



RANDOLPH  
COLLEGE

# WARGALS

AT RANDOLPH COLLEGE

MID-ATLANTIC REGIONAL CONFERENCE  
FOR UNDERGRADUATE SCHOLARSHIP



SATURDAY, NOVEMBER 4, 2023

# Welcome to the 25th Mid-Atlantic Regional Conference for Undergraduate Scholarship (MARCUS)

We at Randolph College are especially proud to be hosting you for the 25th anniversary of MARCUS! Whether you are a presenter, a faculty sponsor, or guest, we are pleased that you are here participating in our conference.

The **Mid-Atlantic Regional Conference for Undergraduate Scholarship (MARCUS)** was founded and hosted by Sweet Briar College from 1999-2018. Since its inception, MARCUS has attracted students from colleges throughout Virginia and surrounding states, who present their research in various formats, including oral presentations, poster presentations, and elevator speeches.

Our conference atmosphere is one of lively inquiry in which the student researchers are the experts, presenting to an audience of their peers. Unlike many conferences, MARCUS is purposely interdisciplinary, with an emphasis on the intersection of disciplines across the liberal arts spectrum. For instance, one presentation session may include students in history, economics, political science, chemistry and psychology.

Please help the student presenters hone their presentation skills by asking questions regarding their scholarship during the questions and answer (Q&A) period following their talk and be sure to visit the poster presenters who are also eager to share their work.



You are welcome to explore the rest of our beautiful campus.

# KEYNOTE SPEAKER

Daniel Willingham is a Professor of Psychology at the University of Virginia, where he has taught since 1992. Until about 2000, his research focused solely on the brain basis of learning and memory. Today, all his research concerns the application of cognitive psychology to K-16 education.

He is the author of several books, including the best-selling *Why Don't Students Like School?* and most recently, *Outsmart Your Brain*. His writing on education has appeared in twenty-three languages.

In 2017 he was appointed by President Obama to serve as a Member of the National Board for Education Sciences.



# schedule

## **SATURDAY, NOVEMBER 4, 2023**

**8:15 - 9 a.m.:** Registration - *Main Hall Lobby*

Bagels & Coffee - *Quillian Conference Room*

**9 - 10 a.m.:** Welcome and Keynote Speaker - *Nichols Theatre*

### **WELCOME: HOLLY TATUM**

PROFESSOR OF PSYCHOLOGY AND DIRECTOR OF THE CENTER FOR STUDENT RESEARCH, RANDOLPH COLLEGE

### **KEYNOTE SPEAKER: DANIEL WILLINGHAM**

PROFESSOR OF PSYCHOLOGY AT THE UNIVERSITY OF VIRGINIA

***“How Does Psychological Science Apply to Education?”***

**10:15 - 11:15 a.m.:** Poster Session I - *Hampson Commons*

**11:30 - 12:30 p.m.:** Oral Presentations Session I - *Nichols Theatre, Klein Boardroom,  
Psychology Room 101*

**12:30 - 1:30 p.m.:** Lunch Buffet - *Smith Banquet Hall, Smith Building*

**1:45 - 2:45 p.m.:** Oral Presentations Session II - *Nichols Theatre, Psychology Room 101*

**1:45 - 2:45 p.m.:** Applying to Graduate School Panel - *Klein Boardroom*

**3 - 4 p.m.:** Poster Session II - *Hampson Commons*



# oral presentations

## **SESSION 1: 11:30 A.M.- 12:30 P.M.**

**Nichols Theatre, Student Center**

**Moderator: Ann Fabirkiewicz**

11:30 a.m. Parboni Dey '25, Sweet Briar College

11:45 a.m. Madelyn Friel '25, Natalyn Stanley '25,  
Randolph College

12:00 p.m. Audrey Flattich, '26 Sweet Briar College

12:15 p.m. Samantha Schatzman '24,  
University of Lynchburg

## **SESSION 1b**

**Klein Boardroom, Student Center**

**Moderator: Jesse Kern**

11:30 a.m. Jacqueline Hou '25, Virginia Tech

11:45 a.m. Marcela Izquierdo Poza '24,  
Angelo De Asis '26, Randolph College

12:00 p.m. Sandra Abdellah '24,  
Virginia Wesleyan University

12:15 p.m. Ana Patino Rojas '25, Sweet Briar College

## **SESSION 1c**

**Psychology 101, Psychology Building**

**Moderator: Blair Gross**

11:30 a.m. Elizabeth McElveen '25, Sweet Briar College

11:45 a.m. Emily Matthews '26, Randolph-Macon College

12:00 p.m. Gracie Wenzel '23,  
Virginia Wesleyan University

12:15 p.m. Cat Pressley '24, Randolph College

## **SESSION 2: 1:45- 2:45 P.M.**

**Nichols Theatre, Student Center**

**Moderator: Peggy Schimmoeller**

1:45 p.m. Julia Jessen '24, Sweet Briar College

2:00 p.m. Gracie Oliver '25, Ethan Caldwell '25,  
Randolph College

2:15 p.m. Alexandra Rosenthal '24, University of Virginia

## **SESSION 2b**

**Psychology 101, Psychology Building**

**Moderator: Elizabeth Perry-Sizemore**

1:45 p.m. Anthony Gorman '25, Liberty University

2:00 p.m. Luke Chapman '25, Isaac Carney '24,  
Randolph College

2:15 p.m. Olivia Ann Heffernan '25, Sweet Briar College

## **GRADUATE SCHOOL PANEL DISCUSSION**

**Klein Boardroom**

Sara Beck, Assistant Professor of Psychology

Aaron Shreve, Assistant Professor of Political Science

Jesse Kern, Assistant Professor of Chemistry

# presenters

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June Alomari.....	21	Ramanpreet Kaur.....	18	Evan Smith.....	17
Evan Alvarez.....	21	Christopher Keesee.....	18	Savannah Smith.....	11
Zakk Beaulieu.....	10	Olivier Kenol.....	19	Makayla Snyder.....	8, 19
Arushi Bejoy.....	9	Lauren Klubertanz.....	10	Natalyn Stanley.....	5
Shalom Beyene.....	21	Krystal Langhorne.....	19	Lea Summers.....	17
Jordan Birkner.....	8	Arleth Lopez.....	10	Maansi Taori.....	10
Aimee Buchanan.....	9	Emily Magee.....	13	Nadinka Taylor.....	9, 21
Ethan Caldwell.....	15	Emma Marshall.....	21	Adyn Teta.....	11
Isaac Carney.....	16	Emily Matthews.....	7	Jada Theodore.....	14
Shannon Carter.....	21	Elizabeth McElveen.....	7	Riley Thompson.....	11
Luke Chapman.....	16, 18	Brenna McManus.....	8, 19	Jefferson Tjaden.....	11
Rashda Choudhary.....	12	Alison Reyes Merced.....	20	Matthew Traversa.....	19
Sandra Coffee.....	13	Bella Molina.....	21	John Tucker.....	19
Haleigh Cooper.....	12	Jessica Monasir.....	20	Emma Valcourt.....	14
Karina Daniel.....	14	Isabel Motil.....	10, 14	Sevrin VanDevender.....	11, 19
Angelo De Asis.....	6	Meredith O'Connor.....	19	Kiryn Virdi.....	9
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Sarah Donahue (withdrawn).....	15	Neena O'Mara.....	16, 21	Jack Wardale.....	10, 18
Mariam Elassal.....	19	Amelia Grace Osborne.....	10	Cassie Watts.....	11
Regan Elmore.....	20	Daniel Paluh.....	22	Gracie Wenzel.....	7
Audrey Flattich.....	5	Austin Parker.....	13	Ella White.....	19, 20
Reagan Foley.....	10	Tyler Parker-Rollins.....	12, 14	Gregory Wietrzykowski.....	18
Emma Friedmann.....	8	Sydia Pearson.....	21	Kyle Williams.....	22
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Nawal Gaal.....	11	Cat Pressley.....	8		
Aki Gibbons.....	8	Noah Prinzbach.....	14		
Rose Giusti.....	16	Shreya Raj.....	16		
Xanthia Gomez.....	12	Evan Reichard.....	21		
Anthony Gorman.....	16	Gabriela Rocha.....	8, 19		
Michael Harrigan.....	18	Ana Patino Rojas.....	7		
Huda Hashash.....	20	Alexandra Rosenthal.....	8, 15		
Olivia Ann Heffernan.....	16	Audry Rush.....	9, 14		
Daisy Hernandez-Ramos.....	14	Ivan Savelyev.....	14		
Caroline Hopkins.....	11	Samantha Schatzman.....	6		
Nishu Hoque.....	14	Marco Seaberg.....	18		
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# abstracts

## **Oral Presentations Session 1** **Session 1a: Nichols Theater, Student Center**

*Parboni Dey '25, Sweet Briar College*

***Effect of Organic Fertilizers on N Mineralization and Soil Organic Carbon Sequestration Mediated by Iron Minerals***

***Advisor: Lili Lei***

Food, fuel, and fiber are all products of agriculture, and they support the world economy. Since long-term stewardship of both natural and human resources is just as vital as economic gain, the production of these products is highly influenced by soil quality, which is the essential foundation of sustainable agriculture (Singh et al., 1992; Brodt et al., 2011). Managing agriculture sustainably enables us to satisfy the needs of the current generation without jeopardizing the needs of future generations in an environmentally friendly, economically feasible, and socially responsible manner. We will use two common vegetable crops—radish and arugula—to examine the impact of various soil organic fertilizers on plant development and soil quality. These two crops have short-life cycles, which fits into the time frame of summer. In order to understand how the plants grow and develop, the study will also examine the photosynthetic process, the ratio of shoots to roots, and the biomass of the plants. The presence of nutrients, organic matter, and soil moisture can all have an impact on a plant's ability to photosynthesize effectively indicated by pigment concentration. The ratio of the shoots to the roots and the biomass can also reveal information about the health and growth of the plant as a whole and help us to assess the effects of the treatments on plant productivity and health, which can inform sustainable agricultural practices. The main objectives of the study are to determine 1) various fertilizers affect plant development via quantifying carbon, nitrogen, and Fe content in the soil and/or 2) soil carbon sequestration via quantifying iron content and two types of SOC degrading enzymes (phenol oxidase and peroxidase) and/or 3) Determine plant growth rate by measuring several morphological and physiological analysis such as biomass, root-shoot ratio, and photosynthetic pigments. Our study will provide insights into managing short-life crops more sustainably to achieve both economic and ecological goals in sustainable agriculture, such as greenhouse crops.

