and lower federal courts, receive today, I wanted to delve into the creation of this branch and analysis what powers people thought the federal judiciary would hold if the Constitution was ratified. By examining Publius's Federalist Papers and Brutus's essays, I was able to ground my research largely on primary sources, and use the words of these two men themselves as a basis for my analysis. The resulting paper showed how the many aspects of the federal judiciary that Publius argued for, and Brutus against, were important not only in their own right, but because they ultimately were the very parts of the proposed judiciary that gave it the power, on top of authority, to exercise judicial review.

Mentor(s): Dr. Daniel Thorp

Eleanor L. Boggs

Community Heritage: Traditional Music and Bluegrass in Montgomery County and Giles County

Montgomery County and Giles County have an established history and continued tradition of old time music and bluegrass. In my research, I examined the scope of the music in the area in order to define its impact on the regional culture. As part of the Community Heritage Project developed by Dr. Anita Puckett and the Appalachian Studies Program, I collected and transcribed oral histories from people involved in the history of traditional music in Montgomery and Giles counties. I also attended local events and jam sessions to witness the music firsthand and interact with the people in attendance and read printed materials to understand music's relation to Appalachian culture. Over the course of my research, I discovered a community of people dedicated to preserving the music and the heritage it represents. The Community Heritage project is being conducted in partnership with The Crooked Road: Virginia's Heritage Music Trail (TCR) for the purpose of constructing TCR Wayside kiosks in Montgomery and Giles Counties, Virginia.

Mentor(s): Dr. Anita Puckett

Olivia N. Brescia, Tyler Erickson, Allison Judge, Keegan Brian, Paul Wotring

The Effects of Framing of Feedback on Self-efficacy

The current study examines the effects of feedback on task specific self-efficacy and task performance, more specifically, the effects of feedback sign (Positive vs. Negative), feedback message (Vague vs. Task-Specific), and feedback source (Expert vs. Novice). Central to interaction predictions are the expectations that positively-signed, task-specific feedback from an expert will lead to the highest levels of self-efficacy and task performance, whereas, negatively-signed, ambiguous feedback from a novice source will lead to the lowest levels of self-efficacy and task performance. This will be an online study using undergraduate college students receiving extra course credit for participation. The experimental design is between subjects with each participant randomly assigned to a condition. Participants will be asked to rate their self-efficacy to perform on brainstorming task and complete a brainstorming task after which they receive feedback. Feedback sign is manipulated by providing comparisons to others doing the task. Participants will then rate their self-efficacy to do well on a second brainstorming task, and then perform the second brainstorming task. Data will be analyzed using Analysis of Variance with follow-up simple effects analyses. The data for this study are currently being collected and the results will be available at the time of the conference.

Mentor(s): Neil Hauenstein

Taylor E. Allen

Maternal Food and Lifestyle Practices in Sri Lanka: Maternal Health Education Program Proposal, Nuwara Eliya

Tradition plays a quintessential role in the daily practices and nutritive habits of those inhabiting the historically rooted country of Sri Lanka. This study aims to fill in the gaps and expand upon research that has been conducted to explore the correlation between maternal health, nutritional knowledge, family impact, and culture. This study uses the data compilation from a series of questionnaires offered to thirty women, either pregnant or lactating, who regularly attend the Medical Officer of Health (MOH) Clinic in Nuwara Eliya. Through exploring their daily practices and overall nutritional knowledge, this data examines how beliefs, especially regarding nutrition, impact the lifestyle and health practices of the mother. Overall, the study found that mothers practice taboos regarding maternal diet and have varying knowledge of maternal nutrition. In addition, the family, especially the maternal figure, plays a critical role in the mother's health and diet practices. These findings suggest that in addition to the health services provided by the MOH, a maternal health education program should be implemented to create a space where mothers are willing to dispel myths, enhance their nutritional knowledge, pursue practices that best serve herself and her baby, and involve their maternal figure in the learning process. This program would provide health services a holistic approach and consider the influence various factors have on maternal health.

Mentor(s): Dr. Robert Siegle

Zach J. Gajewski

The Effect of Zooplankton Feeding on the Amphibian Chytrid Fungus

In recent decades amphibian populations have declined dramatically. Many of these declines are linked to *Batrachochytrium dendrobatidis* (Bd), a pathogenic fungus that grows on the skin of amphibians. Recent studies have demonstrated that the zooplankton, *Daphnia magna*, can reduce mortality of amphibians by grazing on Bd zoospores that would otherwise settle on and infect amphibian skin. If zooplankton consumes Bd zoospores as a food source, then zooplankton may potentially be used to control Bd densities in the environment. In this study, we examined if two additional species of zooplankton—*Daphnia ambigua* and ostracods—also consume Bd. *Daphnia magna* was included as a positive control. A known concentration of zoospores was added into vials containing one of three densities (0, 5, and 10) of zooplankton. The grazing time for all treatments was 24 hours and samples were taken at 0, 12, and 24 hours. To quantify the Bd, a sample of water from each vial was taken at each timepoint, and then quantitative PCR was used to quantify the amount of zoospores in each vial. The samples were then compared to the control to see if the zooplankton reduced the zoospore concentration. While *Daphnia ambigua* reduced zoospore concentration, ostracods did not.

Mentor(s): Dr. Lisa Belden

David Vasquez

Examining the relationship between dominance status and disease transmission in house finches

Mycoplasma gallisepticum (MG) is a conjunctival pathogen of house finches (*Haemorhous mexicanus*) spread through indirect contact on bird-feeders. We used inert microspheres in the conjunctiva as a non-infectious model for MG spread. The microspheres, similar in size to bacterial cells, allow us to non-invasively test the relationship between dominance status and pathogen deposition on bird feeders, which is a key component of MG transmission. I hypothesized that socially-dominant birds will deposit more microspheres onto the bird feeder than socially-subordinate birds. We formed six flocks of five house finches, quantified dominance status, and then inoculated the conjunctiva of the most dominant and subordinate individual in each flock with different colored microspheres. We swabbed feeders to determine whether the dominant or subordinate bird in each flock deposited more microspheres. We also quantified feeding behavior throughout the experiment using radio-frequency identification devices attached to each feeder. We found that dominant birds spent significantly more overall time on the bird feeder than subordinate birds. However, subordinate birds made significantly more visits to the feeder per day than dominant birds. Finally, on average, dominant birds deposited more microspheres but this result was not statistically significant, potentially due to low overall detection of microsphere deposition.

Mentor(s): Dr. Dana Hawley

Hannah L. Haymes

“A Friendship, True or False”

What was the true relationship between the powerful French king Francis I and the influential Italian genius Leonardo da Vinci? Has their relationship been idealized or was it a veritable friendship? The purpose of this study is to explore and understand the historic connections between their respective countries, the history of the Italian Renaissance and the French Renaissance, and the popular opinions about their famous rapport. Through grasping these important details, one hopes to set the record straight about their so-called “friendship.” Information was gathered from various online sources, books, and textbooks and was compiled after gathering facts that directly pertained to the subject. The paper commences with a description of two paintings that portray the romanticized friendship between these two famous men and continues on to delve into the history behind their relationship. It concludes with the understanding that there may have been more to their relations than popular scholars would like to believe. While Francis I and Leonardo da Vinci may very well have been close friends, it is also possible and quite likely that their relationship existed in order to meet their own needs such as increased power for Francis I and financial gains for da Vinci.

Mentor(s): Dr. Alexander Dickow

Obaid, M. Rehman

Sufism in the thought of Ibn Taymiyyah (1263-1328)

This research project will analyze the thought of Ibn Taymiyyah in relation to his views on tasawwuf (Sufism) by examining primary and secondary sources. In modern times, Ibn Taymiyyah is seen as the father of Salafi thought and often presented as being anti-Sufi. However, this project contends that Ibn Taymiyyah's thought is far richer, complex, and dynamic than is often portrayed to be. Thus, by looking at Ibn Taymiyyah's works, the research will explore whether he really is anti-Sufi or whether his views on tasawwuf have to be analyzed from the perspective of his views on the various doctrinal, philosophical, institutional and ritualistic aspects of tasawwuf. The research established is used to see what Ibn Taymiyyah's views are, it will examine the role of the interpretation—or misinterpretation of his work—in the modern Islamic landscape, particularly in the political realm where it has many implications in current events in the Middle East and beyond.

Mentor(s): Dr. Rachel Scott

Kaitlyn E. Fitzgerald

“Keyed In”: An Android Application Proposal rooted in Social Media for NGOs

In the 21st century the use of social media has become a vital tool during protest movements in politically unstable countries. It has helped propel momentum with minute to minute updates and built community through mass networks. Non-governmental organizations (NGOs), as the local supporters, can serve a huge role in giving protest movements structure and safety through this medium of social media. This research seeks to establish a solid case of the effectiveness of an NGO using social media through the proposal of an Android application called “Keyed In”. In addition to reinforcing networks through filtered social media, this app will integrate security measures that could potentially save many lives from pending violence in protest situations. The application uses different components in its four sections: Location, Safety, Community, Connection, and Information. It integrates social media platforms Twitter and Facebook, Google Mapping Technologies, and an online messaging service. The app proposal is in the form of a collection of phone interfaces as you navigate through the apps functions created through Adobe Illustrator. The proposal is in the process of being developed into an actual application as I work with other Computer Science majors to put it into action throughout the next year.

Mentor(s): Dr. Robert Siegle and Dr. Shelby Ward

Emily E. Hurley

Mother's Views on Sexual Objectification of Women in Advertising

American high school students see advertisements every day, and many of these ads contain images that sexually objectify women. While the prevalence of sexual objectification of women is known to impact both women and men in many harmful ways, I was specifically interested in how mothers thought such images were affecting their children. I interviewed six women by showing them advertisements and asking their opinions on how the women were being portrayed and how they would feel if their child saw the ad. I found that, while many wished their kids did not see advertisements that showed women being controlled or objectified by men, they felt that they were unavoidable and therefore focused on making sure their high school children were able to differentiate between the images in the advertisements and real life. Many mothers also recognized that, while none of the advertisements would induce them to buy the advertised product, they must work on enough consumers for companies to continue to use them. While images of sexual objectification of women continue to help companies successfully advertise products, they will continue to put these images in highly visible, public places until appropriate legislation is passed.

