





MID-ATLANTIC REGIONAL CONFERENCE FOR UNDERGRADUATE SCHOLARSHIP





Welcome to the 26th Mid-Atlantic Regional Conference for Undergraduate Scholarship (MARCUS)

We at Randolph College are especially proud to be hosting you for the 26th 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, and anthropology, all sharing a research interest in globalization. In another session, the common topic may be preserving species habitats and include presentations in biology, environmental studies, and philosophy.

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

E. Scott Geller, Ph.D., an Alumni Distinguished Professor at Virginia Tech, has started his 55th year as a faculty member and Director of the Center for Applied Behavior Systems in the Department of Psychology at Virginia Tech. He has authored, edited or co-authored 54 books, 102 book chapters, 41 training manuals, 299 magazine articles, and more than 300 research articles addressing the development and evaluation of behavior-focused interventions to improve quality of life on a large scale.

Scott Geller's dedication, competence, and energy helped him earn a teaching award in 1982 from the American Psychological Association, and then every university-wide teaching award offered at Virginia Tech. Moreover, in 2001 Virginia Tech awarded Dr. Geller the University Alumni Award for Excellence in Research. In 2002, the University honored him with the Alumni Outreach Award for his real-world applications of behavioral science, and in 2003 he received the University Alumni Award for Graduate Student Advising. In 2005, he was awarded the statewide Virginia Outstanding Faculty Award by the State Council of Higher Education, and subsequently Virginia Tech honored him with the title of Alumni Distinguished Professor.



Dr. Geller is a Fellow of the American Psychological Association, the Association for Psychological Science, the Association of Behavior Analysis International, and the World Academy of Productivity and Quality Sciences. He is past Editor of the *Journal of Applied Behavior Analysis* (1989-1992), Associate Editor of *Environment and Behavior* (1982-2017), and current Consulting Editor for *Behavior and Social Issues*, the *Journal of Organizational Behavior Management*, and the *Journal of Safety Research*. He has received lifetime achievement awards from the International Organizational Behavior Management Network (in 2007) and the American Psychological Foundation (in 2009). In 2019, the American Psychological Association (Division 25) honored Scott Geller with the Nathan H. Azrin Distinguished Contributions to Applied Behavior Analysis Award. In 2024, the Virginia Association for Behavior Analysis established the annual "E. Scott Geller Award for Distinguished Service to Applied Behavioral Science."

schedule

SATURDAY, NOVEMBER 2, 2024

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

Light breakfast & Coffee - Quillian Conference Room

9:00 - 10:05 a.m.: Welcome and Keynote Speaker - Nichols Theatre

WELCOME: HOLLY TATUM, PHD

2

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

KEYNOTE SPEAKER: E. SCOTT GELLER, PHD

ALUMNI DISTINGUISHED PROFESSOR OF PSYCHOLOGY, VIRGINIA TECH

"Emotional Intelligence: Research-based Connections to Empowerment, Self-motivation, and Human welfare"

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, Klein Boardroom 3:00 - 4:00 p.m.: Poster Session II - Hampson Commons



oral presentations

SESSION 1 11:30 a.m. - 12:30 p.m.

Session 1a

Nichols Theatre, Student Center Moderator: Ann Fabirkiewicz, PhD

11:30 a.m. Grayden Holliday '26, Washington and Lee University
11:45 a.m. Lara Jost '25, Sweet Briar College
12:00 p.m. Matthew Miscikowski '26, Hampden-Sydney College
12:10 p.m. Aaditi Singhal '28, Georgia State University
12:20 p.m. Anna Hyslop '26, University of Oklahoma

Session 1b

Klein Boardroom, Student Center Moderator: Erin Heller, PhD

11:30 a.m. Ethan Caldwell '25 & Gracie Oliver '26, Randolph College
11:45 a.m. Ainsley John Darling '26, Sweet Briar College
12:00 p.m. Hai-Hsin Huang '25, Virginia Military Institute
12:15 p.m. Abigail Huling '25, Sweet Briar College

Session 1c

Psychology 101, Psychology Building Moderator: Blair Gross, PhD

11:30 a.m. Bridgett Burgos '24, Virginia Tech
11:45 a.m. Madeline Little '25, Longwood University
12:00 a.m. Emily Matthews '26, Randolph-Macon College
12:15 p.m. Alaina Snider '26 & Gregory Wietrzykowski '26, Randolph College

SESSION 2 1:45 - 2:45 p.m.