*Madelyn Friel '25, Natalyn Stanley '25, Randolph College*

***Antioxidant Assessment of Wine Components***

***Advisor: Ann Fabirkiewicz***

Wild grapes were first known in the Caucasus region and can be considered the origin of wine. Cultivation of grape vines was known in the earliest origins of farming. With the development of pottery and a greater understanding of the fermentation process, the production of wine as a beverage spread throughout Europe. In modern times, wine is produced throughout the world, with particular regions noted for the different flavor profiles of their grape cultivars. Wines are recognized as possessing health benefits that include reduced risk of heart disease and cancer, among others. In this project, we analyzed several red wines for their antioxidant potential, and isolated and analyzed their constituent antioxidant components. The wines were chosen from various regions around the world to consider the effect of climate on antioxidant potential. The petit sirah was found to have the highest antioxidant potential, as well as the highest concentration of polyphenols.

*Audrey Flattich '26, Sweet Briar College*

***Mountains and Majestic Vistas: Investigating How Virginia Wineries Make and Market Place***

***Advisors: Lisa Powell, August Hardy***

We know that “as a product, wine is closely associated with place” (Overton and Murray, *Australian Geographer*, vol. 42 p. 419). As theorized by many geographers, especially Yi-Fu Tuan, “place” is more than just coordinates on a map, but the complex meanings humans attach to those coordinates (Tuan 2001). In the case of wine, wineries have long distinguished their products and brands through terroir. The French word terroir is defined as the specified natural location that impacts the flavor of the grapes harvested (Trubek, 2008). Brands use terroir to form a market identity characterized by distinguishable wine flavors and unique origin or pedigree of the physical environment (Murray & Overton, 2014). In this project, I will be looking beyond the traditional context of terroir and flavor of the wines themselves, to how wineries distinguish the experience of their public tasting rooms and grounds – places that may or may not include where the grapes themselves are grown.

**Samantha Schatzman '24, University of Lynchburg**

**Neurodiversity: Employee Support Resources in the Intelligence Community (Elevator Speech)**

**Advisor: David Richards**

It is estimated that 20% of the population is neurodiverse in some form, although many people go undiagnosed and without accommodations that could help them succeed over their entire lives. There is currently a demand for a “STEM and technology savvy workforce, and the jobs required need enormous attention to detail, precision, and a low tolerance for errors (RAND Corporation).” Numerous multi-national corporations have displayed the benefits that arise from hiring the neurodiverse for jobs that fit the way their brains work. The definition of neurodiversity for this project includes autism, dyslexia, dyspraxia, ADHD, PTSD, and executive function disorder. I will be including three easy solutions and two hard ones and discuss the ease and cost of implementation. The question is what types of support resources can help the neurodiverse flourish and succeed in the Intelligence Community, and are there benefits for the community as a whole?

## **Session 1b: Klein Boardroom, Student Center**

**Jacqueline Hou '25, Virginia Tech**

**Naive Neutrophils Induce Endothelial Cell Leakage in Vitro**

**Advisor: Liwu Li**

Endothelial vascular leakage is responsible for the pathogenesis of diverse acute and chronic inflammatory diseases, such as COVID-19, heart disease and arteriosclerosis. In particular, COVID-19 infection exacerbates fluid extravasation to the surrounding tissues, eventually leading to sepsis and multiorgan failure. These processes are mediated by first-responder leukocytes, such as neutrophils; however, the effects of neutrophils on endothelial cell integrity mechanisms have not been well examined to date. In this study, it is shown that naive neutrophils cause significant leakage in brain endothelial tissue, the most restrictive vascular barrier, through the integrated analysis of three perspectives: in vitro leakage assay, cell morphology, and molecular biology. An optimized Evans Blue Dye Assay revealed that neutrophils hijack the endothelial barrier, inducing significant leakage. Light microscopy provided visual evidence that endothelial cells shrank when cultured with naive neutrophils, creating gaps in the endothelial barrier. Neutrophils also reduce expression of adhesion and tight junction endothelial markers E-Cadherin, Catenin beta-1, ESAM, and JAM-1, examined via flow cytometry. Collectively, these data challenge the generally accepted passive nature of neutrophils, demonstrating that neutrophils can be reprogrammed to induce an inflammatory state. This characteristic can be targeted as a potential therapeutic intervention method in treating inflammatory diseases.

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**Marcela Izquierdo Poza '24, Angelo De Asis '26**

**Drone–Drone Collisions over Lynchburg via the Kinetic Theory of Gases and Simulation Models**

**Advisor: Jesse kern**

Drone-based delivery systems might be an attractive alternative to ground-based delivery for corporations such as Amazon and FedEx due to improved speeds and reduced costs. This alternative can only reduce costs if the navigation technology is simple enough and if unwanted collisions that might damage drones or their parcels are sufficiently negligible. A recent publication has shown that the application of the kinetic theory of gases to hypothetical drone traffic above New York City results in up to 170,000 collisions per day by 2026 for “smart” drones. In contrast, Lynchburg, VA, with a more modest population density than NYC, might prove to be more amenable to safe drone deliveries under similar input conditions. We intend to collect the data required to apply the kinetic theory of gases to Lynchburg, as well as to apply direct simulation models to Lynchburg drone delivery traffic.

**Sandra Abdellah '24, Virginia Wesleyan University**

**Spectrophotometric Determination of Amisulpride using PADs**

**Advisor: Maury Howard**

The spectrophotometric determination of Amisulpride, a benzamide derivative used as an antiemetic and antipsychotic, has been explored through two distinct methods: Method A and Method B. Amisulpride is a drug with selective action on D2 and D3 dopamine receptors, prescribed for various conditions. Accurate quantification of Amisulpride is crucial due to its potential side effects and variations in pharmaceutical formulations. Method A involves the formation of a pink chromagen when reacting Amisulpride with N-(1-Naphthyl) ethylenediamine dihydrochloride. It employs self-designed wax pads for colorimetric analysis. Results indicate a higher slope for the PAD calibration curve compared to the solution, with a linear dynamic range suggesting a focus on lower Amisulpride concentrations. Method B utilizes B-Naphthol to create an orange chromagen in the presence of Amisulpride. While Method B in solution demonstrates a lower slope compared to Method A, it exhibits a higher R squared value, suggesting it may be more effective for solution analysis. Both methods provide valuable insights into Amisulpride quantification, with Method B appearing more effective for solution analysis, while Method A's wax pad approach offers potential for further optimization. These methods contribute to the development of cost-effective and reliable techniques for pharmaceutical quality control of Amisulpride.



**Ana Patino Rojas '25, Sweet Briar College**

***Developing Solid Insulators with 3d-Printing Materials and Analyzing Their Breakdown Phenomenon Under Various Environmental Conditions***

**Advisor: Farhina Haque**

The breakdown phenomena of an insulator can cause serious damage to the system within one is placed; this can lead to the failure of the system and may be dangerous. Solid insulators can be used in all kinds of devices or electronics, and they can be subject to various environmental conditions that could affect their performance. In recent years, 3D printing has been introduced into electrical components, and most importantly, 3D-printed solid insulators are becoming more popular but there is not much research on how they perform under various environmental conditions. In this paper, the effects of temperature and humidity on the breakdown point of solid insulators made of Polylactic Acid (PLA) are discussed. The breakdown test under four different environmental conditions was conducted on various samples of PLA solid insulators with different thicknesses to determine how their performance can be affected. The effects of partial discharge on the surface of the sample were also analyzed by looking at various samples under a Scanning Electron Microscope.

Session 1c: Psychology 101

## **Session 1c: Psychology 101, Psychology Building**

**Elizabeth McElveen '25, Sweet Briar College**

***Shattering into Pieces: Destruction through the Lens of Art History and Philosophy***

**Advisors: Kimberly Morse-Jones, Christopher Penfield**

This project intends to answer the question “what does it mean to destroy, especially art?” in the context of iconoclasm (the destruction of images), outside of its historical religious or cultural connotations. This research explores two main avenues of inquiry into iconoclasm: the sociocultural value of destruction and the shock value of destruction, as seen in Ai Weiwei’s piece “Dropping A Han Dynasty Urn,” which this project uses as a central point to connect the two avenues of inquiry. This project includes the time period of the 1970s to the current era--also referred to as the contemporary art period in art history or within the postmodernist tradition of philosophy. Despite this, it also uses iconoclastic works or texts from previous eras in order to foreground the reasons for iconoclasm for a specific art piece and its area of inquiry. The shock value aspect of destruction is based on art that is destroyed to invoke a reaction; whereas the sociocultural aspect of destruction deals with art that is destroyed for political reasons (i.e., war, colonialism, or to bring awareness to social issues).

**Emily Matthews '26, Randolph-Macon College**

***Political Intrigue in the Late-16th Century North Carolina Sounds***

**Advisor: Mathias Bergmann**

As a part of a larger paper exploring the geopolitics of the Algonquian peoples of the Ossomocomuck region (North Carolina Sounds) in the late 16th century, this presentation focuses on how the various Native leaders of Ossomocomuck attempted to use the English people as a tool to challenge rival groups. Events and examples include how the leader of the Roanoacs, Wingina, managed to convince the English that the Choanoacs intended to attack them and to pre-emptively ambush the Roanoacs’ rival, with the Choanoacs turning the tables on that strategy. The leader of the Choanoacs, Menatonon, instead convinced the English that it was Wingina who had staged the conspiracy to bring forth the English’s demise and weaken the Choanoacs. As a result, the Choanoacs and the English then formed a kind of alliance that eventually led to the downfall of Wingina. In response to the English presence, the Ossomocomuck tribes reacted in accordance with their pre-contact geopolitical objectives and concerns, using the English as political pawns in a much larger game.