Mentor(s): Dr. Brandy Faulkner

Juliette D Parks, Michael A Harring

The Effects of Binaural Stimulation on Brainwave Entrainment

An experiment was conducted to determine if binaural stimulation can induce brainwave entrainment in order to improve productivity and focus. Binaural stimulation is the process in which two tones of slightly differing frequencies are individually presented to the left and right ear. This results in a third low-frequency binaural beat, created within the cortex, equal to the frequency difference. Brainwave entrainment occurs when the electrocortical activity oscillates at the frequency of the binaural beat. Clinical trials were run between periods of 10 and 40 minutes where the subject was presented with binaural beats of varying target frequencies, wave patterns, and carrier frequencies. EEG data was collected using a 14 channel Emotiv EEG headset at a sampling frequency of 128 Hz. While no conclusive evidence of entrainment has been observed in the initial results, variables such as sawtooth wave modification, 5 Hz and 7 Hz target frequencies, and carrier frequencies of 240 Hz and 480 Hz have displayed periods of desired frequency activity. Further research could allow for binaural stimulation applications ranging from increased studying efficiency to short-term memory enhancement.

Mentor(s): Dr. Alexander Leonessa

Joseph A. Smith, Joel Luehr, Jacob Vest, Robert Schlicker, and Taylor Johnson

PITCH: Preventative Injury Technology for Concussive Head impacts

Preventative Injury Technology for Concussive Head impacts (PITCH) provides a solution to the issue of severe head injuries to youth athletes in the game of baseball, particularly affecting the pitcher. Currently, there is only one MLB-approved product on the market, isoBLOX, which addresses the issue of cranial baseball impacts for non-catchers/batters. The goal of this project is to design a protective headpiece for youth baseball players that prevents traumatic cranial impacts without overly compromising the size, weight, and comfort of a baseball hat, in addition to outperforming the isoBLOX skull cap in impact testing. We have designed an over-the-hat headpiece prototype containing two components: a rigid outer shell to distribute the impact load over a larger area and a lightweight polystyrene foam-padding layer to absorb the impact energy. Utilizing the material properties gained from compression testing, our analytical mass-spring model predicts a linear head acceleration of 181 g's upon impact, which is less than the 300 g mean predicted acceleration for skull fracture. To confirm predicted head acceleration values, we will place our prototype on a NOCSAE head-form and use a pitching machine to impact test it by launching baseballs at the head-form with speeds up to the elite-youth level of 75 mph.

Mentor(s): Dr. Scott Case and Dr. Stefan Duma

Nicholas R. Tibbetts

Design and Development of the Virginia Tech CubeSat Attitude Control Simulator (CSACS)

Spacecraft three-axis simulators are commonly used to simulate attitude control conditions prior to flight due to the near frictionless environment that they provide. However, most that are currently in use are too large to be conducive to testing CubeSat-class spacecraft. As more universities, industries, and even high schools develop CubeSats to expand the horizons of human understanding, the demand for test platforms to test, verify, and validate systems has increased. Currently, no public attitude control simulator exists that can support the new six and twelve unit CubeSats nor test all current CubeSat configurations. To solve these challenges, an economical black-box approach to CubeSat attitude determination and control (ADACS) simulation has been designed and fabricated at Virginia Tech's Space System Simulation Laboratory. This inexpensive, next-generation platform will enable testing of any current and future CubeSat frame and ADACS system. The Virginia Tech CubeSat Attitude Control Simulator (CSACS) is a lightweight test platform with negligible inertia. Using commercial off the shelf (COTS) components, the system can dynamically balance and eliminate gravitational torque to provide a stable, realistic simulation system to test CubeSat ADACS. With an approximate platform cost of \$2500, this system can be built by any university or business to promote the advancement of small satellite technology and advanced space science research.

Mentor(s): Dr. Jon Black and Dr. Greg Earle

Julia A. Roth

A Synthetic Biology Approach to Ribosomal Collisions and Stalling

The fundamentals of translation are well established but the cellular response to ribosomal stalling and collisions is poorly understood. Total Asymmetric Simple Exclusion Process (TASEP) predicts that ribosomes naturally and frequently interact with each other. We created a TASEP model that utilizes a sliding window approach to represent ribosomal occupation of multiple codons, and includes rare codons to more accurately investigate this phenomena. This new simulation coupled with a synthetic biology approach gives us a more accurate model than previously possible. The experiment involves batch results, and a combination of microfluidic and microscopy using real synthetic circuits in *Escherichia coli*. Our synthetic circuit consists of two adjacent gene encoding fluorescent proteins under the control of an inducible promoter. These genes surround a region that consists of codons normally rare to *E. coli*. Using another synthetic circuit, we can alter the level of tRNA specific to these rare codons and titrate these codons from rare to abundant. We can effectively produce fast, medium, or slow rates of translation based on the tRNA levels. The advantage of using our synthetic approach is it allows for quantitative data of (1) rareness of codons related to tRNA levels, and (2) an *in vivo* analysis of ribosomal collisions and stalling.

Mentor(s): Dr. William Mather

Michael D. Sherburne

Solving the Global Water Crisis Through a Holistic Methodology in Sri Lanka

Global water issues are arising, despite technological improvements and better infrastructure at hand. This disconnect is the center of this research, resulting in the creation of a new methodology in viewing and solving world water problems. This research focused on going into an area and looking at the water issues in a holistic manner, focusing on: government, urban planning, education, and water quality. The city of Kandy in Sri Lanka is being used as a case study due to a wealth of history and numerous water scientists. This case study shows that analysis of water issues at hand are not to be conducted again by another outside entity, but instead empowering the local scientists and the local population to solve their water problems. Concerns are not just about structural factors, but political as well, ranging from local to international influences. This is where western solutions towards water issues fail. More effort needs to be focused towards empowering the local experts, giving them a voice, and listening to what the people need in order to solve their water problems. Despite problems detected and solutions created, implementation of these fixes are the limiting factors in a population's reliable access to clean water.

Mentor(s): Dr. Robert Siegle

Session 4

Poster

Presentations

1. Richard M. Abrahamson

Excess glycogen does not resolve high ultimate pH in red, oxidative chicken meat

In recent discoveries, sulfonated polymer membranes have demonstrate usefulness in a number of applications. The present work focuses on applications for battery technology. Conventional free radical polymerization synthesized random copolymers of 4-methylstyrene and styrene at 25 and 50 wt% styrene incorporation. Synthesized polymers were then treated with acetyl sulfate and then neutralized with either lithium hydroxide or 1-methylimidazole. The solutions were then exposed to common battery additives: diethyl carbonate, ethylene carbonate, ionic liquid 1-ethyl-3-methylimidazolium bis(triflouromethyl)sulfonamide (EMIm Tf₂N), and mixtures of EMIm Tf₂N and Li Tf₂N at 8:1 and 2:1 mixtures by weight. Polymer-additive blends were analyzed for their thermal property changes by using thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC).

Mentor(s): Dr. Tim Long

2. Alexis K. Bruzgul

Excess glycogen does not resolve high ultimate pH in red, oxidative chicken meat

During the conversion of muscle to meat, glycolysis utilizes glycogen to produce lactate and H⁺. The H⁺ production decreases resting muscle pH of 7.2 to near 5.6 in meat. However, where pH decline stops between 7.2 and 5.6 dictates meat quality characteristics. Red, oxidative muscle oftentimes exhibits a higher ultimate pH (~pH 5.9) than white, glycolytic muscle (~pH 5.6). Because red muscle has a lower antemortem level of glycogen than white muscle, we hypothesized that muscle glycogen concentration was the limiting factor controlling the extent of pH decline. Therefore, in the presence of excess glycogen, both muscles should terminate postmortem glycolysis at the same ultimate pH. To test this hypothesis, pre-rigor chicken breast (glycolytic) and thigh (oxidative) muscles (n=4 per muscle) were incorporated into an in vitro glycolytic system with excess glycogen. Samples were taken at 0, 60, 180 and 1440 min and analyzed for pH, lactate, glycogen, glucose 6-phosphate and glucose. Contradictory to our hypothesis, pH decline of the thigh muscles stopped early (pH 5.86 ± 0.05) compared to the breast muscles (pH 5.57 ± 0.10) despite the presence of excess glycogen. These data indicate that glycogen content alone is not responsible for the in vivo differences in ultimate pH between oxidative and glycolytic chicken muscles. Rather, another undetermined mechanism is responsible for stopping pH decline early in the oxidative muscle.

Mentor(s): Dr. David Gerrard

3. Margaret J Caruso

Effects of Habitat and Body Condition on Bird Feather Quality

Flight ability serves as a major determinant of bird fitness and is influenced by the quality of flight feathers. Resources in the environment are known to impact feather growth and condition, yet the relationship between habitat quality, overall bird health, and developmental condition to the quality of flight feathers remains poorly understood. Here we use feathers collected from song birds living in habitats that differed in human impact (i.e., rural and urban areas), as well as zebra finches reared under conditions of varying nutritional quality to study how these variables influence three measures of flight feather quality: the rachis length, vane area, and barbule numbers. Feathers were collected from song sparrows in habitats classified as rural or urban based on ambient noise, light, and human activity, while zebra finch feathers were collected from birds with limited and full access to food during their first 50 days of development. The feathers were imaged using Fiji ImageJ to determine vane area, length of rachis, and barbule number in a set area. Our results indicate that habitat does not play a role in determining body condition, however rachis length correlates weakly (63%) with vane area in flight feathers. Contrary to our expectations we found that body condition of the song sparrow had no effect on feather quality, be it rachis length or vane area.