Session 2a

3

Nichols Theatre, Student Center Moderator: Sarah Sojka, PhD

1:45 p.m. Owen Clarke '25, Virginia Military Institute
2:00 p.m. Emma Evans '26, Sweet Briar College
2:15 p.m. Ariel Hullender '25, Sweet Briar College
2:30 p.m. Gyabaah Kyere Gyeabour '27 & Ashby Bonin '27, Hampden-Sydney College

Session 2b

Klein Boardroom, Student Center Moderator: Siavash Sattar, PhD 1:45 p.m. Christian Guinto-Brody '25, University of Virginia 2:00 p.m. Jay Joseph '26, Randolph College 2:15 p.m. Danielle Nunez '27, Randolph College 2:30 p.m. Elizabeth Wells '26, Sweet Briar College

presenters

Helina Abraham6
Zach Alam 17
Camdyn C. Allen 17
Alielyx E. Aponte 17
Alexander Archinal5
Lane Baker 10
Tessa Bayer23
Ashby Bonin16
Josephine Brumfield22
Joseph T. Bui 17
Bridgett Burgos14
Ethan Caldwell13
Phillip Cates11
Isaac Chenoweth18
Owen Clarke15
Reese Cooper5
Charlotte Cunningham5
Liza Dareing11
Ainsley John Darling13
Angelo De Asis5
Caroline DeDecker 6
Louhan Dembele6
Olivia Dewan11
Matthew Drumheller18
Emma Evans15
Jason Farnsworth5
Tylicia Fields21
Jackson Greer18
Christian Guinto-Brody16
Emily Gundel11
Gyabaah Kyere Gyeabour16
Maureen Habashy 10
Mikey Harrigan 10
Lillian Hayden11
Jake Hazelwood18
Grayden Holliday11
Andrew Hooks6
Hai-Hsin Huang13
Karsen Hudson18
Abigail Huling14
Ariel Hullender16
Anna Hyslop13

John Janiga6
Jay Joseph7, 16
Lara Jost12
Ashlyn Kihuguru7
Casey Kozan8
Krystal Langhorne 19, 22
Anthony Laub 10
Bridget Little 17
Madeline Little14
Agatha Madej6
Emily Matthews14
Aamirah McDonald19
Julianna McIntyre7
Brenna McManus 19, 22
Charlotte Menke7
Matthew Miscikowski12, 19
Isabella Molina7
Jaden Moore22
Josiah Mou20
Jared Mullins8
CJ Nance
Mila Norte20
Danielle Nunez8, 17
Chloe Nyhart8
Gracie Oliver13
Carter Patten9
Kilee Pearson6
Vanessa Perez19
Alex Probst11
Taylor Pulley9
Hannah Puskar8
Gabrielle Quaresma9
Jade Riddle9
Angela Victoria Rojas Rivera20
Daya Rivera21
Ravyn Rodriguez20
Ivan Savelyev10
Anastasia Semenova 10
Aaditi Singhal12
Prerna Singhal12
Savannah Smith10
Alaina Snider15

Makayla Snyder	20
Emily Steinbach	10
Gracie Stewart	20
Alyx Strong	21
Addie Suter	21
Brandy Sweigart	11
Ellie Townsend	8, 11
Sevrin Vandevender	19, 21
Anu Vasireddy	10
Kiryn Virdi	10
Marcelo Viteri	21
Jarad Walker	5
Olivia Walker	22
Rachel Walker	22
Meghan Weaver	22
Elizabeth Wells	17
Ella White	22
Gregory Wietrzykowski	15
Emily Wilks	23
Jenna Williams	23
Kameron Wiliams	21
Xinle Zhang	8
Alenna Zhu	23

abstracts

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

1. Alexander Archinal '27 & Jarad Walker '27, Randolph College

Examining Variation in Photosynthetic Pigments in Salt Marsh Grass and Seagrass, Advisor: Dr. Sarah Sojka

Grassy coastal ecosystems, including salt marshes and seagrass beds, are highly productive, critical for coastal food webs, and threatened by human activities. This presentation highlights both within-plant and within-meadow variability in the photosynthetic pigments found in the blades of these grasses. These pigments are both essential for plant survival, as they allow the plant to capture energy from the sun and are useful as indicators of the health of the plants. Understanding how these plants allocate these pigments provides insight into how they may respond to future stressors, particularly continued sea level rise.

2. Reese Cooper '25, Randolph College

Not so Fast: The Influence of Auditory Stimuli on Perceptual Decision Making, Advisor: Dr. Timothy Patrick

Fast auditory rhythms have been shown to alter the subjective experience of time whereby intervals of time are perceived to last longer. Research has also demonstrated that perceptual decisions are made more quickly when preceded by a series of clicks. This finding suggests that faster rhythms may be capable of not only slowing down time but may also speed up the rate of perceptual processes within the same interval. If this is possible, then participants should be faster at making perceptual judgments in the presence of faster rhythms. Participants were asked to complete a mental rotation task in which they had to determine if two 3-D geometrical shapes were congruent (the same shape) or incongruent (mirror opposites). Both the congruent and incongruent shapes were rotated 0, 50, 100, or 150 degrees. Additionally, each trial was presented with either no background noise, or was paired with a 120 bpm or 240 bpm rhythm during the task. The results revealed a main effect of the degree of rotation, as well as a main effect of the sound type on response times. Participants made significantly faster judgments in the presence of faster rhythms.