**Gracie Wenzel '23, Virginia Wesleyan University**

***Distribution of Photoreceptors and Ganglion Cells in the Retinas of Six Juvenile Atlantic Stingrays, *Hypanus sabinus****

**Advisor: Soraya Bartol**

Stingrays are unique among elasmobranchs in having their eyes opposite from their mouth and thus many researchers have investigated electroreception and olfaction when looking at their sensory systems and have largely ignored their visual system. The objective of this project is to look at the visual capabilities of the juvenile Atlantic Stingray (*Hypanus sabinus*). Eyes were removed from six animals, and using whole mount techniques and light microscopy, photoreceptors and retinal ganglion cells (RGC) were identified and cataloged. Once identified, cells were counted and densities of cell types described. Visual competence is determined by two factors within the retina: the variation of the photoreceptor distribution throughout the retina and the convergence of photoreceptors and ganglion cells (Ali & Klyne, 1985). These results will show the rod to cone ratio and the photoreceptor to ganglion cell ratio. Using this information, we can better understand the level of importance of visual information for the Atlantic Stingray.

**Cat Pressley '24, Randolph College**

***Dialogic Questioning: Supporting Children's Learning from Music and Media***

**Advisor: Sara Beck**

How can parents and teachers support children's learning from music and media? This is a question that educators and parents alike have wondered. This presentation will review scientific literature showing how media consumption can benefit children when accompanied by adult scaffolding or mediation. Specifically, adults can use dialogic questioning or viewing to support expressive language, vocabulary learning and comprehension, and social emotional learning. Dialogic questioning can be defined as a specific approach to interacting with children in the context of reading or viewing that involves both comprehension checks and open-ended questions. The presentation will then connect this body of research to an emerging idea: using targeted adult mediation to increase child engagement and learning in the context of musical improvisation. I will conclude by sharing the process of piloting this idea at The Randolph College Nursery School with Dr. Sara Beck, Assistant Professor of Psychological Science.

## **Poster Session I: Hampson Commons 10:15 a.m.-11:15 a.m.**

**1. Brenna McManus '26, Gabriela Rocha '23, Emma Friedmann '23, Makayla Snyder '19, Aki Gibbons, Christopher Newport University**  
***Poor Sleep and High Anxiety Compound to Predict Acts of Courage***

**Advisor: Jeffrey Gibbons**

Previous studies have demonstrated the positive relationship between sleep deprivation and anxiety (rsal et al., 2012; Rosa et al., 1983). Researchers stated that fear responses were decreased by sleep deprivation (Hicks et al., 1979) and they impaired the ability of rats to consolidate memories (Hagewoud et al., 2010). Research on anxiety and bravery showed, despite exposure and previous knowledge of a stressor, that participants still acted courageously (Norton et al., 2009; Rachman et al., 1984). The current study's objective was to examine if sleep deprivation and anxiety are jointly related to courage. Performed on Qualtrics, this study used Christopher Newport University student participants seeking SONA experimental credit for their classes. Participants completed the DASS-21, the PSQI, and the WPCS-23. The results showed that anxiety and sleep combined to predict courage, based on the assumption that participants would experience fear when acting bravely. The participants reported that they would engage in brave tasks despite high fear when sleep deprivation and anxiety were high. Future research could explore behavioral measures across different social groups and contexts.

**2. Alexandra Rosenthal '24, University of Virginia**

***Calculating Mass-Loss Rates for Massive Stars with Stellar Bowshocks***

**Advisors: Nikhil Patten, Chip Kobulnicky, Daniel Dale**

Massive stars lose a significant portion of their mass through stellar winds over the course of their lifetime, and understanding the rate of mass-loss is critical for understanding stellar evolution and compact object genesis. Traditional methods of determining mass-loss rates rely on UV observations and parameterizing a "clumping" factor, which varies significantly and results in a two-order-of-magnitude difference between prediction and observation for stars with weak winds. We intend to address this "weak-wind problem" using a novel method to measure mass-loss rates of massive stars powering stellar bowshocks using optical spectroscopy of the central stars, far infrared measurements of the bowshock nebulae, and space velocities calculated from GAIA DR3 proper motions. This method utilizes the geometry of the bowshock and the principle of balancing the momentum flux between stellar winds and ambient interstellar material to make a mass-loss rate determination. We observed late-O and early-B type stars with bowshocks with the Apache Point Observatory 3.5m telescope with the KOSMOS long-slit spectrograph and the Wyoming Infrared Observatory's 2.3m telescope with an optical spectrograph. We used the emcee package in Python and interpolated between models from the PoWR OB-I grid to fit their spectra to find temperatures and surface gravities. We found that our sample spanned a range of stellar parameters, with temperatures varying from 18,000-38,000 K and the log of surface gravity ranging from 2.8-4.1 dex. Using these parameters and photometric data, we calculated predicted mass-loss rates. This work is supported by the National Science Foundation under REU grant AST 1852289.

**3. Jacqueline Hou '25, Virginia Tech**

***Naive Neutrophils Induce Endothelial Cell Leakage in Vitro***

**Advisor: Liwu Li**

Endothelial vascular leakage is responsible for the pathogenesis of diverse acute and chronic inflammatory diseases, such as COVID-19, heart disease and arteriosclerosis. In particular, COVID-19 infection exacerbates fluid extravasation to the surrounding tissues, eventually leading to sepsis and multiorgan failure. These processes are mediated by first-responder leukocytes, such as neutrophils; however, the effects of neutrophils on endothelial cell integrity mechanisms have not been well examined to date. In this study, it is shown that naive neutrophils cause significant leakage in brain endothelial tissue, the most restrictive vascular barrier, through the integrated analysis of three perspectives:

in vitro leakage assay, cell morphology, and molecular biology. An optimized Evans Blue Dye Assay revealed that neutrophils hijack the endothelial barrier, inducing significant leakage. Light microscopy provided visual evidence that endothelial cells shrank when cultured with naive neutrophils, creating gaps in the endothelial barrier. Neutrophils also reduce expression of adhesion and tight junction endothelial markers E-Cadherin, Catenin beta-1, ESAM, and JAM-1, examined via flow cytometry. Collectively, these data challenge the generally accepted passive nature of neutrophils, demonstrating that neutrophils can be reprogrammed to induce an inflammatory state. This characteristic can be targeted as a potential therapeutic intervention method in treating inflammatory diseases.

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#### **5. Nadinka Taylor '24, Arushi Bejoy '24, Zarifa Ali '24, Kiryn Virdi '25, Virginia Tech**

##### ***Flourishing and Academic Performance: Investigating Seligman's PERMA Model in Relationship to Academic Performance***

**Advisor: E. Scott Geller**

This longitudinal study aims to look at trends over a semester of psychology students' exam scores, GPA, and their self-reported Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment (PERMA) levels. The PERMA model was created in 2012 by positive psychologist Dr. Martin Seligman to conceptualize the main factors that contribute to subjective well-being. Through cross sectional analysis, the data collected from students about their exam scores or GPA and their self-reported survey responses on their PERMA dimensions is analyzed to show which dimensions have higher correlation to higher levels of academic performance and vice versa. Preliminary data has been collected in October of 2023 from a sample size of about 50 students at Virginia Tech. The survey asked questions from the student adapted version of the PERMA-profiler (Chue, et al. 2023), as well as current grades, GPA from the Spring 2023 semester, and their overall GPA in college. Through data analysis, the preliminary data will provide more insight on the future of the rest of the study.

#### **6. Meredith O'Connor '24, Virginia Tech**

##### ***Exploring Predictors of Disordered Eating in College Students with ADHD***

**Advisor: Rosanna Breaux**

College students with attention-deficit/hyperactivity disorder (ADHD) are more likely to display disordered eating. This study sought to examine potential predictors (anxiety symptoms, distress tolerance, and emotion dysregulation) of disordered eating (uncontrolled eating and emotional eating) among 63 college students (42.9% freshman) with ADHD. Participants were largely female (79.4%) and white (68.3%), with 23.8% identifying as Latine. Participants completed an online study, with the current sample of college students with ADHD reporting significantly more anxiety, more emotion dysregulation, less distress tolerance, and marginally more uncontrolled eating than the sub-sample of college students without ADHD (n = 80). Multiple regression analyses revealed that anxiety symptoms were a significant unique predictor of both uncontrolled and emotional eating ( $r = .33$  and  $.36$ ), such that college students with higher levels of anxiety displayed more disordered eating, controlling for distress tolerance and emotion dysregulation. Results suggest that targeting anxiety symptoms but not distress tolerance or emotion dysregulation via interventions for college students with ADHD could reduce their risk for disordered eating.

### **7. Maansi Taori '25, University of Virginia School of Medicine**

#### ***Harnessing Glucosylceramide Synthase Inhibitors to Improve Venetoclax Sensitivity in Acute Myeloid Leukemia***

**Advisors: Thomas P. Loughran Jr., Johnson Ung**

Acute myeloid leukemia (AML) is an aggressive cancer of the blood and bone marrow affecting thousands annually. The FDA recently approved the Bcl-2 inhibitor/BH3 mimetic, venetoclax, for use in AML. Unfortunately, many patients relapse due to drug resistance necessitating the development of improved therapeutics. Sphingolipids help maintain structural integrity of the plasma membrane whilst participating in cellular processes (e.g., proliferation, cell death, and drug resistance). Glucosylceramide synthase (GCS), a pro-survival sphingolipid enzyme, is upregulated in chemotherapy-resistant AML cell lines and promotes survival by decreasing ceramides and generating glucosylceramides. Because GCS is implicated in AML drug resistance, we evaluated sphingolipid changes associated with venetoclax resistance and tested the therapeutic efficacy of combining GCS inhibitors with venetoclax. Preliminary data suggested that glucosylceramides are upregulated in venetoclax-resistant cells. Increased glucosylceramides correlated with decreased sensitivity to BH3 mimetics. We tested how pharmacological GCS inhibitors (eliglustat, ibiglustat, and PDMP) affected the viability of AML cell lines as single agents and in combination with venetoclax using the MTS viability assay and flow cytometry. Our results showed that GCS inhibitors as single agents had minimal effects on cell viability. However, combining GCS inhibitors with venetoclax resulted in synergistic loss of cell viability and increased apoptotic cell death over single-agent controls. Together, these findings suggest that GCS inhibition improves sensitivity to venetoclax. Studies evaluating the mechanisms behind the synergistic lethality are ongoing.