Mentor(s): Dr. Kendra Sewall

4. Bailey E. Carver

Developing a Neurological Definition of Boredom

Research has shown that boredom exists in multiple capacities defined by varying behaviors. Boredom can result in active behaviors such as pacing and being agitated, yet it can also result in lethargic behaviors such as sleeping and little movement. While boredom has been studied through self-report and behavioral observations, little research has been done in neuroscience. It is believed these states of boredom have distinguishable neural activity. We intend to develop a neurological definition of boredom using quantitative encephalography (QEEG). While this aspect of our research is exploratory, we do have additional hypotheses: Participants who have faster cognitive processing speed will have a higher propensity toward boredom. Participants who self-report a high propensity toward boredom will reach the neurological state of boredom faster. Methods Participants will be given a cognitive processing speed task (Trail Making Test) in which s/he quickly connects a series of numbers in sequential order. After the task, the participant is connected to the QEEG and given a state boredom survey to assess levels of boredom before recording neural activity during the vigilance task used to induce boredom. During this vigilance task, QEEG recordings will be taken to develop a neurological definition of boredom. After the vigilance task is complete, a follow-up state boredom survey will be given to ensure the vigilance task induced boredom.

Mentor(s): Kelly Harrison, Zechariah Robinson, Heather Watt, and-Maria Carmack

5. Casey C. Clark

Developing a Universal Method for Metallic Nanoprism Synthesis

Metallic nanoprisms are equilateral triangles with edge lengths of 15nm – 90nm and usually 5nm thick. These have seen great promise for opto-electronics due to their novel optical properties. Here, a universal, seed-mediated method for the rapid synthesis of metallic nanoprisms, particularly gold and silver, is investigated in order to produce such nanoprisms in ambient room conditions. The seeds were produced by a drop-wise addition of the metal salt into a solution of a shape directing polymer and a strong reducing agent. These seeds were then stabilized by an addition of sodium citrate. After stirring, select amounts of seed solution were added to an ascorbic acid solution, and then more metal salt solution was added drop-wise. The amount of seed solution used determines the size of the nanoprisms. The gold prisms experience a distinct red shift in its absorption spectra with decreasing seed amounts, going from light pink to dark blue. The silver nanoprisms experienced a similar shift, but had more visible intermediate colors, going through most of the visible spectrum before ending at an iridescent blue color. These samples were confirmed by UV/Vis and transmission electron microscopy to have the expected geometry and size. While the methods for producing gold and silver nanoprisms differs slightly due to their inherent material properties, the overall production method was the same. This promotes the possibility that a universal synthesis method for other metal may exist.

Mentor(s): Dr. Guoliang Liu

6. Lacey J. Costello

Understanding intraplate volcanism in the Atlantic Ocean: A case study from Bermuda

Intraplate volcanism is a process that produces volcanoes in locations away from active plate boundaries. Many of these volcanoes are commonly explained by mantle plumes, areas of abnormally hot magma fixed deep within the Earth's mantle. Mantle plumes are associated with locations such as Hawaii, where a chain of volcanoes is produced as the result of plate motion over the active plume. However, not all intraplate volcanoes fit the plume model, thus prompting the need to investigate other melting mechanisms within the mantle, such as edge-driven convection and lithospheric delamination. Bermuda is an ideal location to test the various models of mantle melting, as it is a location that has been described by both plume and non-plume models. All previous explanations for Bermuda are derived from geophysical data. No study to date has correlated the geochemistry and petrology to melting models. For this project, samples of volcanic rock from Bermuda are being studied for major element composition and mineral abundances to give insight into the magmatic history of this volcano. All of this information will help determine the melting mechanisms that formed Bermuda, with the goal of improving our understanding of global mantle dynamics.

Mentor(s): Dr. Esteban Gazel

7. Brianna M. Early

Does Maternal Personality Relate to Emotional Support of Pre-school-Aged Children?

Young children look to caregivers as a source of emotional support, especially when dealing with negative emotions (Diener & Mangelsdorf, 2000); therefore, we examined how mothers responded to their children during a frustrating situation. We expected that maternal characteristics, in particular her own personality (e.g., extraversion, agreeableness, conscientiousness, neuroticism, openness to experience), would be associated with how they chose to respond to children, even though they were given specific instructions on how to respond if children asked for help. Children were observed in a locked box frustration task where they could not open a clear box containing a set of attractive toys. Although mothers were present while children tried to open the box, they were told to tell children that they would help after completing some work. Three events were coded: child bids to mothers for help, child off-topic comments, and maternal unsolicited comments. Maternal responses to bids were coded as ignoring, encouraging, script response, acknowledgement, discouraging, or off-topic. Mothers completed the Big Five Inventory to measure their personality. We predicted that mothers high in personality characteristics related to supportive parenting would be more encouraging and acknowledging and less off-topic, discouraging, and ignoring. Results testing our hypotheses will be presented.

Mentor(s):Dr. Cynthia Smith

8. Megan C. Freyman

Protein-directed synthesis of anisotropic Au nanoparticles

Protein-directed synthesis of anisotropic Au nanoparticles Megan C. Freyman*, Xi Geng, and Tijana Z. Grove Department of Chemistry, Virginia Polytechnic Institute and State University, BlacksburgVA 24060 USA A green synthetic strategy has been developed to obtain anisotropic Au-NPs in high-yield. The synthesis of Au NPs was performed using repeat protein and halide anions as shape directing agents while the biological MOPS buffer, a Good's buffer, was employed as mild reducing agent. The fluorescence quenching experiments indicate that the interaction between protein and gold precursor increases with increasing ionic strength of the solution. Thus, we hypothesized that the size and shape of the Au NP could be directed by changing salt concentration in the reaction mixture. NaBr salt and Consensus Tetratricopeptide Repeat (CTPR) protein were used in the experiment. Spectroscopic and electronic microscopy characterization showed that in higher ionic strength solutions shape-selective growth for triangular nanoparticles occurred.

Mentor(s): Dr. Tijana Z. Grove and Dr. Xi Geng

9. KaLynn E. M. Harlow

Piglet health and growth performance following probiotic or antibiotic supplementation in the nursery diet

Antibiotic resistance concerns and consumer desire for antibiotic-free pork prompt investigations into suitable antibiotic alternatives on the swine farm. Successful use of probiotics as an alternative remains unclear, but if effective, would benefit Virginia pig farmers. The objective of this experiment was to compare pig health, growth, and carcass components following nursery diet supplementation with antibiotics (AB), probiotics (PB), or no supplements (CON). At weaning, 54 gilts were randomly divided into nursery pens (n=3 pigs per pen; n=6 pens per treatment) and provided full access to treatment diets for 28 d. Each pen was observed for 60 seconds four times per day and presence of scours was recorded. Upon conclusion of the treatment period, one pig per pen (n=6 per treatment; n=18 total) was harvested for organ sampling. Remaining pigs were grown in mixed pens. At market weight, 18 pigs (n=6 per treatment) were slaughtered and their carcasses analyzed for loin-eye area (LEA), backfat thickness (BF), and quality measures. Although not significant ($p > 0.15$), AB-fed pigs had the shortest duration of post-weaning scours; CON-fed pigs the longest. There was no difference in ADG during or following treatment. There was also no difference in LEA, BF, or carcass quality at slaughter. These results suggest that probiotics may be a suitable replacement for antibiotics in weanling pig diets. Additional replicates within this study will be required to substantiate these claims.

Mentor(s): Dr. Mark Estienne and Dr. Jeffrey Wiegert

10. Louis Hollingsworth

Synthesis of Trityl-poly(ethylene glycol) Oligomers for Drug Delivery Applications

Polyethylene glycol (PEG) polymers of various lengths are used in a variety of applications, from polymeric drug delivery vehicles to cryogenic electron microscopy. PEG conjugation has been shown to decrease immunogenicity, and is thus promising for the creation of novel therapeutic formulations such as PEG tethered nanoparticles. To deliver multiple drugs with different physicochemical properties, we are developing a lipid-bilayer-coated nanoparticle that requires discrete monodisperse lengths of PEG. Our system will allow for increased selectivity and the incorporation of both hydrophilic and hydrophobic molecules, causing reduced side effects in patients and enabling a novel strategy to deliver several drugs simultaneously. If our hypothesis is correct, these particles will allow for synergistic combinations of drugs that may cure diseases such as cancer. Optimizing the size of the nanoparticle will maximize the enhanced permeability and retention (EPR) effect, increasing efficacy. Current work aims to improve synthesis reaction procedures and flash column chromatography separations, which will allow us to move forward with the creation of this novel drug delivery vehicle.

Mentor(s): Dr. Richard Gandour

11. Steven, J. Hurwitt

From Student to Collaborator: My Role as an Interdisciplinary Collaborator in LISA

The use of statistics is fundamental to almost every field of research. As such, there is an increasing need for statistical collaborators to be properly trained in the application of statistics to real-world problems. This poster details the experience and training of an undergraduate in LISA (Virginia Tech's Laboratory for Interdisciplinary Statistical Analysis) and details a few collaborative projects. The poster details the collaboration and consulting sessions undergone in order to be an effective statistical collaborator, as well as how these sessions are systematically improved upon. It also discusses the methods used to produce effective collaboration. The end result is the ability to engage in meaningful work with non-statisticians in an efficient manner. In a broad sense, this training results in students who are able to collaborate with others and make sense of the large amount of data we continue to be surrounded by.

Mentor(s): Dr. Eric Vance

12. Emily J. Lessner

A New Rausuchid (Archosauria:Pseudosuchia) Increases Archosaur Diversity in the Late Triassic (210 Ma) of North America

How is a new species of rausuchid related to previously identified rausuchids, and does the new material confirm, refute, or reveal any characteristics that are useful in identifying relationships among the extinct relatives of crocodylians? Rausuchids are an extinct group of reptiles that are related to living crocodylians and were major predators of the Late Triassic. An understanding of their evolution gives insights into the major patterns of evolution of other closely related archosaurs that lived in the Triassic Period. I am studying the skull bones and ilium (hip bone) of a new species of rausuchid recovered from the Upper Triassic Hayden Quarry of New Mexico. I am examining the external morphology of those bones and using technology including CT scans and 3D printing to collect internal anatomical data. Using the data collected, I have described the fossils and am comparing them to previously known rausuchid specimens so they can be added to a phylogenetic analysis to reconstruct relationships. I have postulated that the new specimen is morphologically similar to the rausuchids *Teratosaurus seuvicus* from Europe and *Postosuchus kirkpatricki* from Texas. Their upper jaws share shape characteristics but differ in specific structures on the bone surface. The new species of rausuchid from New Mexico has revealed characteristics that will be useful in resolving the unclear evolutionary relationships of rausuchids and closely related archosaurs.