3. Charlotte Cunningham '27, Virginia Tech

Decreasing the Use of Plastic Bags: A Systematic Evaluation of Behavior Implications, Advisor: Dr. E. Scott Geller

Without large-scale behavior change, the annual flow of plastic into the ocean will triple over the next 20 years, limiting climate regulation and severely harming ecology. Most grocery-store customers still choose single-use plastic bags over reusable bags. This applied behavioral science research has been evaluating the impact of socially valid interventions implemented to increase the use of reusable bags at two large grocery stores. Baseline observations from January 2022 to November 2023 indicated that less than 14% of 2,664 observed customers used reusable bags. From April to May of 2022, the research students evaluated the effects of placing large poster prompts at the exit of two grocery stores, with the phrase "Hokies, Choose to Reuse!" This intervention did not significantly increase the use of returnable bags, with only 12% of 1,725 customers using reusable bags during the intervention. A more innovative intervention includes a large poster prompt and a reminder card that is handed to customers exiting the store. Both the large sign and the 3x5 inch reminder card list reasons for limiting the use of plastic bags and urge actively caring customer collaboration to protect our priceless environmental resources.

4. Angelo De Asis '26 & Jason Farnsworth '26, Randolph College

Handwritten or Digital Notes: Why Not Both? Using Language and Knowledge Modeling to Improve OCR for Handwritten Class Notes, Advisor: Dr. Brad Spendlove

Hand-writing notes has demonstrable benefits for students, but many still choose to take notes digitally for convenience in storage, backup, and searching. Optical Character Recognition (OCR) is a technology for digitizing physical documents, but it may struggle to recognize and accurately transcribe hastily written and organized pages of notes. We propose incorporating contextual information relevant to class notetaking, such as topic analysis, language modeling, and factual knowledge, to improve the efficacy and accuracy of an OCR system for digitizing those notes. Starting with a state-of-the-art base- line OCR model, we will build new programs to incorporate that contextual information and measure its impact on the system's accuracy. We anticipate that our improved system could form the core of a digitizing app to help students combine the academic benefits of hand notetaking with the convenience of digital files.

5. Caroline DeDecker '26, Helina Abraham '25, & Kilee Pearson '26, Virgina Tech

Factors Contributing to the Perception of Misogynistic Culture in Online Spaces, Advisor: Dr. E. Scott Geller

Misogyny online has become an alarming and pervasive issue in the digital age. The prevalence of misogynistic content online has caused hatred, prejudice, and discrimination against women in digital spaces, emerging as a pressing societal concern. This research explored gender differences in perceptions of misogynistic content presented online, specifically several 15-second TikTok videos. The first study used a QuestionPro survey with an ordinal scale to evaluate the perceptions of 110 participants and found that women perceived the content as being significantly more misogynistic than men (p>.001). In a follow-up study, sociocultural information is being collected to identify and address potential factors contributing to a respondent's perception of misogyny, including a) religious affiliation, b) level of devotion to organized religion, c) political affiliation, d) level of agreement with major political candidates, i.e., Kamala Harris and Donald Trump, and e) the cultural background of caregivers. These will enable us to determine how sociocultural factors influence people's perception of misogyny online. We expect to find that people who are more devout in their religion, people who have more conservative viewpoints, and people who were raised in non-western cultures will exhibit higher levels of misogyny.

6. Louhan Dembele '25 & Agatha Madej '27, Virginia Tech

Raman Spectroscopy: A Novel Approach for Schistosomiasis and HPV Detection in Low Resource Settings, Advisor: Dr. Andy Muelenaer, with Dr. Penelope Muelenaer, & Dr. John Robertson

The parasite Schistosoma haematobium causes schistosomiasis, which can develop into bladder cancer in humans if it is not detected and treated early on. Human papillomavirus (HPV), without early detection and treatment, can cause cervical cancer. Schistosomiasis and HPV have a high prevalence in Malawi, a low-income country in southeastern Africa. For both scenarios, early intervention is possible should there be accurate and cost-efficient screening. District hospitals in Malawi are currently utilizing microscopic detection of schistosomiasis by qualified technicians, taking 45 to 60 minutes for processing. HPV testing in Malawi is also done by qualified technicians, and it may take one to two hours for the sample to be processed. Raman spectroscopy (RS) is a novel technology that detects biomarkers of 2 mL urine samples in less than 15 minutes. RS creates a "molecular fingerprint" by outputting a wavelength spectrum that corresponds to different biomarkers, which allows for the pinpointing of abnormalities. RS theory and methodology were presented to various medical, scientific, and engineering groups in Malawi. Our aim is to streamline the detection process through appropriate affordable technology, which can be integrated with current disease management programs, building point-of-care screening and diagnostic capacity.