### **8. Amelia Grace Osborne '25, Agnes Scott College**

#### ***Investigating Potential Sperm Size Dimorphism in Bluehead Wrasse***

**Advisor: Lock Rogers**

Bluehead wrasse (*Thalassoma bifasciatum*) is a protogynous marine fish endemic to the tropical western Atlantic Ocean measuring between 5 and 10 cm in length. Two color phases characterize the fish: initial phase (IP), which are yellow, brown, and white, and terminal phase (TP), which are larger, with a blue head. IP individuals are sexually mature males or females but can transform to TP males at an optimal size. TP mating strategies involve less sperm competition than IP strategies. This research project investigates the potential difference in sperm size between IP and TP males, potentially due to different levels of sperm competition between phases. This question will help explain reproductive energy allocation in bluehead wrasse. Sperm samples were collected off the eastern coast of Key Largo, Florida, during midday spawning period and preserved in glutaraldehyde. Thirteen samples were from IPs and thirteen from TPs. Samples were photographed under a light microscope and analyzed using image analysis software. Sperm length was measured and analyzed using nested analysis. There was no statistically significant difference between sperm lengths in IP and TP males. It appears that despite evidence that IP and TP males allocate energy differently to reproduction, sperm length is not a factor.

### **9. Zakk Beaulieu '25, Christopher Newport University**

#### ***The Effect of Employee Responsibility on Third-Party Perceptions of Fairness in a Reward Scenario***

**Advisor: Jeffrey Gibbons**

In the current experiment, participants portrayed the role of third-party employees who witnessed a supervisor rewarding a subordinate for excellent job performance. Information was provided to participants conveying whether or not the rewarded employee was responsible for the excellent performance and then participants made ratings related to fairness. Subsequently, employee responsibility either changed (Time 1) and participants again provided the same ratings. Observers' final (Time 2) perceptions of fairness followed the expected pattern in that fairness was perceived when the employee was responsible for the performance and the converse was true. These results contrasted past results from supervisor-subordinate punishment scenarios producing opposite and extreme fairness ratings after employee responsibility changed. These different outcomes suggest that third-party observer perceptions involved in punishment and reward work scenarios are very different, as they differentially influence fairness perceptions in third-party observers. These results also show that supervisors need to establish the facts before they openly reward/reprimand employees or they should take steps to avoid such displays.

### **10. Isabel Motil '24, Reagan Foley '23, Max Huynh '24, Arleth Lopez '24, Lauren Klubertanz '24,**

**Jack Wardale, Ph.D. candidate, Virginia Tech**

#### ***Effect of Stress on the Accuracy of Perceiving Emotions***

**Advisor: E. Scott Geller**

Whether a doctor is trying to assess a patient's wellbeing, or a police officer is attempting to de-escalate a situation, correctly interpreting another person's emotions via facial expressions is an integral part of the human experience. For this study, participants completed an emotion perception test under experiment-induced stressors. The task consisted of a 50-item test where facial expressions conveying emotions were flashed on a computer screen, and participants were asked to identify the emotion. Participants were divided into four groups: Time Constraint, Authority Figure, Time and Authority, and Control. In the Time Constraint group, participants were given a timer that continuously ticked down.

In the Authority group, a proctor looked over participants' shoulders, commenting using filler words. Afterwards, participants completed a Big 5 Personality assessment. Results showed that men were significantly better at identifying disgust ( $p=0.005$ ) and joy ( $p<.001$ ) than were women, and those scoring high on openness were more accurate at recognizing neutral emotions. There was no significant difference between the four experimental groups, with the Time and Authority group having the highest accuracy at 92.05%. The Control group had 91.04% accuracy, then Time at 90.77%, and finally, Authority at 89.23%.

**11. Nawal Gaal '23, Riley Thompson '25, Adyn Teta '25, Savannah Smith '25, Caroline Hopkins '26, Virginia Tech**  
***The Art of Appreciation: Exploring Gratitude in Romantic Relationships***

**Advisor: E. Scott Geller**

This research seeks to provide a multifaceted understanding of the intricate dynamics involved in improving relationship satisfaction in order to promote healthier relationships. This study aims to investigate the relationship between perceived gratitude expression and its effects on romantic relationship satisfaction among college students. A cohort of 100-200 undergraduate students at Virginia Polytechnic and State University will complete questionnaires from the Couples Satisfaction Index and the Expressions of Gratitude in Relationships Questionnaire to gauge partner-perceived gratitude expression and the subsequent levels of relationship satisfaction. Demographic information will be collected to investigate possible gender differences in perceptions of gratitude expression. Three hypotheses guide this study. 1) Higher levels of partner-perceived gratitude expression will be positively correlated with higher levels of relationship satisfaction. 2) Compared to men, women will report higher levels of perceived gratitude from their partner, which will be associated with higher levels of relationship satisfaction. 3) Reported partner-perceived gratitude expression may decrease as length of the relationship increases, while reported relationship satisfaction will remain high. This study contributes to a more comprehensive understanding of the role of gratitude expression in relationships, which may further develop strategies that promote healthier and more satisfying relationships.

**12. Sevrin VanDevender '25, Cassie Watts '24, Christopher Newport University**  
***Are Confident Problem-Solvers Better at Coping? How Problem-Solving Interacts with the Fading Affect Bias***

**Advisor: Jeffrey Gibbons**

The Fading Affect Bias (FAB; Walker et al., 2003) occurs in autobiographical memory when pleasant emotions fade slower than unpleasant emotions (Walker et al., 1997), and it appears to be a form of emotion regulation (Ritchie et al., 2014). As emotion regulation has been positively related to problem solving in the literature (Spering et al., 2005), the current study examined FAB in the context of problem solving. We asked 157 undergraduate students to provide basic demographics, rate their problem-solving abilities and emotional intelligence, and complete various healthy and unhealthy emotion scales. Participants described two pleasant and two unpleasant problem-solving and non-problem-solving events, rated initial and current effect of the events, and provided rehearsal ratings. We expected and found a robust FAB that was negatively predicted by unhealthy variables (e.g., depression) and positively predicted by healthy variables [e.g., Positive and Negative Affect Schedule (PANAS)]. We also expected and found that the relations between FAB and both problem-solving beliefs and emotional intelligences were stronger for problem-solving events than for non-problem-solving events. Finally, we found that problem-solving beliefs predicted the FAB when it combined with unhealthy variables, including anxiety, depression, neuroticism, stress, and poor sleep, and talking rehearsals mediated these 3-way interactions.

**13. Jefferson Tjaden '25, James Madison University**  
***Using Artificial Intelligence in a New Era of Space Exploration***

**Advisor: Philip Frana**

Even with all that is currently known about astronomy and space, we have barely scratched the surface. There is much more in space that we have yet to completely understand, such as dark matter or the universe's expansion rate (Hubble Constant). We have not sent a human to another planet, let alone beyond the Solar System or the Milky Way Galaxy. Artificial Intelligence (AI) has already proven to be a massive game-changer in almost every. With space often referred to as the 'final frontier,' and AI already making substantial impacts and progress just this year, the possibilities for combining the two are limitless. AI will exponentially accelerate the speed at which astronomical data can be sorted, interpreted, and compared. In our lifetime, spaceflight could become a reality if we could perfect the ability to use AI for instantaneous and error-free navigation.

**14. Haleigh Cooper '24, Emory & Henry College**

***Mediterranean versus Western Diet and the Gut-Brain Axis: Diet-induced Links Between Gut Microbial Abundances and Heart Rate Variability in Captive Female Cynomolgus Macaques (*Macaca fascicularis*)***

**Advisor: Brett Frye**

Heart rate variability (HRV) - the variation in time between heartbeats - reflects the activity of the autonomic nervous system and is often used as a metric of sympathetic versus parasympathetic activation. Dietary patterns have been shown to impact HRV, with unhealthy diets promoting sympathetic activation and healthy diets promoting greater parasympathetic activation. The composition of the gut microbiome may mediate the relationships between dietary patterns and the autonomic nervous system. To study the relationships between diet, gut microbiome, and HRV, we conducted a preclinical, randomized dietary intervention in a nonhuman primate model: Faecalibacterium macaques (*Macaca fascicularis*). We found several significant differences in the composition of the gut microbiome across diets: an abundance of *Lactobacillus* ( $t=1.789$ ;  $p=0.029$ ), *Oscillospira* ( $t=2.904$ ;  $p=0.008$ ), and *Faecalibacterium* ( $t=3.86$ ;  $p=0.001$ ). We also detected several significant correlations between the gut microbiome and HRV parameters. Finally, we determined a positive relationship between *Oscillospira* and the LF/HF ratio ( $p=0.00025$ ). These results suggest that dietary patterns can lead to alterations in gut-microbiome composition. They also suggest that the microbiome may mediate the relationship between diet and the autonomic nervous system. Ultimately, this study provides important insight into the importance of diet and how it can affect multiple systems in the body in ways relevant to health.

**15. Rashda Choudhary '27, George Mason University**

***Extent Creative Art Interventions Mitigate Symptoms of Anxiety in Adolescents with Generalized/Social Anxiety Disorder***

**Advisor: Holly Matto**

In this systemic review, the central questions are (1) to identify literature concerning effectiveness research on creative arts expression on adolescents with social anxiety and generalized anxiety disorder, (2) to review the results of this research, and (3) to draw conclusions on the effectiveness of creative arts expression in the treatment of anxiety levels in adolescents. The review reports the extent to which art therapy and creative art interventions can help mitigate symptoms of anxiety in adolescents with a focus of diagnosis of social anxiety disorder and generalized anxiety disorder. To assess the effects that creative art interventions can have on anxiety levels, a cross sectional quasi-experimental design was implemented in order to compare the mitigating effects. A pretest and posttest design were also implemented in order to compare participants anxiety levels before and after the creative art intervention. A separate analysis on adolescents with generalized anxiety disorder and social anxiety disorder was also completed within the same study. It was concluded that adolescents' anxiety levels did decrease as a result of the creative art intervention. Further, adolescents with generalized anxiety disorder and social anxiety disorder had even more decreased levels of post anxiety scores.

**16. Xanthia Gomez '24, James Madison University**

***Navigating Identity and Intersectionality, and Its Influence on Travel***

**Advisor: Philip Frana**

Humans have always desired to travel and see the world. Exploring new places, trying new things, and the experiences gained from traveling are generally considered worthwhile. There are numerous benefits for the mind and body that come from traveling. Unfortunately, for many, travel may be inaccessible due to the intersectionality of identities. While there are certainly valid fears and barriers that can discourage people from traveling, these should not dissuade them. Anxieties are natural when it comes to traveling, especially abroad, but with conscious planning, these fears can be effectively managed. This project acknowledges common barriers that people face and provides guidance on how to overcome them.