Mentor(s): Dr. Sterling Nesbitt and Dr. Michelle Stocker

13. David M. Maeng

Development of Hetero-Multivalent Scaffolds as Theranostic Agents for Metastatic Melanoma

Melanoma and other forms of cancer affect millions, annually. When discovered early on, melanoma can often be cured but treatment becomes difficult over time. We are interested in motifs of multiple cell-surface proteins unique to tumor cells, despite the potential overlap in some normal cells. We generated proof-of-concept data on the idea that molecular fingerprint composed of two or more cell-surface proteins could be used for theranostic development in metastatic melanoma. My aim is to take Protease Activated Receptor 1 (PAR1) and Melanocortin Receptor 1 (MC1R), two proteins validated for co-expression on the cell surface in WM2664 melanoma cell line, as the model system. We are synthesizing bivalent ligands to target the fingerprint. Once the efficacy of these ligands is determined, we will continue our efforts by optimizing the efficiency in animal studies. We use Fmoc solid-phase peptide synthesis to construct this large peptidomimetic multivalent scaffold. Ligands are synthesized in a modular fashion, with an orthogonally protected lysine, followed by a suitable PEG linker. Attaching a small molecule onto the short peptide sequence completes the synthesis of a full PAR1 ligand. The ligand is cleaved from the resin, purified by HPLC and characterized by MS. We are performing biological assays with these ligands on cell cultures to determine the efficacy of the PAR1 ligand.

Mentor(s): Dr. Jatinder Josan

14. Armand L. Meza

NLRX1 Protects Against Traumatic brain Injury Pathogenesis

Traumatic Brain Injury (TBI) has seen increased awareness, particularly in the context of sports. Mechanical trauma to the central nervous system results in the disruption of cellular micro-environments and induces a progressive cascade of secondary events, including inflammation. Nod-Like Receptors, a family of proteins associated with the immune system, have been shown to influence the rate and amount of inflammation triggered by the immune response following TBI. A unique protein of this family, NLRX1 was recently identified and found to negatively regulate inflammation. The purpose of the present study is to investigate the role of NLRX1 in TBI-induced damage. We sought to evaluate the effects of NLRX1 gene deletion on cortical tissue loss in a murine model of controlled cortical impact (CCI) injury. NLRX1 knockout mice exhibited larger brain lesions following CCI injury, thus NLRX1 can be concluded to have a role in protecting against TBI. Current and future studies will aim to evaluate the mechanism associated with NLRX1's attenuation of pathogenesis through 4 possible signaling networks: type-1 interferon, reactive oxidation species, NF- κ B signaling, and autophagy. Understanding networks that lead to inflammation will be crucial to treating TBI and understanding NLRX1 may result in novel therapeutic strategies for TBI patients.

Mentor(s): Dr. Irving Allen

15. Neil Huckstep, Lindsey Miller, and Helen Butler

Effects of Mycoplasma Infection on House Finch Telencephalon and Hippocampus

Early life infections may cause defects in memory and spatial learning ability, as well as underlying brain development. To better understand the effects of early life infection on the brain, our group examined the neuroanatomy of wild house finches that either were, or were not, infected with Mycoplasma. Mycoplasma causes conjunctivitis in house finches and is a naturally occurring pathogen effecting birds in their first year of life. To quantify the impact of this infection on the brain we measured the volume of the telencephalon (forebrain) and hippocampus of each subject. Each student measured a particular brain region using prepared histological slides and photomicrographs, and we compiled overall measures to make comparisons across natural treatments of infection status. Differences in the volume of the telencephalon and hippocampus will be reported as a function of Mycoplasma infection. This research could help us understand how infections play a role in brain function later in life, across species. For example, many human psychological disorders cite early life infection as part of the etiology. Learning more about the effects of infection on brain function in birds could broaden our knowledge of the etiology and treatment of brain disorders rooted in developmental processes in humans.

Mentor(s): Dr. Kendra Sewall

16. Adam R. Mills

Ripple Near Edges in MoS₂ Few Layers and Pyramid Nanostructures

Atomically thin molybdenum disulfide (MoS₂) has recently captured increasing research attention across disciplines for their optical properties, catalytic properties and potential applications in field effect transistors. Of particular interest is the emergence of a 1.90 eV direct band gap in the monolayer phase of MoS₂ and the catalytic activity of the edge sites. We use scanning tunneling microscopy (STM) and spectroscopy (STS) to study mono- to few-layered MoS₂ and a pyramid nanostructure synthesized through chemical vapor deposition (CVD). On the nanopyramids grown on highly oriented pyrolytic graphite (HOPG), we observe an intriguing curved region near edge terminals. Similar curved structures are observed on few-layered MoS₂ on gallium nitride (GaN). Spectroscopies from the curved region are consistent with the band gap of monolayer MoS₂. Our observations may help explain the catalytic performance of these nanoparticles and offer insight as to how to optimize them for improved efficacy in future HER applications.

Mentor(s): Dr. Chenggang Tao

17. Tuan H. Nguyen

Learning Approach for Computing Regularization Parameters Selection in Tikhonov Regularization

1) Research question: How can we find regularization parameters for Tikhonov regularization problem that would lead to more accurate image reconstructions? 2) Purpose: Existing Tikhonov regularization methods often use one regularization matrix (one-parameter case). The purpose of this project is to investigate effects of using various forms of regularization matrix, as well as an extension including several regularization matrices simultaneously (multi-parameter case). In the multi-parameter case, when certain constraints on forward matrix and regularization matrices are not met, we attempt to solve an approximate problem. We examine the use of training data to compute regularization parameters for the above-mentioned forms of Tikhonov regularization. 3) Methods: Numerical linear algebra, Bayesian statistics, and MATLAB computing 4) Summary of results:

- For the one-parameter case, obtained relative reconstruction errors suggest that using a discrete derivative approximation can lead to more accurate reconstructions than using identity matrix. The multi-parameter Tikhonov reconstructions were also of good quality.
- Regularization parameters obtained using training data on the approximate problem produced reconstructions that were almost as good as those achieved by optimal parameters for the original problem. The advantages here are reduction in computational cost and potential to apply approximated parameters for images different from the original problem.

Mentor(s): Dr. Julianne Chung

18. Chris Rader

Study of high surface area hypercrosslinked polymers

Currently, in the U.S alone, 65 million metric tons of carbon dioxide are produced from electric power plants, automobiles, and other power generating devices and only 15% of the carbon dioxide is captured. Therefore, the goal of this project is to develop a polymer to aid in carbon dioxide capture. Instead of using microporous polymers, we plan on developing nanoporous polymers. Nanoporous polymers have potential applications as catalyst substrates, gas sorption matrix, and chromatography separation materials, making them a stable polymer. We are pursuing several routes to prepare new nanoporous hypercrosslinked polymers. One method is to incorporate functional groups into the nanostructure by copolymerizing monomers with protected groups into the polymers and then cleavage of these protection groups to yield the desired reactive functional groups. We will have synthesized a series of crosslinked polymer precursors I via suspension polymerization of t-butyl carboxylate-functionalized stilbene and tert-butyl carboxylate-functionalized N-phenylmaleimide with divinylbenzene. The polymer precursors are treated with trifluoroacetic acid or heated in vacuum oven to cleave the tert-butyl groups. With the loss of isobutylene, the space that the tert-butyl groups used to occupy results in nanopores, and the semi-rigid stilbene-maleimide backbone inhibit the nanoporous structure from collapse. The remaining carboxylate acid groups are proposed to be sorption sites for CO₂ capture..

Mentor(s): Dr. Turner

19. Reinaldo C. Reina

Design and Testing Global Navigation Satellite System Total Electron Content Measurement Software Infrastructure

A critical problem Global Navigation Satellite System (GNSS) engineers face is accurately quantifying the Total Electron Content (TEC) in the ionosphere to eliminate the error and deliver more precise positioning results. The ionosphere is part of the upper layer of the atmosphere that constantly produces errors in GNSS. The variation of the speed of radio waves in the ionosphere leads to GNSS errors due to inaccurate ranging information data. The purpose of this study is to examine the TEC data and ionospheric delays for Blacksburg which will allow characterization of the impact of the midlatitude ionosphere. This study is done for a specific GNSS namely the Global Positioning System (GPS). In this project, time delay and TEC data are investigated using both the GPS L1 and L2 signals from a dual frequency GPS receiver. Dual frequency GNSS receivers allow calculation of TEC and provide more accurate positioning due to elimination of ranging errors between L1 and L2 signals reaching the receiver. The results of the data are compared to the Klobuchar model, which is a theoretical prediction of the TEC for GPS. Based on current data, it shown that the Klobuchar model has reasonable agreement with the observed data; however, this agreement is not expected to be as good under disturbed ionospheric conditions. Nevertheless, this comparison validates the usefulness of the TEC measurements software infrastructure with a wide variety of multifrequency GNSS receivers.

Mentor(s): Dr. Wayne Scales

20. Malavika Sahai

The Impact of Air Pollution on the Reproductive Health of Women of Color in the United States

This research explores the impact that air pollution from oil refineries and coal coke producing factories has on the reproductive health of women of color in the United States. The fact that people of color statistically live nearest to polluting toxic industries is established to further explore specific health impacts that disproportionately burden minority populations. Reproductive health is specifically explored because of its impacts not only on individuals, but general population health as well. The environmental burdens to reproductive health are examined in the scope of general reproductive injustices that women of color face to assess the climate for women of colors' reproductive rights in America. The examination of reproductive rights contextualizes the issue and demonstrates that air pollution enforcement must be increased based on its overarching social detriment to the livelihoods of large populations within the United States.