7. Andrew Hooks '27, Randolph College

The Factors that Influence the Formation of Defects in AFP, Advisor: Dr. Siavash Sattar

This review investigates the influence of temperature, compaction force, and contact time on defect formation during the Automated Fiber Placement (AFP) process, a manufacturing technique in the aerospace industry used to produce lightweight and high-strength materials. AFP employs a robotic arm to deposit prepreg materials (composites of reinforcement fibers pre-impregnated with partially cured resin) onto molds. The process is often prone to defects such as wrinkles, gaps, overlaps, and twists, which compromise the quality and performance of the final product. This review examines existing studies on the effects of temperature, compaction force, and contact time on defect formation, focusing on understanding their role in influencing product quality. Utilizing findings from T-peel tests and experiments with IM7/8552 prepreg materials, the review highlights the importance of optimizing these parameters to minimize defects and ensure a high-quality outcome. In future work, we plan to explore the effects of varying fiber orientations under different processing conditions to understand how fiber placement orientation impacts defect formation. By consolidating current research, this review aims to provide insights and practical recommendations for reducing defects in AFP processes, contributing to the advancement of high-performance composite manufacturing.

8. John Janiga '26, Virginia Tech

Minimally Invasive Screening Test for DPD Mutations Linked To 5-Fluorouracil Sensitivity Using Computational Mutation Predictions, Advisor: Dr. Carla V. Finkielstein

5-Fluorouracil (5-FU), a common chemotherapy for solid tumors, is metabolized primarily by dihydropyrimidine dehydrogenase (DPD), encoded by the DPYD gene. With >200 known variants, individuals with nonfunctional DPYD alleles exhibit impaired 5-FU metabolism and are at risk of severe toxicity. Approximately 35% of the population has partial DPD deficiency, and 0.2% completely lack enzymatic activity. Despite this, DPYD genotyping is not standard practice. cBioPortal was utilized to search the TCGA database for studies involving colon cancer patients with novel DPYD mutations exhibiting a total FIS score of at least 2 or identified through 3D modeling of DPD using PyMol based on their proximity to or the presence of polar contacts within the active site. Putative pathogenic mutations were analyzed using AlphaMissense and ChimeraX to assign a RSMD score, assessing their potential negative impact on DPD function. By combining computational modeling with the analysis of naturally occurring mutations in colon cancer patients, we have successfully identified potentially pathogenic mutations in the DPYD gene. This information can enhance existing clinical diagnostic tests, providing a more comprehensive assessment of DPYD mutations, including novel variants.

9. Jay Joseph '26, Randolph College, with David Shatwell & Kevin Zhai, University of Central Florida Fellows Time-of-Capture Prediction in Outdoor Videos, Advisor: University of Central Florida,

Advisor: Dr. Mubarak Shah, University of Central Florida

Estimating the precise time-of-capture for videos is crucial for applications in digital forensics, ecological studies, and social media management. While previous research has focused on images, video-based time prediction remains largely unexplored. This paper introduces a novel classification model for predicting the hour and month of outdoor videos using a combination of a pre-trained CLIP ViT backbone, a shallow transformer for frame aggregation, and semantic pseudo-labels derived from the CLIP text transformer. We evaluated our models on a driving video dataset and demonstrated superior performance compared to an image-only baseline and two pretrained video-specific models. Our contributions include a new method for time-of-capture prediction in videos, exploration of different model architectures, identification of the best-performing architecture, and ablation studies on optimal frame and batch size configurations.

10. Julianna McIntyre '25, Sweet Briar College

Feeling Salty: Impacts of Dietary Sodium Content on Gene Expression in Monarch Butterflies, Advisor: Dr. Megan Kobiela

Human actions have shaped the world we live in. We have altered the environment around us in extensive ways. One such impact is the increased soil sodium content because of road-salt application in the northern U.S. and Canada. Among many affected species, Monarch butterflies offer an insight into these impacts. The grasslands of the Midwest were once the location of the breeding monarch population's primary food source before modern human agriculture and development (Thogmartin et al., 2017). Previous research has identified several aspects of butterfly development and survival that are affected by sodium, including both neural and muscular development (Snell-Rood et al., 2014). However, we do not yet understand the effects of sodium on a genetic level. A first step in this process is the identification of candidate genes which may exhibit sodium sensitivity. NFAT homolog, Glutathione S-transferase D1 (GstD1), catalase (Cat), and Sodium/Potassium Pump ATPase were identified as candidates based on sodium sensitivity previously found in Drosophila (fruit flies). Subsequent primer design was undertaken using the NIH and NCBI blast to generate possible primers for these candidates in the Monarch butterfly.