**17. Tyler Parker-Rollins '24, Virginia Tech**

***Psychological Safety in Higher Education***

**Advisor: E. Scott Geller**

Psychological Safety, or the degree of perceived inclusion, contribution, belongingness, and comfort one experiences in a given situation, has recently become a topic of extreme interest in industry (Clarke, 2020). Recent research indicates that in workplace settings, psychological safety can increase creativity (Castro, et al., 2018), engagement (Frazier, et al., 2016), and reduce distress (Obrenovic, et al., 2020). The present study examined student perceptions of psychological safety in individual courses at Virginia Tech through an innovative 36-question survey. Thus far, 134 participants have provided answers to this survey, each responding in reference to a particular singular course they have recently taken. This questionnaire measures psychological safety with an eight-question "Psychological Safety in Education" scale, adapted from psychological safety scales created for industrial settings. Additional questions on our survey assess variables that may impact a student's perception of psychological safety, including the student's academic year, the number of students in the course, the course subject, and several other issues. While a larger sample is needed for confidence in these results, the current data indicate that psychological safety is influenced significantly by the number of students taking a course, the student's grade in the course, and the subject matter of the course.

**18. Sandra Coffee '24, Emory & Henry College**  
***The Effects of CBD on Activity in Shelter Canines***  
**Advisor: Brett Frye**

Intervention strategies – including olfactory, auditory, and physical interventions - to reduce stress in shelter dogs have had varying degrees of success, but alternative approaches are needed. Cannabidiol (CBD) supplements are increasingly used as therapeutics to treat pain. Increasing evidence also suggests that oral administration of CBD may reduce anxiety in canines, but additional study is needed to better understand the efficacy of these treatments in different settings, like shelters. For this project, I implemented a CBD intervention on 12 shelter canines at two study locations (Fredericksburg SPCA and Old Dominion Humane Society) to assess the effects of CBD on activity levels. Preliminary results suggest that CBD did not significantly affect the dogs' activity. Despite lacking evidence supporting the link between CBD administration and dosage, we detected significant inter-individual variation in activity levels. Additional analyses are ongoing to determine how individual factors may influence the effects of CBD on activity in dogs living in shelters.

**19. Casey Smith '25, James Madison University**  
***Fabrication (of a) Business***  
**Advisor: Philip Frana**

To establish and operate a successful fabrication business is nothing short of a multi-stage entrepreneurial endeavor. Planning comes first and foremost, with specific intentions regarding numerous variables. What will you manufacture? Who will be your buyers? Is there a demand for your products in the marketplace? Do you face competition that could pose a threat to your business? Where will you source raw materials, and more importantly, what type of machinery will you need to acquire? Will you require employees, or can the business operate self-sufficiently? Deliberating on and determining these factors is crucial not only for initiating a startup but also for ensuring the long-term sustainability of an established business.

**20. Shauna Shepard '25, Randolph College**  
***Observing Dark Matter through Strong Gravitational Lensing Using Next-Generation Space Telescopes***  
**Advisor: Simon Birrer, Stony Brook University**

Finding definitive proof of the presence of dark matter in the universe is a topic of ever-increasing interest in physics and astronomy. By using the method of Strong Gravitational Lensing (SGL) to observe stars, galaxies, black holes, etc. one can make observations not possible with only visible-light telescopes. In an effort to understand the potential use of next generation space telescopes, simulations of halos and Einstein rings can be generated to study potential dark matter substructure and gain ideas of what these subhalos may look like in real field imaging. Programs such as pyHalo and lenstronomy permit users to simulate large populations of these halos and adjust individual parameters to better understand what the limiting factors and strengths of future space telescopes will be.

**21. Austin Parker '24, Roanoke College,**  
***Using CRISPR/Cas9 to Model a Human Disease in Zebrafish (*Danio rerio*)***  
**Advisor: Christopher S. Lassiter**

The star gene encodes for the star protein, which transports cholesterol into the mitochondria for steroid biosynthesis. In humans, mutations in the star gene have been linked to several conditions, including lipoid congenital adrenal hyperplasia (LCAH). CRISPR/cas9 is a gene editing tool that can produce double-stranded DNA breaks in a desired location in the genome. CRISPR/cas9 will be used to produce a line of zebrafish that have a mutation in the star gene. This mutation is expected to result in an inactive protein, providing a useful animal model for studying the effects of steroid deficiency. This model will be used to test potential drugs to alleviate this condition, and symptoms will be characterized to potentially allow for early screening of LCAH.

**22. Emily Magee '24, James Madison University**  
***The Patient-Provider Healthcare Relationship***  
**Advisor: Philip Frana**

This project focuses on the patient-provider relationship. Interviews are conducted with physicians and nurses to gather their perspectives on the patient-provider relationship. Another aspect of the project involves interviewing individuals about their healthcare experiences and how they perceive the healthcare system. The purpose is to collect data on the quality of the patient-provider relationship from both the patient's and the provider's perspectives. The aim is to determine whether there are more positive interactions or negative interactions.

**23. Emma Valcourt '24, Roanoke College*****Histone Modifiers in Coprinopsis Cinerea*****Advisor: Marilee Ramesh**

Histones are necessary tools in eukaryotic organisms in order to package DNA from long strands into the condensed form of chromatin and chromosomes. Likewise, histone modifiers are needed to help unwind sections of chromosomes in order to be transcribed and translated into RNA that help make proteins for a variety of cellular functions. Using these techniques, we were able to confirm the presence of six histone modifiers with functions related to histone acetylation out of fourteen predicted histone modifiers and one histone chaperone out of the one predicted. This research was conducted using bioinformatic techniques to analyze histone modifiers in *Coprinopsis cinerea*. The results of this research indicate a greater presence of histone acetylases compared to histone methylases and histone chaperones. This research can be applied to not just gaining a better understanding of *Coprinopsis cinerea*, but also in cancer research, stress and aging research, research the development of mental health conditions, and agricultural purposes.

**24. Tyler Parker-Rollins '24, Karina Daniel '24, Isabel Motil '24, Jada Theodore '24, Audry Rush '24, Daisy Hernandez-Ramos, '24,****Virginia Tech*****Greeks Go Green: A Practical Intervention to Increase the Use of Reusable Grocery Bags Using Greek Organizations*****Advisor: E. Scott Geller**

The annual flow of plastic into the ocean will triple over the next 20 years, limiting climate regulation of the ocean and severely damaging both marine and terrestrial. Unfortunately, most grocery-store customers choose single-use plastic bags over reusable bags. Preliminary research indicates that just 14% of grocery-store customers use reusable bags, and that young people (under 30) disproportionately contribute to plastic bag waste. This study details an intervention which targets members of Greek Organizations at Virginia Tech, promoting intergroup competition to motivate the use of reusable bags. The intervention will consist of a sign being placed by the exits of two grocery stores, displaying a QR code in which members of Greek Organizations can submit a photograph of their reusable bags, and identify which organization they belong to. From there, these results will be uploaded to an online leaderboard, displaying the fraternities and sororities which have used the most reusable bags. This leaderboard will also be displayed on the sign, updated weekly to reflect changes in reusable bag use. We hypothesize that this intervention will motivate a significant increase in reusable bag use among grocery-store customers, particularly among the under-30 age group.

**25. Nishu Hoque '24, Sweet Briar College*****Zinc Whisker Growth Mitigation via Reduced Mechanical Deformation*****Advisor: Michelle Gervasio**

Whisker growth on galvanized metal surfaces is inevitably a safety hazard for electronics industries. Electrical shorts, equipment damages, and contaminations are provoking exacerbated performance issues and leading to the malfunction of other interconnected devices. This study was intended to alleviate zinc whisker growth by reducing mechanical deformation on galvanized zinc plates. Through this controlled experiment, groups of metal substrates were subjected to standard diamond and ball indenters after being annealed at 150°C. Samples were incubated at 30°C for a prolonged period of at least 1000 hours and specimen screening was conducted every 250 hours interval. Finite Element Method analysis was employed to stimulate and investigate these zinc-coated substrates' structural and statistical data. Based on performed tests and stimulations, the growth rate of metal whiskers and their formation sites were detected and analyzed under imposed conditions.

**Oral Presentations Session II****Session 2a: Nichols Theater, Student Center 1:45 p.m.-3:00 p.m.****Julia Jessen '24, Sweet Briar College*****Reduce, Reuse, or Recycle? Economic Incentives' Effects on Disposable Plastic Bag Usage*****Advisor: August Hardy**

The disposable plastic bag quickly gained popularity after its introduction to worldwide markets in 1965 due to its durability, waterproof nature, and lightweight design. Over 500 billion plastic bags are used annually worldwide, but their disposable nature leads to significant waste issues. Less than 10% of all plastic film produced in the US is recycled, and the rest contributes to harmful environmental externalities, including littering and damage to wildlife. Management of these disposal externalities presents considerable challenges and costs to governments, firms, and individuals. To address these issues, various strategies have been proposed, such as taxes or bans on plastic bags, incentives for reusable bags, increased awareness of plastic waste, and improved recycling methods. The paper analyzes these approaches within the "Reduce, Reuse, and Recycle" sustainability framework to determine effectiveness. I determine that the complete elimination of plastic bag use is inefficient due to potential for reuse, and that while recycling is a promising alternative, operation costs are currently too high to be effective. The most sustainable strategy, both environmentally and economically, is the implementation of a consumer-paid tax at the point of purchase for each plastic bag, as it encourages responsible usage and helps internalize external costs.



*Sarah Donahue '25, Longwood University (withdrawn)*

*Monstrous Maternity: La Malinche and La Llorona in Ixcanul (2015), Roma (2018), and Todo sobre mi madre (1999)*

*Advisor: Renee Gutierrez*

This project applies feminist theory to cinematic representations of monstrous mothers such as La Malinche/Malintzin and La Llorona. I will trace historical and cultural changes in the expression of these Mexican figures and will use theory to illuminate patterns in the modern intersections of maternity and femininity. The project considers a small part of the larger discussion on how femininity has been (re)defined through history and culture.