Mentor(s): Dr. Maria Elisa Christie

21. Kaitlyn M. Sonifrank

Biotech in a Box

The Biotech in a Box program provides hands-on kits for teachers that serve to supplement to existing curriculum. The Bioengineering kit introduces students to engineering and science in a way that they have not been previously exposed. The purpose of this study is to assess students learning outcomes related to the kit and to collect demographic data on students who use the kit. Students are given anonymous pre- and posttest questions on how their ideas have changed. These questions are designed to make the students think about the different parts of engineering. Preliminary qualitative analysis of one year of open-ended data indicates that this program is opening the eyes of the students and helping them to see the world of engineering in a better light and to consider the benefits of engineering and science as a career. The demographic data has shown that a majority of the students who are participating are in either the 12th grade (46.9%) or the 11th grade (25.9%). The ethnicity of the students is a majority White (55.2%) with Hispanic being (20.8%). Results of this study and a comprehensive literature review will be used to inform revisions of the Bioengineering curriculum.

Mentor(s): Dr. Hannah Sherer

22. James M. Narramore and Alyssa Debra

Isolation and Identification of Antibiotic producing Microbes from soil

Our research entailed the use of established methods, and the incorporation of new methods, to cultivate and search for new antimicrobial compounds from collected soil samples. Once evidence of new compounds were discovered, the research proceeded to identify, purify and isolate potential organisms for further reproduction and study. New antimicrobials will lead the way in the fight against the ever increasing drug resistant strains of bacteria. A suspected soil sample that could contain new antimicrobial producers is serially diluted and plated to establish isolation of the colonies. Once isolated, a pure colony is grown from one of the colonies on a plate then grown in a broth. After, they are then collected at different points of the growth cycle, establishing which growth phase produces the product. These possible producers are plated against susceptible *S. Aureus* and *E.coli* strains, with standard Gram Positive and Negative controls to establish effectiveness. After testing various soil samples, a sample collected down river of a sewage treatment plant has shown to have antibiotic properties. This leads to evidence that supports the idea that environmental conditions have a bigger role in soil bacteria diversity.

Mentor(s): Dr. Nammalwar Sriranganathan

23. Rei A. Sturm

Synthesis of Redox Mediators for Quantum Dot Sensitized Solar Cells

Solar energy has been a topic of interest concerning the transition towards renewable energy. Steady advancements in solar energy have been made over the past two decades. The use of solar energy has many attractive attributes, but sub-optimal conversion efficiencies and high costs make solar energy unfavorable. This research explores obtaining more efficient and economical quantum dot sensitized solar cells (QDSSC). QDSSCs show great theoretical potential but are yet to reach competitive standards. The goal is to exploit fundamental electronic properties of inorganic compounds to develop efficient mediators that promote maximum charge collection. Proper counter electrode preparation and electrolyte concentration pose a problem to the cells' efficiencies. Exploration of different electrode preparations may lead to lower levels of resistance. Preparation of the counter electrodes in acid baths to expose copper is being investigated to find any correlation between treatment and efficiency. Electrolyte concentration may also affect how well charge is conducted. Combination studies of the effect of changing both variables will be attempted to determine what effect different concentration has versus counter electrode preparation and vice-versa. All cells will undergo testing via solar simulation, calibrated to 1 sun. Linear sweep voltammetry is used performed to determine V_{oc} , I_{sc} , fill factor, V_{mp} , I_{mp} , and finally efficiency. Mentor(s): Dr. Dennis Godward

24. Erica M. Tiedemann

Does Maternal Personality Relate to Emotional Support of Pre-school-Aged Children?

Young children look to caregivers as a source of emotional support, especially when dealing with negative emotions (Diener & Mangelsdorf, 2000); therefore, we examined how mothers responded to their children during a frustrating situation. We expected that maternal characteristics, in particular her own personality (e.g., extraversion, agreeableness, conscientiousness, neuroticism, openness to experience), would be associated with how they chose to respond to children, even though they were given specific instructions on how to respond if children asked for help. Children were observed in a locked box frustration task where they could not open a clear box containing a set of attractive toys. Although mothers were present while children tried to open the box, they were told to tell children that they would help after completing some work. Three events were coded: child bids to mothers for help, child off-topic comments, and maternal unsolicited comments. Maternal responses to bids were coded as ignoring, encouraging, script response, acknowledgement, discouraging, or off-topic. Mothers completed the Big Five Inventory to measure their personality. We predicted that mothers high in personality characteristics related to supportive parenting would be more encouraging and acknowledging and less off-topic, discouraging, and ignoring. Results testing our hypotheses will be presented.

Mentor(s): Dr. Cynthia Smith

25. Alexa H. Turner

Role of O-GlcNAcylation in Porcine Satellite Cell Function

Meat is the most significant component in animal production. Understanding the molecular mechanisms controlling skeletal muscle growth in response to nutrients will help design a strategy to promote meat animal growth and efficiency. Addition of carbohydrate derivatives, or glycosylation, is a common post-translational modification to various proteins. However, the addition and removal of O-linked β -D-N-acetylglucosamine (O-GlcNAc), a sugar derivative from the hexosamine biosynthetic pathway, has only recently been established as a nutrient sensor pathway in a wide range of cellular processes. O-GlcNAc's role in porcine muscle satellite cells was explored. Satellite cells were isolated from skeletal muscle and allowed to differentiate while manipulating the O-GlcNAc pathway. DMSO was used as the control. Inhibition of OGA, which removes O-GlcNAc, was used to over-express O-GlcNAc (ThG). OGT, which adds O-GlcNAc, was inhibited to under-express O-GlcNAc (TT04), and . TT04 and DMSO results were comparable. However, the results showed a significant decrease in fusion index when ThG was used. An in vivo study was also used, in which cardiotoxin was directly injected into the muscle followed by the same inhibitors at day 0 and day 2, which also showed a significant decrease in muscle repair. Excessive O-GlcNAcylation impairs late stage of muscle differentiation. Hyper-O-GlcNAcylation also impairs myogenesis and regenerative myogenesis, seemingly by repressing myogenin expression.

Mentor(s): Dr. Hao Shi

26. Priya Venkatraman

Chitosan Based Antimicrobial Hydrogels Combating Antibiotic Resistant Infections

Antimicrobial hydrogels have the ability to combat antibiotic-resistant infections, a rising problem in the United States and globally. Chitosan has been widely used as an antimicrobial agent for wound healing, and is useful in preventing and treating infections related to fungi and both gram-negative and gram-positive bacteria. It is especially appealing due to its biocompatibility and biodegradability in the human body. In this work, chitosan-based hydrogels are being developed by facile cross-linking, resulting in mechanically robust structures. The antimicrobial properties can be attributed to the amine groups in the structure, and therefore can be manipulated by the addition of a diamine at different concentrations during the processing of the hydrogels. Gels are tested for their antimicrobial activity by administration via syringe to agar surfaces infected with bacteria and measuring the ability of the gel to kill bacteria on contact. The chitosan-based hydrogels are biodegradable, mechanically sound, and shown to be antimicrobial.

Mentor(s): Dr. E. Johan Foster

27. Hope H. Wentzel

Effect of pasture improvement method on grazing selectivity of sheep between Bromus valdivianus and Lolium perenne

Sheep grazing selectivity for *Bromus valdivianus* (Bv) or *Lolium perenne* (Lp) as a function of pasture management was evaluated during a three-day winter grazing trial in Valdivia, Chile. Experimental pastures were developed from formerly degraded pastureland that received different pasture improvement treatments. Treatments were naturalized pasture with fertilizer and lime amendment (NF treatment) or pasture renovation with *L. perenne*, *Trifolium repens*, *Holcus lanatus*, *Dactylis glomerata*, and *B. valdivianus* direct drilled into the pasture (DP treatment) (*H. lanatus* and Bv seeds were collected from pastures in southern Chile). Six tillers each of Bv and Lp were marked in each of three replicated pasture treatments. Marked tillers were measured pre and post grazing to determine treatment effects on grazing selectivity. In the same paddocks, 10 tillers of each species were collected and measured to determine and model pre-grazing forage availability. Sheep consumed more Lp in the NF treatment and more Bv in the DP treatment. Between treatments, growth patterns were more consistent for Lp, whereas Bv tillers were larger and presented more lamina in the DP treatment. Growth differences did not appear due to selective grazing, thus further study is needed to determine the cause of the observed responses.

Mentor(s): Dr. Ignacio Lopez

28. Thomas A. E. Wood

How did the oldest archosaurs of North America grow?

Archosaurs, a group of reptiles including birds, dinosaurs, and crocodiles, and all of their extinct relatives, originated in the Early Triassic (~247 Ma), but the paleobiology of the earliest members is poorly known. *Arizonasaurus* and a shuvosaurid-like animal from the Moenkopi Formation of the southwestern United States represent some of the oldest known archosaurs (from the early Middle Triassic ~245 Ma) and both belong to the group Podosauroida, a group more closely related to crocodiles than to dinosaurs and birds. To investigate the paleobiology of these two animals, we examined how these animals grew by using histological techniques. By creating thin sections of the long bones (e.g., femur), we can examine the bone structure, which allows us to estimate rates of growth. Both animals exhibit higher rates of bone growth than any extant non-avian reptiles, especially their closest living relatives, the crocodylians. Among early archosaurs, it is not known how they compare to other extinct relatives, which is something I hope to elucidate in the course of this study. Archosaurs were fast-growing when the clade originated, and their growth rates are known to have increased in dinosaurs later in the Triassic, though they show a marked decrease in extant crocodylians.

Mentor(s): Dr. Sterling Nesbitt

Session 5

Oral

Presentation

Alexander E. Castellano

The Lost Colony of Roanoke: Murder or Mystery?

The goal of this research project was to determine which theory as to the fate of the lost colony of Roanoke has been supported by primary source evidence from the time period. This theory would then be compared with other facts and knowledge of early colonial life to determine its likelihood. In order to complete this research process, primary sources such as journals and published historical works were used. These primary sources were accompanied by secondary sources that gave context to the words of colonists who were in Virginia shortly after the disappearance of the Roanoke Colony was known. The results of this project point to a theory that the Roanoke colonists abandoned the settlement and went to live with the Chesapeake Indian tribe, who had been known to assist the European settlers. This tribe was later slaughtered by the Powhatan Indians in an unprecedented surprise attack and total annihilation, leading some to believe that the Roanoke colonists were killed along with the Chesapeakes. The possibility remains that some Roanoke settlers escaped the slaughter, influenced Native American architecture, and are the ancestors of today's Lumbee Indian tribe.