11. Charlotte Menke '24, Virginia Tech

Suicidality in Children and Adolescents with ADHD with and without Comorbid Internalizing, Externalizing, and Neurodevelopmental Disorders, Advisor: Dr. Rosanna Breaux

Attention-deficit/hyperactivity disorder (ADHD) is associated with increased risk for suicidality, with comorbid symptomatology, particularly depression, irritability, and anxiety explaining this association. Research with community samples of has found that both internalizing and externalizing symptoms in children, regardless of severity, are associated with a 73-83% increase in the odds of suicidality during adolescence. This study examined rates of caregiver and self-reported self-harm and suicidal ideation in 346 youth (70.1% male; ages 5-17 years, M=10.1) comprehensively diagnosed with ADHD and assessed for various internalizing (anxiety/depressive disorders), externalizing (oppositional defiant/ conduct disorders), and neurodevelopmental (autism spectrum/learning disorders). Participants and their primary caregivers (85.1% biological mothers) reported on suicidality using items 18 (Harms Self) and 91 (Thinks about suicide) of the Youth Self-Report/Child Behavior Checklist, respectively. Comorbidity was not related to self-harm per caregiver-report, but was related to suicidal ideation. In contrast, based on self-report, youth with comorbid externalizing disorders or comorbid neurodevelopmental disorders were less likely to report experiencing suicidal ideation or self-harm. Results highlight the importance of getting caregiver-report when assessing suicidality in youth with ADHD, rather than solely relying on self-report.

12. Isabella Molina '25, Ashlyn Kihuguru '25, Virginia Tech

Interpersonal Gratitude: Behavioral Observations of Modeling vs. Diffusion of Responsibility on Campus Buses, Advisor: Dr. E. Scott Geller Gratitude is one of the most underappreciated and unstudied emotions. In recent years, research has emerged suggesting that intrapersonal gratitude is strongly related to subjective wellbeing (Emmons & McCullough, 2003). Frederickson's 'broaden-and-build' theory of positive emotions and 'find-remind-bind' theory explicate how positive emotions enhance social bonds. More specifically, intrapersonal gratitude inspired by another person's expression of interpersonal gratitude enhances the likelihood of prosocial behaviors such as saying, "Thank you" (Algoe & Zhaoyang, 2016). Other than interpersonal expressions of gratitude contributing to enhance social ties, it also provides resources on which people may rely to reduce distress in a stressful situation (Emmons & Mishra, 2012). To better understand the roles of gratitude expression as a moderator and potential positive reinforcer, we examined behavioral patterns of university students exiting campus buses. Trained research students observed and recorded systematically whether prosocial expressions of the bus driver influenced the expression of gratitude to the bus driver from a passenger exiting the vehicle. The expression of an exiting passenger was also analyzed as a function of whether other passengers in a line of exiting passengers had expressed gratitude. This analysis enabled a comparison of modeling vs diffusion of responsibility as a determinant of an individual's expression of gratitude.

13. Jared Mullins '26, Bridgewater College

Customer Perspectives on AI Implementation in Service Industries: Exploring Benefits, Concerns, Governmental Rules and Regulations, Advisor: Dr. Sevinj Iskandarova

As service industries increasingly integrate Artificial Intelligence (AI) initiatives, their significant impact on service operations and customer behavior is undeniable. It is crucial to recognize that prior literature may have been overly optimistic about AI implementation. There is a growing need to examine its potential benefits as well as concerns for consumers, businesses, and society at large. This research focuses on insurance companies as a business model and introduces three approaches to gain comprehensive insights into this evolving field, with a particular emphasis on the potential benefits that AI can bring to the industry. The study explores governmental policies and regulations related to AI in the insurance sector - providing insights into the legal framework. It delves into service interactions to understand how AI affects customer experiences in service delivery, analyzing 263 responses to gain insights into customer experience. It explores risks associated with AI integration, including data privacy concerns and the potential for biased decision-making. By identifying key factors and research gaps within each category, the study aims to provide a holistic understanding of the potential adverse outcomes of AI-based services and offer valuable insights to scholars and practitioners ultimately fostering a more informed discourse on the integration of AI in service operations.