*Gracie Oliver '25, Ethan Caldwell '25, Randolph College*

*Ticked-Off: Determining the Presence, Abundance, and Distribution of Potentially Pathogen-Carrying Ticks across an Urbanized Landscape in Lynchburg, VA*

*Advisor: Erin Heller*

Ticks are ectoparasites that pose significant health threats to humans and non-human animals. Different species of ticks are capable of harboring and transmitting a large variety of diseases, such as Lyme disease and alpha-gal, to name just a few. As urbanization continues to disrupt relationships between ticks and their non-human hosts and as more people populate urban areas, the potential for ticks parasitizing humans is increasing. This project aims to determine and officiate what species of ticks are present and most abundant in urban areas throughout Lynchburg, VA. We employed tick dragging techniques to collect ticks at a variety of city parks and in other publicly accessible areas and morphometrically identified these ticks in the lab. Once we determined what species are found locally, we conducted bibliographic reviews to determine what potential disease pathogens these tick species can carry. As part of a collaboration with the Ecological Research as Education Network, this project serves as a pilot study for a wide-ranging effort to determine tick presence and abundance in urban areas and to share these results with public health agencies so that medical professionals can be better prepared to diagnose and treat patients with suspected tick-borne illnesses.

*Alexandra Rosenthal '24, University of Virginia*

*Calculating Mass-Loss Rates for Massive Stars with Stellar Bowshocks (Elevator Speech)*

*Advisors: Nikhil Patten, Chip Kobulnicky, Daniel Dale*

Massive stars lose a significant portion of their mass through stellar winds over the course of their lifetime, and understanding the rate of mass-loss is critical for understanding stellar evolution and compact object genesis. Traditional methods of determining mass-loss rates rely on UV observations and parameterizing a “clumping” factor, which varies significantly and results in a two-order-of-magnitude difference between prediction and observation for stars with weak winds. We intend to address this “weak-wind problem” using a novel method to measure mass-loss rates of massive stars powering stellar bowshocks using optical spectroscopy of the central stars, far infrared measurements of the bowshock nebulae, and space velocities calculated from GAIA DR3 proper motions. This method utilizes the geometry of the bowshock and the principle of balancing the momentum flux between stellar winds and ambient interstellar material to make a mass-loss rate determination. We observed late-O and early-B type stars with bowshocks with the Apache Point Observatory 3.5m telescope with the KOSMOS long-slit spectrograph and the Wyoming Infrared Observatory’s 2.3m telescope with an optical spectrograph. We used the emcee package in Python and interpolated between models from the PoWR OB-I grid to fit their spectra to find temperatures and surface gravities. We found that our sample spanned a range of stellar parameters, with temperatures varying from 18,000-38,000 K and the log of surface gravity ranging from 2.8-4.1 dex. Using these parameters and photometric data, we calculated predicted mass-loss rates. This work is supported by the National Science Foundation under REU grant AST 1852289.

## **Session 2b: Psychology 101, 1:45 p.m.-2:45 p.m.**

*Anthony Gorman '25, Liberty University*

*P Versus NP: The State of Computer Science’s Most Intriguing Open Question in 2023*

*Advisor: Andrew Volk*

It is clear that easy problems can be solved in incredibly inefficient ways. To state this more precisely, the set of all polynomial time complexity problems is contained in the set of non-polynomial time complexity problems. What if we can prove that all difficult problems can be solved in more time efficient ways? This is the million-dollar question. The goal of this research is to shed light on the state of the millennium problem P versus NP in 2023. If the set of non-polynomial complexity problems is proven to be contained in the set of polynomial complexity problems, then this would have serious implications in several fields of computer science, most prevalently cybersecurity. It is our intention to spark the audience’s interest in the mathematical side of computer science.

**Luke Chapman '25, Isaac Carney '24, Randolph College**

**Smart Phone Accelerometer Anomaly**

**Advisor: Peter Sheldon**

Smart phones and their associated usages are ubiquitous in everyday life for many people. The advanced features that they possess provide the opportunity for any smartphone owner to perform measurements for the study of Physics. Previous research suggests that smartphones have issues recording accelerometer data for constant acceleration scenarios. The research performed by the Randolph College team provides an in-depth observation of an anomaly spotted within both iPhone and Android smartphones, which is that there is decay in the measured acceleration for the phones in any constant acceleration experiment. The team presented multiple situations in which a smartphone is subject to this condition, and in all experiments, decay was spotted.

**Olivia Ann Heffernan '25, Sweet Briar College**

**The Mysteries, Mysteria, and Mystai of Ancient Greco-Roman Religion: Beliefs, Internal Rites, and External Interpretations**

**Advisors: Erin Pitt, Tracy Hamilton**

An investigation of Greek and Roman polytheistic mystery cults, ranging from 3rd century BCE to 7th century CE, through analyses of universalities concluded across known mysteria of the period and, most notably, case studies of the pagan mysteries of Aphrodite, Hecate, and Isis' religious ideologies, initiate experiences, and non-initiate interactions. Material evidence from the Sanctuary of Aphrodite Paphia, Temple of Hecate Lagina, and Temple of Isis Pompeii, as well as archaeological objects pertaining to associated deities during late antiquity, will be scrutinized in relation to rites experienced, beliefs held, and motives determined by initiates within each case study. Primary, secondary, and tertiary texts spanning from 3rd century BCE to 21st century CE will be referenced for encompassing and case-specific mystery cult classifications, origins, and organizations. Similarly, primary, secondary, and tertiary texts will be interpreted to hypothesize Aphrodite, Hecate, and Isis' relationships with, and influences over, initiates and non-initiates through perceived existences and characteristics. Comprehensive understandings of privatized Greek and Roman religions and, subsequently, developed theories of mystery cults' multi-dimensional effects over the cultural milieu of Greco-Roman civilizations, capstone the research, asserting the high importance and prevalence of imagistic modes of religiosity in ancient Mesopotamia.

## **Poster Session II Hampson Commons 3:00 p.m.-4:00 p.m.**

**26. Shreya Raj '24, Rose Giusti '24, Neena O'Mara '25, Virginia Tech**

**Cardiac-Specific Knockout of Meis1 Induced Dilated Cardiomyopathy and Heart Failure**

**Advisor: Jia-Qiang He**

Dilated cardiomyopathy and its subsequent heart failure are cardiac severe disorders that have been shown to affect a person's heart function and overall health significantly. Unfortunately, there are no permanent cures for these diseases, partially due to an incomplete mechanistic understanding associated with a shortage of appropriate animal models. To this end, we aim to investigate the role of the Meis1 (myeloid ecotropic viral integration site 1) gene in cardiac development and pathogenesis using a transgenic mouse model. Briefly, cardiac-specific Meis1-KO mice were generated by breeding Lox-p (floxed) mice with myosin heavy chain 6 (Myh6)-cre mice, and PCR-based genotyping was used to confirm knockout in resulting offspring. It was found that all knockout mice died at around 5.5 months of age, while it did not occur in any controlled wild-type (WT) mice. Echocardiography (Echo), electrocardiography (ECG), and gross pathohistological analysis indicated there was a significant decrease in cardiac ejection fraction (EF%), a decrease in R-wave amplitude, and an increased left ventricular chamber size in knockout mice compared to WT controls. We conclude that cardiac Meis1-KO promotes cardiomyopathy and heart failure via unknown mechanisms. The ongoing experiments intend to increase sample size and evaluate cardiac structure changes at the cellular level.

**27. Evan Smith '25, James Madison University**

**Expanding Business Education Beyond the Classroom**

**Advisor: Philip Frana**

Real-world knowledge and experience are almost always preferred by employers. While the classroom can be an excellent learning environment for certain fields, such as mathematics, science, and medicine, many aspects of business practices cannot be adequately experienced within its confines. Universities across the nation need alternative options for business class opportunities beyond the traditional classroom structure. The challenges of shipping, fabrication, manufacturing, and in-person sales simply cannot be replicated within the walls of the classroom. Off-campus experiential activities are indispensable for the development of future leaders in modern for-profit companies, and students seeking to gain deeper insights into these activities encounter significant constraints beyond temporary internships.

**28. Meara Kane '27, North Carolina State University**

***Impact of cpcABC on Cyanobacteria Growth Rates under Varying Light Intensities***

**Advisor: Ryan Paerl**

Cyanobacteria are abundant in marine and estuarine environments and play a significant role in primary production and nutrient cycling. They survive in habitats with widely varying nutrient concentrations, temperatures, and light conditions, which has been attributed to their wide genetic and pigment diversity related to the composition of light-harvesting structures called phycobilisomes. However, the physiological consequences of variation in the number of some light-harvesting related genes have not been entirely resolved. In this study, we will investigate whether variation in the number of *cpcABC* (genes encoding for the differentiation of pigment types) in estuarine cyanobacteria can be linked to differences in growth rates under varying light intensities. A photosynthetron will be used to expose four unicellular cyanobacteria strains with varying *cpcABC* numbers to six light intensities ranging from approximately 5  $\mu\text{E m}^{-2} \text{s}^{-1}$  to 300  $\mu\text{E m}^{-2} \text{s}^{-1}$ . These values are based on the results of a previous cyanobacteria study investigating the impact of irradiance levels on photosynthesis. The growth of each strain will be compared to test a working hypothesis that *cpcABC* numbers impact cyanobacteria growth rates under varying light intensities. This could help clarify the advantage of possessing multiple copies of light harvesting genes (*cpcABC*) in cyanobacteria.

**29. Varsha Shankar '26, University of Michigan**

***The Role of PP2A Tumor Suppressor in Neuroblastoma Differentiation***

**Advisors: Goutham Narla, Brian Tran**

Protein phosphatase 2A (PP2A) is a heterotrimeric phosphatase that plays a role in the regulation of oncogenic signaling pathways. PP2A is classified as a tumor suppressor and is inactivated due to mutations in its B regulatory and A scaffolding subunits. One of the most well-characterized PP2A substrates are oncogenes of the MYC transcription factor family, such as c-Myc. Recent advances in understanding MYCN-amplified neuroblastoma have found that overexpression of N-Myc in these cancers regulates heterogeneity of the tumor environment by affecting the differentiation stages in these cells. These mechanisms are important for neuroblastoma development and potentially their ability to escape cancer therapies for high-risk patients by inducing a less differentiated tumor. As a result, differentiation in neuroblastoma has been of increasing interest and more studies uncovering the mechanisms may be important for finding new druggable targets in this disease. PP2A is believed to be one of the mechanisms regulating the expression of Myc oncogenes. Better understanding whether PP2A can modulate differentiation in neuroblastoma may allow the targeting of this phosphatase by PP2A molecular glues (PMGs) in cancer.