Mentor(s): Dr. Peter Wallenstein

Delia Tomlison

The War on Poverty in Appalachia: “Which Side Are You On?”

President Lyndon B. Johnson launched the War on Poverty in 1964, targeting both urban and rural poverty, primarily within the Appalachian region. This project explores both the opinions of the nation at large and insiders’ perspectives on the War on Poverty in southern Appalachia. I argue that by the end of the decade, the War on Poverty in Appalachia had influenced some important changes in the region, but pessimism toward the Great Society left its Appalachian supporters hopeless. Using national and local newspapers, interviews, and government documents, I examine changing sentiments on the program from 1964 to 1971. The federal government, by way of the Appalachian Regional Commission, tackled Appalachian regional poverty with fervor and optimism at the beginning of the War on Poverty. Similarly, Appalachian residents looked forward to the possible eradication of poverty and approached the War energetically. As the decade progressed, these residents realized that the Appalachian Regional Commission’s actions under the federal government, never fully appreciating the input of their constituents, closely resembled the historical paternalism that had plagued the region for since the late 1800s.

Mentor(s): Dr. Marian Mollin

Amanda N. Parmiter

The Benefits “Outweigh” the Critiques: Weightlifting in the American Prison System

In 1994, the Zimmer Bill was brought in front of Congress. The Act called for the immediate removal of all weightlifting equipment from federal prisons in an attempt to return the prison system to its original state of as little luxury as possible. The bill gained a tremendous amount of support as Congressmen, media outlets and the American people dissected and “exploited” weight training in the prisons; the culprit of what they believed to be the source of recent prisoner violence. Negating and ignoring the multitude of evidence that proved weightlifting in prison was an incredible rehabilitative asset for the prisoners, Congress passed the Bill in 1996 with overwhelming support. This paper analyzes the positive and negative effects that both prisoners and prisons faced in the wake of the weights’ removal from the federal prisons. By using newspaper articles, television news spots, prisoner psychological and health evaluations, prisoner’s personal accounts and literature written specifically on prison recreation, this paper is able to further prove the rehabilitative effects of weightlifting on prisoner behavior both inside and outside the prison walls. And by passing the Zimmer Bill, Congress unintentionally created an environment in the prisons that bred violence instead of suppressed it.

Mentor(s): Dr. Peter Wallenstein and Dr. Carmen Bolt

Kayla P Sykes

Using Driver Eye Glance Behavior to Determine Safety Implications of Adaptive In-vehicle Stop Displays

Traditional static stop signs get covered by vegetation, knocked over, and are often missed by drivers. Adaptive in-vehicle signage can eliminate these issues by placing road signage inside the vehicle. However, in-vehicle devices that use visual stimuli can adversely affect the driver by taking their eyes off the road, causing them to overlook potential hazards. The motivation behind studying these in-vehicle display (IVD) systems is to determine if any unintended safety consequences are associated with their use. Forty-nine participants (24 Males, 25 Females) ages 18-25 and 50 years or older participated in a closed test-track study where they experienced a series of scenarios in which they were presented with varying traffic control symbols (stop and proceed with caution) on the IVD. VTTI-developed software (Hawk-eye) was utilized to manually code for eye glance location. This data was then analyzed to answer the following research questions: 1) Does the total eyes off road time increase significantly with IVD vs. static stop signs? 2) Does the number of driving-related glances increase while the driver is using the IVD?

Mentor(s): Dr. Zachary Doerzaph

Marcus Williams

Schism: Life of a Sado-Solipsist

On the flight back from an interview for a management-type position in a multi-national corporation I woke up. In a clarity that can only be described as “omniscient,” I knew that the standard issue, STEM 9-5 wasn’t for me; what may be even more amazing though was that I also knew what I wanted to “be” when I grew-up. And through a range of genres I’ll chronicle the creative endeavors I went through on my way to pursue, apply, and (now) admitted to graduate school for a M.A. or M.F.A. in creative writing with the intent to teach the subject at the college level.

Mentor(s): Dr. Erika Meitner, Fred D’Aguir, Tom Gardner, Robert Siegle, and Matthew Vollmer

Travis D. Whaley

Beethoven's Compositional Process and the Evolution of the Waldstein Sonata.

How did Beethoven go about the composition of this particular sonata? What can his sketches tell us about his process while composing music? How can today's composers apply this to their process of writing music? I have chosen to examine the Waldstein Sonata because it evolved significantly over the course of its composition, which allows for an in-depth study of Beethoven's compositional process. My goal is to chronologically reconstruct the manner in which this sonata was written through Beethoven's sketches. The order that these sketches appear show the composer's manner of thinking while writing this particular sonata. He did not write it in the order it appears today and jumped from section to section. I have learned the Waldstein Sonata and will use a personal recording to highlight aspects of my research, such as demonstrating how certain themes evolved and displaying the final product, first showing the primitive outline then highlighting the completed passage. These sketches allow a glimpse at Beethoven's compositional process which can be utilized by composers today.

Mentor(s): Dr. Debra Stoudt

Kathleen A. Smith, Caryn Crotty, Miranda Marques, and Kendall Bullock

Behind the SMYLEs

This project is an extension of the work conducted by the VT Project SMYLE research team. Under the guidance of Dr. Erika Grafsky, our team of undergraduates has spearheaded a separate subproject that contributes to the development of an online intervention for sexual minority youth. We seek to translate key themes and experiences from previous and original interviews of sexual minority youth into a multimedia platform, including videos, that will assist other sexual minority youth in safely disclosing their identities. With these videos, other youth can access empirically analyzed data, allowing them to explore the range of attitudes and responses that may surround their own disclosure processes. Our presentation will highlight the collaborative process we have undergone as undergraduates from different disciplines and the rewarding, though difficult, union of art and science – reviewing qualitatively coded interviews, developing scripts, securing proper equipment and approval, engaging with the filming process, and partnering with our participants. While the focus of this presentation is on the experience of the undergraduate researcher, looking to effect change, we will incorporate current and incoming data to help the team illustrate this process. Through this project, we grew increasingly motivated to serve this population in a way that caters to evolving forms of resource development.

Mentor(s): Dr. Erika Grafsky

Banna Desta

Brooklyn's Finest: How Gentrification Changed Hip-Hop

The question I seek to answer in my research is how gentrification has changed hip-hop music. What spurred Brooklyn to become a hub for such a game-changing musical genre, and what does the preservation of that genre look like after intense rounds of gentrification? Through my research I unpack these questions and discover what will happen to Brooklyn's artistically steeped past as it becomes drastically altered in the future.

Mentor(s): Dr. Ryan Rideau

Vatia P. Caldwell

Defending and Refuting Feminist Ideologies Through the Works of Lil Kim

Female rap music focuses on promoting women's importance, which in turn, demands equal treatment for women, and demonstrates the need for women to support each other. The purpose of this paper is to examine the portrayal of feminism in rap music exclusively looking at rap artist Lil Kim. To what extent does Lil Kim defend or refute common feminist ideologies, specifically related to core themes in U.S. Black feminist thought? My research focuses on three core themes of Patricia Hill Collin's *Black Feminist Thought: Mammies, Matriarchs, and Other Controlling Images, The Power of Self-Definition, The Sexual Politics of Black Womanhood*. In order to analyze these themes, I employed a content analysis of Lil Kim lyrics while also doing an analysis of interviews and her fashion style. Rap artists use their lyrics as a way to authenticate themselves. This is a useful way to investigate the intent behind depictions of feminism throughout Lil Kim's music. Interviews allow artists to openly express their opinions and can be used as another form of authentication to "set the record straight" or "keep it real." Because feminism is broadly defined and doesn't have one set definition, Lil Kim both challenges and defends some of the core themes of Black feminist thought.

Mentor(s): Dr. Ryan Rideau

Eleonor M. Cayford

Use of green vegetative index maps to predict nutritional quality variation of corn silage.

The objective of this study was to evaluate the use of remote sensing techniques to predict the nutritional variation of corn silage. Landsat satellite images of three commercial dairy farms in Virginia were gathered and analyzed for their usability based on cloud cover. Clear images were run through ArcGIS/Arcpy software to generate normalized difference vegetation index (NDVI) maps. NDVI maps show concentration of chlorophyll which theoretically would correlate to the nutritional variation within the field. Each field was divided into areas of high, medium, and low chlorophyll and samples were collected from each region resulting in twenty seven samples total. Each sample was a bundle of eight corn plants which were chopped up and ensiled for two months. Nutritional composition of the resulting silage was found using wet chemistry. This data was analyzed using a complete block design with fields being the blocks and NDVI values being the treatments. Dry plant biomass was similar among NDVI areas (270 g/plant; $P > 0.39$). Concentrations of DM (28.3%; $P > 0.25$), Ash (4.55; $P > 0.38$), CP (10.5%; $P > 0.29$), NDF (41.3%; $P > 0.49$), and ADF (25.3%; $P > 0.89$) did not differ among NDVI areas. In conclusion, the differences in NDVI values did not correspond with nutritional variation in the corn silage

Mentor(s): Dr. Gonzalo Ferreira, Leyang Feng, and Shao Yang

Kaitlyn M. Phillips

Investigating Defense Mutualisms: Under What Conditions is Chaetogaster Limnaei Limnaei a parasite or mutualist of snails?

Defense mutualisms are a special class of mutualism in which a symbiont defends its host from a natural enemy, frequently a parasite. These relationships can have important implications for host health and more broadly can influence disease dynamics in natural systems. However, recent work suggests that these host-symbiont relationships may not be fixed because the benefits and costs for the species involved are context-dependent. To investigate whether the net effect of defensive symbionts on host fitness is changed by the presence and abundance of natural enemies, I investigated the defense mutualism between the annelid *Chaetogaster limnaei limnaei* and its aquatic snail host. I performed an experiment where defensive symbionts were present or absent and hosts were exposed to free-living trematode parasites at three densities: control, low, and high densities. Adult snail fitness was measured via growth, survival, and reproductive success. Neither parasites nor defensive symbionts affected any snail fitness measures. These results contradict other experimental work with juvenile snails and different snail species, which suggests that host snail characteristics may play an important role in determining the outcome of host-symbiont interactions.