14. CJ Nance '25, Casey Kozan '25, Ellie Townsend, '26, Xinle Zhang '26, Virginia Tech Assessing Transgender Psychological Safety at Virginia Tech, Advisor: Dr. E. Scott Geller

Psychological safety refers to a community or environmental setting wherein one feels included, able to take risks, and contribute without fear of negative consequences (McClintock et al., 2021). Feeling psychologically safe is essential for a person's well-being. Transgender college students who participated in previous studies reported alarming levels of transphobic harassment and discrimination. Environments high in such incidents can be considered psychologically unsafe for trans people. The current study designed and applied a 60-question self-report survey to assess the perceived psychological safety of transgender students enrolled at Virginia Tech. Cisgender students took a similar questionnaire, which served as a control condition. Results have provided insight into where the Virginia Tech community can improve at serving its transgender student body. As of May 2024, 17 sections of this survey showed statistical significance, primarily concerning the Virginia Tech administration's lack of support for transgender students and their physical safety on campus. In the majority of the "Social Support" section, transgender students reported significantly lower levels of support than their cisgender peers. These results suggest that the differences in experiences of discrimination and harassment between transgender and cisgender students are unlikely to be random chance.

15. Danielle Nunez '27, Randolph College

Development of a Cosmic Ray Trigger Test Stand for Quality Control of the High Granularity Calorimeter Scintillator Tile-Modules at Fermilab, Advisor: Dr. Daniel Guerrero, USCMS/PURSUE program

The High-granularity calorimeter (HGCAL) is a major upgrade of CMS, which is necessary to maintain calorimetric performance in the endcaps during the HL-LHC (High Luminosity Large Hadron Collider) operation (2027-2040). This new endcap calorimeter is designed to have a higher radiation tolerance, better 3D granularity, precise timing. At Fermilab, the Scintillator Tile detector Modules (Tile- Modules) of the Hadronic Compartment will be assembled using a robot pick and place machine. A post assembly quality control test will be performed for electrical validation using a multi- module test stand. I developed the first prototype of the cosmic ray trigger system of this test stand.

16. Chloe Nyhart '25 & Hannah Puskar '26, Virginia Tech

A Novel Approach to Assessing the Human Chronotype using Hair Follicle Cells, Advisor: Dr. Carla Finkielstein

Evaluating human chronotype, i.e., the sleep-wake pattern, can provide valuable insights into the relationship between an individual's circadian rhythm and the development of various diseases and disorders. Understanding the circadian clock of an individual can enable personalized diagnostics, preventive measures, and optimized treatment strategies. Chronopharmaceutical drug delivery systems aim to enhance drug efficacy by aligning drugs release with an individual's chronotype. To optimize the timing of drug delivery and ensure effective treatments, a molecular footprint of the patient's internal clock is needed. Current methods for determining chronotype are often subjective, relying on self-reporting questionnaires, or invasive and stressful for patients and most of these methods lack precision, standardization, or practicality. We developed a simple and minimally invasive method using human hair follicle cells for circadian assessment. Previous studies have shown that circadian clock genes are expressed in hair follicle cells, making them a promising candidate for clock gene analysis. Hair samples from five healthy volunteers were collected every four hours over a 24-hour period, from 9 AM to 9 AM (seven total samples). RNA extraction and NanoDrop quantification were optimized. A two-step quantitative real-time PCR (RT- qPCR) was then performed to amplify genes involved in regulating the cell's clock (e.g., PER2, BMAL1, CRY2). Gene expression was normalized to a reference housekeeping Gene, and expression levels for each time point were graphed to determine oscillation patterns. The gene expression graphs showed varying levels of expressions throughout the day and night, aligning with expected patterns. Genes such as BMAL1 and PERIOD which are expected to peak and trough in anti-phase, behaved accordingly and a phase distribution graph confirmed the presence of a robust circadian clock in the hair follicle samples. Next, we will apply CYCLOPS (Cyclic Ordering by Periodic Structure), a machine learning algori

The consistency of the CYCLOPS result will be compared with the time-course data for validation. RNA was isolated from 19 hair follicle samples collected at a single time-point using the optimized protocol. The RNA samples will be analyzed with CYCLOPS to determine each volunteer's chronotype. Expanding this method to volunteers diagnosed with chronic illness such as endometrial cancer, will advance our understanding of circadian biology, and enhance the implementation of chronotherapy in clinical practice.