**30. Lea Summers '24, James Madison University**

***Paws and Hearts: Exploring the Therapeutic Potential of the Human-Animal Bond***

**Advisor: Philip Frana**

The exploration of therapeutic dimensions within the human-animal bond sheds light on profound and healing connections existing between humans and animals. Through a visual narrative, this investigation delves into how animals, particularly therapy and support animals, contribute to the well-being of individuals across diverse contexts, from healthcare to mental health. This research delves into the psychological and physiological mechanisms underlying the therapeutic benefits of the human-animal bond, presenting compelling case studies and evidence of its positive impact on human health and emotional well-being. Viewers are invited to explore the therapeutic potential of the human-animal bond, with an emphasis on its role in improving the quality of life for individuals and inspiring further research and future applications.

**31. Michael Harrigan '25, Christopher Keesee '24, Erin Wade '26, Jack Wardale, PhD Candidate, Virginia Tech**

***Intervening to Increase Expressions of Gratitude between Pedestrians and Vehicle Drivers: Impact of a Prompt***

**Advisor: E. Scott Geller**

Approximately 35,000 individuals – including 6,000 pedestrians – die in traffic collisions annually (NHTSA, 2020). Many such collisions are influenced by irrational decision-making, which can result from psychological distress (Kassam, 2009). Reducing such distress may decrease the occurrence of vehicle crashes. Expressions of interpersonal gratitude reduce psychological distress (Bono, 2018). Therefore, promoting gratitude in traffic may decrease occurrences of vehicle collisions. Our field study investigates the impact of prompting pedestrians to express gratitude to drivers who yield at crosswalks. We strategically placed a sign reading, “Please Thank Drivers with a WAVE” on one crosswalk entrance. The sign’s location is alternated weekly between entrances. Trained researchers systematically observe pedestrians from both ends of the crosswalk, noting whenever a pedestrian expresses gratitude to yielding drivers. With each car pass, observation alternates between pedestrians passing by the sign and those unprompted individuals, crossing from the other entrance. This method analytically compares prompted and unprompted behaviors within data collection sessions, eliminating confounding variables found in previous studies. Additionally, we compare the baseline with post-intervention, analyzing whether effective control was demonstrated. Over seven weeks, baseline observations revealed 14.8% of 21,040 pedestrians expressed gratitude. Comparisons of these data with observations during the sign intervention will be presented at the Mid-Atlantic Regional Conference for Undergraduate Scholarship (MARCUS.)

**32. Jordan Birkner '23, North Carolina State University**

***Assessing the Impact of a Critical Thinking Course: Instrument Development and Preliminary Findings***

**Advisor: Gary Comstock**

The instrument developed during the summer of 2023 serves as an evaluative tool to gauge the efficacy of a previously devised critical thinking curriculum by an interdisciplinary research team spanning several years known as “How We Argue”. The incorporation of pre-test and post-test assessments facilitates the demonstration of the course’s impact on critical thinking skill development. On August 28, a cohort of 654 students underwent the initial assessment in conjunction with a standardized LSAT section evaluation, finding  $C$  of .70 and .73 respectively. Given the established utility of the LSAT in appraising critical thinking abilities, the comparative analysis between the new instrument and historical LSAT data attests to the test’s validity and item quality. The amassed data revealed a moderate degree of internal consistency ( $r = .56$ ) in the newly devised assessment for evaluating critical thinking. In future directions, a post-test evaluation with a commensurate structure but distinct inquiries is being formulated. Students will be randomly allocated to either the “How We Argue” course or a conventional seminar. The analysis of post-test outcomes in comparison to pre-test results will provide insight into the course’s overall effectiveness in developing critical thinking.

**33. Marco Seaberg '25, James Madison University**

***The Power of Hair in Identity***

**Advisor: Philip Frana**

This project will explore the power of hair. Hair has a very distinct ability to affirm and perform identity. One can make a statement with their hair. Hair has been policed and used to discriminate, and it has also been used to experiment and play. Even the act of going to the barber versus going to a hair salon is a choice and a performance. How do people feel about their hair, and how does it impact their identity? What is the history of hairstyling? How does hair express identity? How can one begin to explore and experiment with hair? Finally, how does doing your hair “do gender”?

**34. Gregory Wietrzykowski '26, Luke Chapman '25, Randolph College**

***SPS Presents NASA HOEE StarShade Undergraduate Competition Design***

**Advisor: Peter Sheldon**

A star shade is an instrument for use in outer space with telescopes for exoplanet imaging; it blocks the sun’s light, causing exoplanets to be identified more clearly. The National Aeronautics and Space Administration (NASA) held a national competition to design a star shade in the fall of 2023, in which the Randolph College chapter of the Society of Physics Students (SPS) participated. This presentation consists of our design process as of the week of November 4, 2023, one month before the final NASA submission date of December 15, 2023, including orbital calculations, free-body diagrams, structural and material research revelations, and progressive models represented by 2D and 3D CAD drawings.

**35. Ramanpreet Kaur '24, James Madison University**

***Leadership and Teamwork in Action***

**Advisor: Philip Frana**

Leadership, communication, and interpersonal skills form the cornerstones of this project. Without these crucial components, individuals, irrespective of their future careers, would struggle to succeed in the real world. The South Asian Student Association, an organization promoting cultural awareness throughout James Madison University by hosting events and welcoming individuals regardless of their cultural background, served as the subject of observation. In the capacity of an observer, executive team meetings were overseen, events were documented through photography, notes were taken on exhibited leadership qualities, and the team’s collaboration was observed. This experience holds significant value in the pursuit of a future career as a marketing manager. It underscores the importance of observing a team’s journey as members overcome challenges and celebrate achievements. Additionally, it sheds light on the behind-the-scenes dynamics of teamwork. In summary, this project emphasizes the significance of effective leadership, strong interpersonal skills, and essential communication skills, all of which are vital for success in both personal and professional endeavors.

**36. Brenna McManus '26, Sevrin VanDevender '25, Ella White '26, John Tucker '23, Olivier Kenol '23, Aimee Buchanan '24, Zach Alam '23, Gabriela Rocha '23, Matthew Traversa '23, Krystal Langhorne '23, Makayla Snyder '19, Christopher Newport University**

***Effects of Priming and Sourcing on Recognition and Believability of Media Headlines***

**Advisor: Jeffrey Gibbons**

Gibbons et al. (2005) found that, over time, unbelievable news headlines increased in believability, and they were recognized more frequently than believable media headlines. The current study explores the effects of priming, headline source, and the degree of match in source across learning and test on the believability and recognition of plausible and implausible news headlines. Following participants’ informed consent, participants filled out demographic and media consumption questionnaires. They were then assigned to randomized priming conditions of a short news article, series of tweets, or basic math problems. Following this priming, participants rated the believability of 12 believable and 12 unbelievable headlines, which were either consistently or inconsistently sourced. 48 hours later, participants were presented with 48 headlines

plus selected headlines from part one and rated the believability of these headlines. We hypothesized that the strongest recognition of headlines would be sourced at both times of the study, and that this effect would be influenced by priming and headline believability. We also expected all the factors to combine and affect the believability ratings of news headlines across learning and test.

**37. Mariam Elassal '24, James Madison University**

***Contextualizing Incarceration***

**Advisor: Philip Frana**

Criminal justice disparity in relation to race and ethnicity has become a subject of discourse for scholars in the fields of criminal justice. While the existing literature does explore social factors contributing to disparity, it rarely places significant emphasis on the connection between social determinants of health and their profound impact on both criminal justice contact and conviction, as well as the resulting outcomes for defendants. By analyzing factors such as housing, socioeconomic status, education, healthcare, and more, an interdisciplinary lens of sociology, policy, and social work is applied to explain disproportionate minority representation through the historical sentiments and policies that persistently permeate justice systems. By contextualizing criminal justice disparity within the broader framework of deep-seated social issues, this project emphasizes that addressing the disproportionate burden of the criminal justice system on minority and underserved populations demands more than mere reform of the criminal justice system. Rather, it necessitates a compassionate approach to education and policy change.

**38. Aimee Buchanan '24, Christopher Newport University**

***The Fading Affect Bias Across Political and Non-Political Events in the 2020 Presidential Election***

**Advisor: Jeffrey Gibbons**

The Fading Affect Bias is the faster fading of unpleasant emotions than pleasant emotions (Walker et al., 1997; FAB). Research has found that winning voters report more positive emotions towards political events and experience a greater fading affect bias than losing voters (Gibbons et al., 2020). The current study replicated a study done on the 2016 presidential election that was applied to the 2020 presidential election (Gibbons et al., 2020). A total of 255 participants completed this study. Participants provided four events: their emotional reaction to hearing the election results, an opposite emotion political event, a pleasant non-political event, and an unpleasant non-political event. Participants also filled out various demographic and psychological measures as well as some political measures. The results supported the predictions from the study on the 2016 election, such that the FAB was larger for non-political events than for political events overall, but the FAB was larger for political events when winners of the 2020 election (liberals) rated them as opposed to when losers of the 2020 election (conservatives) rated them.

**39. Huda Hashash '23, Roanoke College**

***Analyzing Potentially Substandard Amoxicillin Samples Across Different Socioeconomic Regions in Palestine Using HPLC***

**Advisor: Timothy Johann**

The widespread occurrence of substandard drugs presents a significant threat to the healthcare system worldwide and to the patients, and according to the World Health Organization, an estimate of one in ten medications in low and middle-income countries are falsified. To prevent the prevalence of falsified drugs, it is crucial to test and identify suspect drugs and report the results to authorities. Therefore, this study aimed to analyze pharmaceutical samples, specifically amoxicillin, collected from Palestine. Studies have indicated that amoxicillin is overused and misused in Palestine and that medication quality; especially amoxicillin quality was not tested using high-quality instrumentation. Fifty-nine amoxicillin samples were collected from three different socioeconomic regions in Palestine and analyzed using High-Performance Liquid Chromatography.