Mentor(s): Dr. Lisa Belden

Alyssa Noble

Unequal Impact of Social Norm Expectations: A Retail Brand Perspective

Our research examines the relationship between perceptions of social order in a retail setting and disruptions of social order, and how their interaction influences consumers' perceptions of the retail brand. In the highly competitive market for women's apparel, it is important that corporations maintain retail brand image and loyalty, particularly as consumers increasingly purchase online. One aspect of retail brand perception is the social context of the retail environment. Integrating attribution theory and social norm research, we develop a conceptual model that we use to predict differing evaluations of social norm violations – positive and negative – depending on the violation context (higher v. lower quality). With three studies, we demonstrate that a) social norm expectations differ across retail environments; b) consumers systematically and differently weigh positive and negative behaviors, based on perceptions of the likelihood of a norm violation occurring and the social/retail context; and c) in-store violations influence consumers' retail brand perceptions.

Mentor(s): Dr. Eloise Coupey

Pingyuan Wang

LISA 2nd Order Impact

LISA 2nd order impact project is to analyze what the faculties and students in Virginia Tech accomplished with the help of LISA. We would like to measure how strong our impact is to Virginia Tech. Also our project team can learn how to search data through website. This project also plans to design a survey which I am currently doing to our client to see how much LISA helped clients with their project and to know their accomplishments. This semester, our goal is to get the data collected. We have some part done but now we are still collecting data and designing a survey to our clients.

Mentor(s): Dr. Eric Vance

Daniel S. Lee

Procedures for Detecting Testing Bias

The Alternative Mantel-Haenszel (AMH) procedure, proposed by Mazor, Clauser, and Hambleton (1994), serves as a strategic approach to detect non-uniform differential item functioning (DIF). Following its discovery, little research exists that demonstrates how factors of testing can affect its performance. This study explored how sample size ratios between reference and focal groups, item difficulty, and item discrimination affect the rate at which the AMH procedure detects non-uniform DIF. To extend on their work, this study also considered the cases of equal and unequal ability distributions. Simulations generated scores for three group ratios (1:1, 2:1, and 5:1), three levels of item difficulty (easy, medium, and tough), and two levels of item discrimination (low and high). Detection rates from the AMH procedure were compared to those of the Breslow-Day procedure, and regression models were generated to model detection rates and identify significant factors. Recommendations were made that identify the conditions in which the AMH procedure yield higher DIF detection rates.

Mentor(s): Dr. Marlow Lemons

Claire Kelling

Estimating Liquidity Risk Using Exchange Traded Funds

The financial crisis of 2008 starkly illustrated the perils of ignoring liquidity risk. This risk is particularly crucial to index and Exchange-Traded Fund (ETF) providers that explicitly guarantee the provision of underlying shares through time and implicitly agree to absorb the associated liquidity risks and costs. In this project, we propose an ETF specific liquidity measure. The proposed model isolates liquidity risk from other factors by forming a portfolio of buying the ETF and shorting the underlying basket of securities using the weighting system employed by the ETF issuer. Since we are buying and selling the same set of securities the difference between the price of the ETF and the value of the basket of underlying securities is purely tied to a difference in liquidity. This work is closely related to a similar measure proposed by Chacko et al which we find, while useful, provides counter-intuitive results during times of fast changing liquidity environments. Since liquidity crises typically evolve rapidly, the time sensitive nature of our measure is a particularly important feature. Our analysis is performed on JNK and its underlying securities. We also compare the proposed liquidity metric to those existing in the literature and industry standard measures. We find that our measure captures the shifts in liquidity in a conservative and timely fashion, making it particularly applicable to risk management purposes for ETF investors and providers.

Mentor(s): Dr. Marcel Blais

Tyler L. Weiglein

Soil Greenhouse Gas Emissions along a Riparian-Upland Transect: How Do Landscape Position and Rainfall Magnitude and Frequency Affect Soil CO₂, CH₄, and N₂O Fluxes?

Global climate models predict climate change caused by anthropogenic greenhouse gas (GHG) emissions will result in altered precipitation regimes by the end of the 21st century. Although there is still uncertainty regarding how mean annual rainfall will change in the mid-Atlantic region, it is predicted that there will be more intense rainfall events followed by extended dry periods. Given the important role played by soils in global GHG fluxes, a key question that remains unanswered is how changes in precipitation will affect soil GHG emissions across the landscape. This project investigates the impact of landscape position and rainfall magnitude and frequency on soil CO₂, CH₄, and N₂O emissions. Soil cores were taken from a riparian-upland transect in Virginia Tech's StREAM Lab and divided into treatment groups based on landscape position and simulated precipitation regime. Each group received the same total amount of water over the course of 13 days, but the timing and magnitude of water additions were manipulated to simulate storm events of various sizes. Chamber headspace concentrations of CO₂, CH₄, and N₂O were measured with a cavity ring-down spectrometer and used to calculate fluxes from the cores. Additionally, soil from each core was characterized using physical and chemical methods. The results of this project could provide insight into possible feedback loops that may exist between soil GHG emissions and altered precipitation regimes resulting from climate change.

Mentor(s): Dr. Durelle Scott and Dr. Brian Strahm

Bevin Huang

Methods to Consistently Produce and Visualize Mechanically Exfoliated Atomically Thin WSe₂

Mechanical exfoliation via scotch tape is a common procedure to produce mono- to few-layered transition metal dichalcogenides (TMDCs), a family of quasi two-dimensional layered materials with novel electronic and optical properties. This technique utilizes the same methodology to produce graphene and is relatively easy to replicate, requiring only scotch tape and the sample of interest. However, a centralized procedure based on the van der Waals inter-layer interactions to produce large area monolayers or even a few layers consistently remains lacking in literature. Therefore, the objectives of this research are first to study the inter-layer interactions of tungsten diselenide (WSe₂) flakes, a TMDC, during the exfoliation process and second, to develop an imaging technique that would better discern mono-, bi-, and tri-layer tungsten diselenide flakes from one another. The culmination of all this research has resulted in a consistent method to produce monolayer tungsten diselenide roughly a few microns wide, and the incorporation of both brightfield and darkfield optical microscopy to pinpoint monolayers from other few layer flakes.

Mentor(s): Dr. Chenggang Tao

Alejandro J. Sosa

Optical Studies of Multifunctional Materials

Multiferroic materials are materials that exhibit two or more ferroic orders, such as ferroelectricity, and ferromagnetism. These materials are essential to the development of electronic devices such as computer memories and magnetic field detectors. We study particular novel examples of such materials, which possess potential applications in the development of new, more efficient electronic components. In order to characterize these material systems, we perform various optical experiments at room, and low temperatures. Two such experiments are photoluminescence and electroluminescence measurements. In photoluminescence measurements, a laser beam is pointed at the material of interest, which then emits light as a result. Measuring the wavelength of the emitted light reveals information such as the band gap and possible defects in the material. On the other hand, in electroluminescence measurements, in addition to the use of an incident laser beam, the material is subject to an applied electric field. By observing the change in the polarization angle of the emitted light, we can obtain information such as the Pockels coefficient, which is a measure of the change in the material's birefringence.

Mentor(s): Dr. Giti Khodaparast

Michael T. Graham

Emotional responses to music in Autism Spectrum Disorders

The goal of this research is to compare the emotional effects of music on a population of people with autism spectrum disorder traits to a general population. Autism is a commonly misunderstood disorder and individuals with autism are disadvantaged in many ways; therefore, the purpose is to show how this population is not as distinct of a population as many believe. Both physiological reactions (heart rate) and self-reported affective experiences to several musical selections will be measured. Comparisons will be made between college students with ASD-like traits with a general population to see if groups have similar or different responses. It is hypothesized that individuals with ASD-like traits will experience similar emotional responses and physiological reactions as a typically-developing population, but will exhibit less intense self-reported ratings of emotion induced by the music. This will help to show that individuals with ASD-traits experience emotions in similar ways to those without those traits, even if they are not able to communicate their emotions verbally.

Mentor(s): Dr. Angela Scarpa and Jonathan Waldron

Session 6

Performances

VT Olé- Flamenco

Dance Group

Advisor: María del Carmen Caña Jiménez

Chelsea Rinn

Kristen Fread

Tiffany Moreira

Olivia White

Alex Clark

Natalia Estevez

Tracy Laux

Carolina Amodeo

Allie Cain

Abbey Lawhorne

Session 7

Installations

and

Displays

Oliver D. Ebeling-Koning

Visual Servoing

The goal of this project is to work with the TREC lab to implement a visual servoing system on the humanoid robot, ESCHER. The end result will let ESCHER accurately grasp objects while using minimal to no user interaction. The short term need for this is ESCHER will be competing in the DARPA Robotics Finals in June 2015. The competition requires the robot to operate remotely with a very degraded communications link to a teleoperator. Ideally, with a good communication link between the robot and operator, the operator would be able to see exactly where the robot hand and object of interest are. Visual servoing would eliminate or greatly reduce the data communication cost of grasping something. The high level current analytical process is getting different software tools working with the TREC software system. Once the tools are working, they can be modified and evaluated if each will be an effective part of the visual servoing solution.

Mentor(s): Dr. Tomonari Furukawa

Patrick William Gallagher

Pipeline Information Network

The Pipeline Information Network is a community resource group consisting of thirty undergraduate and graduate students, from a wide range of disciplines. Understanding that pipelines are complex issues, we are working to create the largest publicly accessible source of information on the proposed Mountain Valley Pipeline. We seek to connect all the organizations and individuals currently residing in West Virginia and Virginia so there is an increased regional understanding of the potential effects of the MVP. Our goal is to assure that everyone linked to the MVP has the information they need to make informed decisions. Our research takes the form of a website, which we are working to promote as a resource to those affected by the pipeline. Community members are encouraged to make use of the website in order to better understand how the pipeline may affect their community. The research we have gathered has been formatted and presented in a fashion which can be easily understood and navigated by all. Examples include news digests, community events, interactive pipeline-specific maps, community information sheets, and pipeline fact sheets which allow people to easily access non-bias information on the Mountain Valley Pipeline.