17. Carter Patten '25, University of Virginia

Overview of the Barrel Timing Layer Assembly for the High-Luminosity Large Hadron Collider (HL-LHC), Advisor: Dr. Chris Neu

As part of the LHC's upcoming High Luminosity upgrade, more than triple the collisions per bunch crossing will occur than in previous runs. To account for volume of data received, the CMS (Compact Muon Solenoid) detector is being augmented with a new timing detector to better localize these events. I will provide a broad overview of the timing detector project, focusing on the Barrel Timing Layer (BTL) and its components. Along with data-collecting hardware, the BTL will be composed of 2,592 sensor modules, a quarter of which are being assembled at the University of Virginia before being placed into more complex modules to be shipped to CERN. I will be detailing UVA's efforts in starting the assembly of BTL, especially regarding these sensor modules. Strong progress has been made in establishing consistent procedure for sensor module assembly, feeding into the assembly of larger modules for the final detector. I will discuss the latest developments in this project and give a rough overview of the next steps on the road to its completion.

18. Taylor Pulley '25, Longwood University

Carbon and Nitrogen Influence on Enzyme Production in Batrachochytrium dendrobatidis, Advisor: Dr. Amanda M. Starr

Batrachochytrium dendrobatidis (Bd) fungus has contributed to global amphibian decline and extinction. Bd infects the skin of amphibians, causing ion imbalances and death. The exact nutrients and carbon to nitrogen (C:N) ratios of amphibian skin is unknown. Altering the C:N conditions for Bd could alter production of virulence traits. The goals for the project are: 1) determine sub-lethal C:N ranges of Bd, 2) analyze gene expression of secreted proteases in sub-lethal C:N ratios, and 3) determine protease activity in each condition. The growth of Bd in different C:N ratios was completed in 96 well plates using a spectrophotometer with a wavelength of 492 nm over 7 days. The sublethal conditions of Bd were C10N1 and C1N5. Gene expression was analyzed by extracting RNA from Bd grown in C:N conditions on day 4 of growth by converting RNA to cDNA and using Real Time qPCR with 5.8S rRNA as an internal standard and protease activity is higher in nitrogen conditions. Future studies will look at gene expression and protease activity over five days.

19. Gabrielle Quaresma '26, Dr. Amanda Starr, Longwood University & Dr. Scott Starr, Hampden-Sydney College Optimization of eDNA Air Sampling in Livestock Communities, Advisor: Dr. Amanda Starr

Livestock are given preventative medications to aid in keeping them healthy, and the excretion of this medication through urine and feces is a large contributor to the spread of antibiotic resistance in the environment. Farmville, Virginia has a large farming community, so we would expect to have more antibiotic resistant bacteria in the environment, especially near livestock. Through this project, air samples were collected from livestock communities and Longwood University's campus using a 3D printed fan. Genetic material was extracted from HVAC and quartz filters, and 16S primers and PCR were used to verify the presence of bacteria. Additional methods for extracting included incubation in PBS solutions and growth on rich media. DNA was sequenced using the Nanopore Flongle device with the rapid PCR barcoding kit for low input DNA. Six different sampling and extraction methods were evaluated. The best method identified was extraction of genetic material from quartz filters, 16S PCR with the Nanopore end ligation library prep. Amongst all methods, 38 different bacterial species were identified, 60% being pathogenic or known to carry antibiotic resistance. Future directions include continued livestock sampling and using the Nanopore end ligation library prep with Flongle sequencing.

20. Jade Riddle '25, Longwood University

Bacterial Diversity of Central Virginia Rainwater Harvesting Systems, Advisor: Dr. Dale Beach

Increasing global water scarcity has sparked interest in more sustainable water sources such as rainwater harvesting (RWH). There are lingering health and safety concerns due to the lack of research into the microbial communities contained within them. To address this gap, this study aimed to characterize the bacterial diversity and community composition of RWH systems across central Virginia. Water samples were taken from systems in Farmville, Richmond, Blackstone, and the surrounding areas, and then filtered through 0.22 µm membranes to capture resident bacteria. The 16S rRNA gene was amplified then analyzed using Nanopore sequencing. Highly diverse bacterial communities were observed across all geographic locations. Preliminary results indicate a potential difference in the diversity and composition of microbes in samples from the summer and winter of 2023. Shifts in the relative abundance of genera at the same site were observed with increased community evenness in the winter. Current work is focused on completing sequencing for the remaining 2023 samples and beginning analysis of a new set of samples collected in the summer of 2024 for comparison.