**40. Alison Reyes Merced '24, Jessica Monasir '24, Randolph College**

***The Effects of Bacteriophage T4 on E.coli Biofilm Formation, Stability, and Cell Viability***

**Advisor: Adam Houlihan**

Biofilms are communities of bacteria embedded within a self-produced matrix. They are responsible for biofouling of engineered surfaces and water systems. Thus, it is imperative to find ways to eradicate these highly resistant bacterial communities that are not detrimental to the environment. Our research aimed to answer the question of whether bacteriophages (viruses that infect bacteria), alone and in combination with the nonionic surfactant Tween 80, are capable of inhibiting or disrupting *Escherichia coli* biofilms. We did this by growing *E. coli* biofilms and targeting them with bacteriophage T4. Our first round of treatment measured the effect of T4 bacteriophage alone. Our second round of treatment included T4 bacteriophage in combination with Tween 80, which is known to disrupt biofilm matrices, to assess synergistic effects on biofilm structure and *E. coli* cell viability.

**41. Ella White '26, Christopher Newport University**

***The Fading Affect Bias Investigated Through the 2020 Presidential Election Online***

**Advisor: Jeffrey Gibbons**

The Fading Affect Bias (FAB; Walker et al., 2003a) describes the faster fading of negative than positive emotions (e.g., Walker et al., 1997). The FAB is viewed as a healthy coping mechanism (Walker et al., 2003b), based on its relation to other variables, such as its negative relation to psychological distress (Gibbons & Lee, 2019). Research shows that winning and losing voters experience positive and negative emotions, respectively (i.e., Anderson, 2005). Gibbons et al. (2020) expected and found that losing voters of the 2016 election showed smaller FAB than winning voters, political events showed smaller FAB than non-political events, and conservatism (winning) positively predicted FAB. The current study extended the 2016 election study to the 2020 election. The 225 participants completed personality questionnaires and provided original and current affect ratings for pleasant/unpleasant political/non-political events to receive monetary compensation through Amazon mTurk and Qualtrics. Like the 2020 study on the 2016 election, unpleasant events faded more than pleasant events, which demonstrated the FAB, FAB was larger for non-political events than political events, and FAB was positively predicted by conservatism. A novel, but not completely surprising, finding showed that FAB was positively predicted by positive PANAS.

**42. Regan Elmore '26, James Madison University**

***How Do We Define Lines?***

**Advisor: Philip Frana**

Geographical regions have been defined through the observation of shared history, culture, language, and physical land masses. Having so many different aspects in creating a region can lead to the blurring of these regional lines and the production of multiple regions. This project examines the interrelationship between East Asian countries and aims to determine which of these definitions is more suitable when defining geographical regions. To further expand on which aspect is more appropriate, a deep dive into the most popular grouping of East Asian countries—Japan, China, South Korea, and North Korea—will be explored in its curricular context. International affairs, public and foreign policy, history, cultural communications, linguistic anthropology, and area studies are drawn upon to grow understanding of what should be included when determining a region, as well as what effect a new definition might potentially have on the world at large.

**43. Shannon Carter '24, Sweet Briar College**

***The Impact of MACF-1 Suppression on the Proliferative Capacity of HGSOC***

**Advisor: Kala Bonner**

In order to investigate the role of MACF-1 in HGSOC, the response of HGSOC cells belonging to the CAO3 cell line relative to a variety of treatments was recorded and compared. A series of dose responses was used to determine the appropriate concentration of cisplatin. Transfection allowed for MACF-1 suppression in selected cell populations which were then used in comparative time courses to observe the impact on proliferation.

**44. Neena O'Mara '25, Evan Reichard '24, Virginia Tech**  
**Establishment of a Novel Frostbite Model in Rats**

**Advisor: Jia-Qiang He**

Current animal models for frostbite fall short in their ability to realistically replicate a cryogenic injury. We developed a novel frostbite rat model in which one of the rear paws was sandwiched in dry ice to induce paw frostbite. Cyro-exposure times of 5-, 2.5-, and 1-minute were tested. Injury progression was evaluated using a rodent-specific frostbite clinical grading scale, which was developed based upon the current criteria used in humans. Limb blood perfusion data was collected with Laser Speckle Imaging before and after the injuries and the data were normalized as flow ratio of an injured paw versus control paw in each animal. A thermal imager was also used to obtain a skin surface temperature ratio as described above. Strong correlations between extent of injury and exposure time were observed in clinical scores, blood perfusion and thermal image ratios, regardless of time after injury. The injuries in 5-, 2.5-, and 1-minute groups were comparable to those reported in human frostbite. This model may provide a new avenue for studying the mechanisms associated with frostbite, as well as offering a platform for screening/identifying new drugs that may be used to treat human patients with frostbite in the future.

**45. June Alomari '24, Shannon Carter '24, Shalom Beyene '24, Sweet Briar College**  
**An Evaluation of the Impact of Microtubule Actin Crosslinking Factor 1 (MACF1) Suppression on Migratory Capacity in the Therapeutic Treatment of High-Grade Serous Ovarian Cancer (HGSOC)**

**Advisor: Kala Bonner**

High-Grade Serous Ovarian Cancer (HGSOC) is a challenge in the realm of oncology due to its aggressive nature and resistance to conventional treatments. This study delves into the therapeutic potential of suppressing Microtubule Actin Crosslinking Factor 1 (MACF1) to mitigate the migratory capacity of HGSOC cells, aiming to shed light on novel treatment strategies. MACF1, a cytoskeletal linker protein, has been implicated in various cancers, including ovarian cancer. This research employs siRNA transfection to inhibit MACF1 expression in the CAOV3 HGSOC cell line, followed by treatment with Cisplatin, a common chemotherapy drug. The study assesses the impact of MACF1 suppression on cell migration, cell viability, and morphology. Findings suggest that MACF1 inhibition, in conjunction with Cisplatin treatment, may hinder migratory capacity, potentially offering a promising avenue for therapeutic intervention. This research underscores the importance of understanding the mechanistic aspects of HGSOC, the role of MACF1, and its implications for future treatment strategies. Further investigations into molecular pathways, combination therapies, clinical applications, and biomarker correlations are recommended to advance the field of HGSOC therapeutics.

**46. Evan Alvarez '24, Nadinka Taylor '24, Emma Marshall '24, Bella Molina '24, Sydia Pearson '26, Virginia Tech**  
**Interpersonal Gratitude: Behavioral Observations of Modeling vs. Diffusion of Responsibility on Campus Buses**

**Advisor: E. Scott Geller**

This naturalistic observational study compares the differential influence of two notable psychological theories -- observational learning and diffusion of responsibility. Observational learning predicts people will take cues from the actions of others and model relevant behavior. On the other hand, diffusion of responsibility predicts that people will be less likely to take responsibility for the welfare or wellbeing of another person if others are available to actively care. This field study observed expressions of interpersonal gratitude on campus buses, as a function of other passengers expressing similar gratitude. Specifically, undergraduate researchers have been recording whether passengers thank bus drivers as they disembark, and whether a "Thank you" is influenced by the drivers exhibiting prosocial behavior (e.g., saying "Have a nice day!"). Analysis is ongoing and focused on whether passengers exhibit observational learning or diffusion of responsibility more often. Our observations have indicated that prosocial behavior exhibited by the driver increased expressions of gratitude from exiting passengers. While 71.4% of passengers followed a driver's kind remarks with a "Thank You," those passengers exiting after this passenger were less likely to express gratitude, supporting diffusion of responsibility over modeling or observational learning. Observations are ongoing and additional findings will be reported.

**47. Daniel Paluh '25, University of Mary Washington**  
**Acceleration of Gravity on a Flat Earth**

**Advisor: Desmond Villalba**

In science, we learn that the Earth is a sphere, and the average acceleration of gravity is  $g = 9.81 \text{ m/s}^2$ , but where does this acceleration of gravity value come from and how does the value change as Earth changes shape? For example, if the Earth were a flat-like shape, we expect the acceleration of gravity to vary wildly from its average value of  $9.81 \text{ m/s}^2$ . We have calculated numerically the acceleration of gravity if the Earth were a 1-Dimensional line and a 2-Dimensional sheet, and in both cases the value of  $g$  changed drastically at the edges compared to at the center. In our ongoing research, we anticipate that in the case of other flat Earth-like shapes a drastic change in  $g$  will manifest in the 3-Dimensional shapes we are studying.

**48. Kyle Williams '23, Christina Hamilton, Marina Klimenko, University of Florida**  
***Friendships on Screen: Investigating the Cultural and Gender Dynamics in Television***  
**Advisor: Marina Klimenko**

This study examines the depictions of cultural and gender differences in friendships between White American and African American characters in most popular television sitcoms that center around friendships. Komaraju and Cokley (2008) found that African Americans scored higher on horizontal individualism (e.g., freedom to express oneself) whereas White Americans scored higher on vertical individualism (e.g., competitiveness). It was predicted that these cultural differences would influence depictions of dynamics among friends on television. Our preliminary analyses of the content analyses of friends' communication revealed that gender was the main predictor of variations in communication among friends on television series. Specifically, female characters in both African American and White American television sitcoms showed more one-on-one self-disclosure and psychological support in comparison to the male characters. This finding draws a comparison to reality today, emphasizing the implications that less attention is brought to the emotional aspect and feelings of males even though both males and females highly value these aspects of friendships.

**49. Anastasia Semenova '24, Noah Prinzbach '23, Ivan Savelyev '26, Virginia Tech**  
***Social Media Implications in the Perpetuation of a Misogynistic Culture***  
**Advisor: Professor E. Scott Geller**

Online Misogyny, the manifestation of hatred, prejudice, and discrimination against women in digital spaces, has emerged as a pressing societal concern in the age of the internet. This research explores the gender differences in the perception and evaluation of misogynistic content in one of its most pervasive arenas: social media. Study 1 used a QuestionPro survey with an ordinal scale to collect data from 51 participants at Virginia Tech. Respondents were shown 15-second TikTok videos, which were deemed misogynistic at varying levels by researchers, as well as multiple control videos unrelated to the study to rule out response biases. In study 1, women were found on average to perceive the given content as more misogynistic ( = significant  $p^*$  at 0.05 level). To better understand the gender difference, a factor analysis will be conducted using 300 participants who previously answered the survey to identify and address potential distinct themes in the content, such as scope of misogyny (i.e. institutional or individual), that may predict patterns in respondents' perceptions. Study 2 will aim to understand how not only gender, but upbringing and socialization can shape perception of misogynistic content online.



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