Mentor(s): Dr. Jordan Hill

Meredith E. Dove and Keena Shang

Crystal Formation on Collagenous Gelatins: Effects of Carboxylation and pH on Rates and Polymorphs of Calcium Carbonates

An understanding of how macromolecule chemistry controls crystal formation within collagens to produce complex composites may lead to crystal-modified synthetic tissues with medical and technological applications. The purpose of this study was to test two hypotheses to determine the effects of carboxylation and pH (independent variables) on the number and polymorphism of calcium carbonate (CaCO_3) crystallites (dependent variables). Experiments used gelatin substrates, which are considered model compounds for collagen. These were placed in flow-through chambers to monitor crystal development using CaCl_2 and NaHCO_3 solutions. The number and type of crystallites that formed were characterized with optical and scanning electron microscopy. At the highest pH of 9.90, calcite was the predominant polymorph in contrast to aragonite at lower pH. Independent samples t-test showed 1) substrates with higher carboxyl density promoted more calcite ($p < 0.10$) and more total crystals; 2) crystallization rate increased with pH for all substrates ($p < 0.05$). This finding is previously unreported. Further analysis uncovered a relationship between rate of crystallite formation and carboxyl density. The findings demonstrate a chemical basis for regulating crystal formation in collagens to produce crystal modified tissues with enhanced material properties. This type of fundamental research may lead to future patent opportunities for synthesis of new bone substitutes.

Mentor(s): Dr. Nizhou Han

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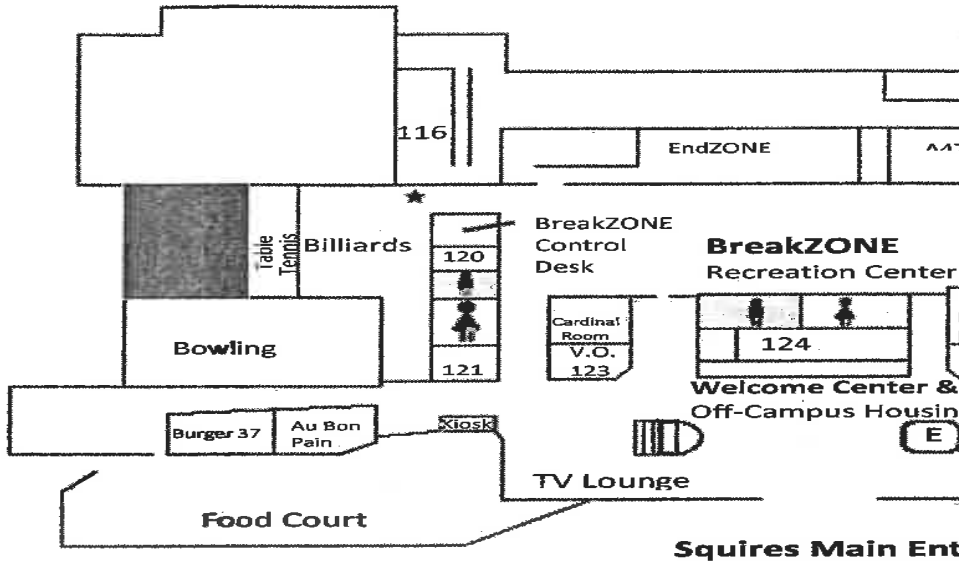
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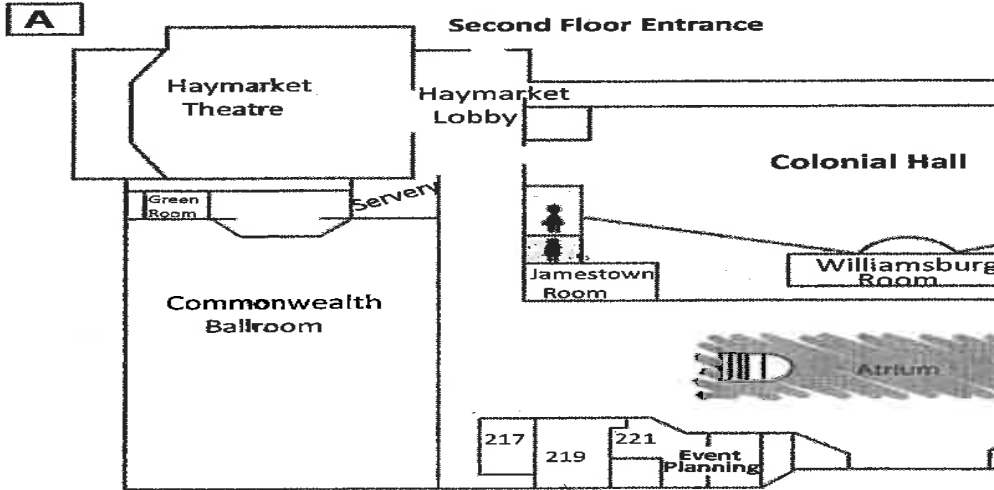
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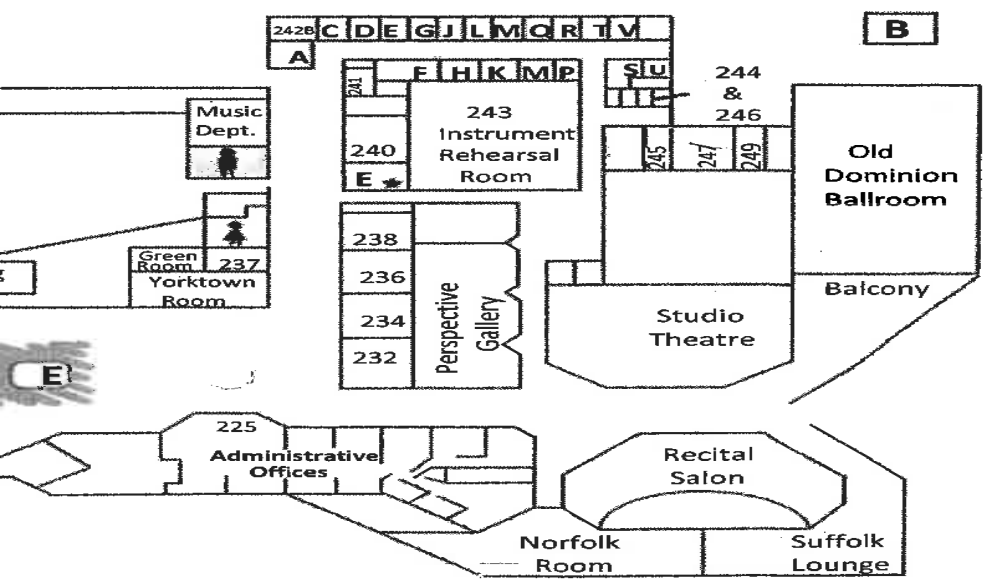
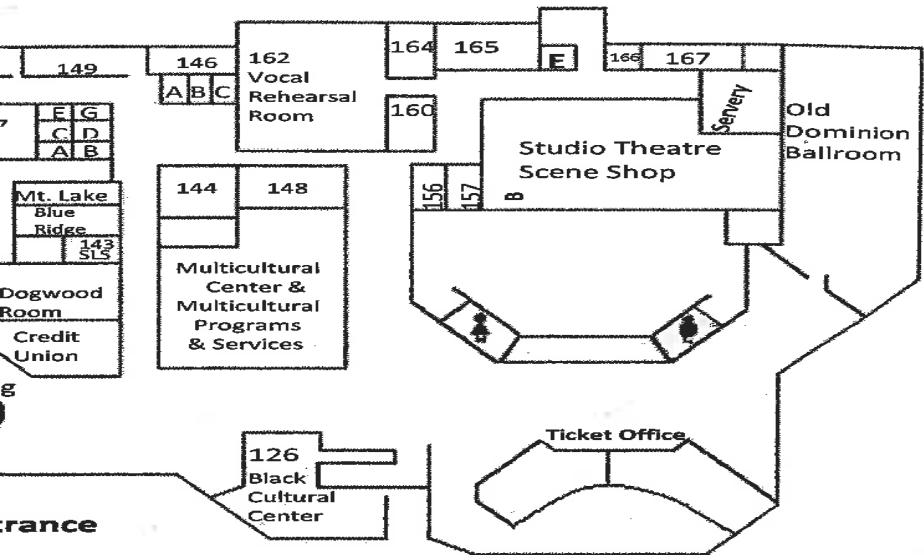


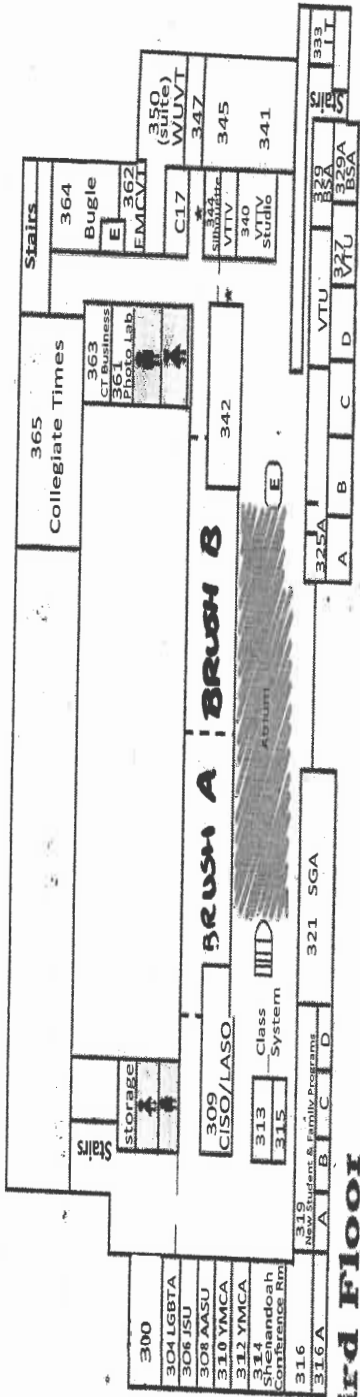
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