21. Ivan Savelyev '25 & Mikey Harrigan '24, Virginia Tech

Environmental Determinants of Gratitude Expressions: Naturalistic Observations of Pedestrian Behavior, Advisor: Dr. E. Scott Geller

Within the domain of positive psychology, it has been demonstrated that expressions of gratitude boost the subjective wellbeing for both parties involved—the benefactor and the beneficiary of an expression of gratitude. Trained research students observed and recorded various human dynamics occurring before and after a vehicle stopped for a pedestrian, including the pedestrian's facial expression (smiling/not smiling), social interactions (walking alone/walking with others), gratitude (gratitude expressed/not expressed), and phone use (using/not using a cell phone). Gender and age per pedestrian were recorded, along with the number of vehicles that passed a pedestrian waiting to cross. Those who expressed gratitude were significantly more likely to smile afterwards; and those using their cellphone while crossing the street were significantly less likely to express gratitude. Also, substantial differences in the frequency of gratitude expressions were observed as a function of the pedestrian's age, with "50+" individuals most likely to express gratitude (62% of 297), and those "Under 18" being the least likely to do so (11% of 131). We found that gratitude expressions to vehicle drivers increased as a function of the number of cars that passed the pedestrian up to three, after which there was a strong negative relationship.

22. Anastasia Semenova '24, Virginia Tech

The Power of "Thank You": How Expressing Gratitude Affects Wellbeing in Higher Education, Advisor: Dr. E. Scott Geller

The Actively Caring for People (AC4P) Movement integrates humanism and behavioral science (humanistic behaviorism) to promote prosocial behavior. This study followed a structured protocol whereby thank you card (TYC) participants delivered a TYC of appreciation to their course instructor after class, while randomly-selected control participants completed mood surveys without participating in gratitude expression. All TYC participants completed pre- and post-class mood surveys, using a Likert scale to assess 19 mood states (e.g., vulnerability, confidence, happiness) from 1 (Untrue) to 10 (True). The TYC participants were instructed to prepare a TYC, deliver it to the instructor after the control participants had completed their post-class survey, and then complete their own post-surveys. Qualitative analysis revealed uniformly positive emotions from all instructors and the 64 TYC participants. Quantitative analysis demonstrated a significant 36% increase in positive mood states for the TYC participants, while the control group showed no significant change. The findings indicated that expressing gratitude enhances subjective wellbeing (SWB) across multiple mood states and suggests a need for additional interventions to increase interpersonal gratitude as an evidence-based strategy for improving SWB. The research highlights the importance of gratitude in enhancing relationships and wellbeing, and the role of humanistic behaviorism in cultivating an AC4P culture.

23. Savannah Smith '24, Maureen Habashy '25, & Anu Vasireddy '24, Virginia Tech

Promoting Healthy Relationships: The Role of Gratitude Expression in Romantic Relationships, Advisor: Dr. E. Scott Geller

This study is exploring a certain behavior that may improve the fulfillment of interpersonal relationships, i.e., gratitude expression. This research examines connections between gratitude expression and relationship satisfaction among college-aged students. A cohort of 150-200 undergraduate students at Virginia Tech will be asked to complete a series of questions based on a modified version of the Couples Satisfaction Index and the Appreciation in Relationships Scale, designed to enable researchers to discover connections between satisfaction and gratitude expression in romantic relationships. Demographic information about participants and their current partners will be collected to explore potential contributions of individual differences. The hypotheses guiding this research are: a) Higher levels of gratitude expression will be positively correlated with higher levels of relationship satisfaction, b) gratitude expressions will decrease as the length of a relationship increases, while reported relationship satisfaction than those who are long distance or are living together will report lower levels of both gratitude expression and relationship satisfaction than those who are long distance or are living separately. Increasing an understanding of the role of gratitude expression in romantic relationships can offer valuable insights into the design of intervention strategies to foster healthier, longer, and more fulfilling partnerships.

24. Emily Steinbach '25, Anthony Laub '25, Anastasia Semenova '25, Kiryn Virdi '25, & Lane Baker '25, Virginia Tech Evaluating Determinants of Psychological Safety in Higher Education, Advisor: Dr. E. Scott Geller

Psychological Safety—the degree of personal inclusion, contribution, and engagement one experiences in given situations—has become a topic of extreme interest in industrial settings (Clarke, 2020). Empirical research indicates that in the workplace, psychological safety can increase creativity (Castro et al., 2018), inspire engagement (Frazier et al., 2016), and reduce distress (Obrenovic et al., 2020). A recent study examined students' perceptions of psychological safety in various courses at Virginia Tech through an innovative 36-question survey. A total of 213 students provided answers to the survey, each responding with reference to a university course taken within the past year. This questionnaire assesses psychological safety with an eight-question "Psychological Safety in Education" scale, adapted from psychological safety scales for industrial settings. The scale measures students' perceived level of psychological safety by asking them to respond to statements on a "strongly agree" to "strongly disagree" Likert scale. (Parker-Rollins & Geller, 2024). While this prior study had notable findings, the current study aims to increase sample size and add questions to the survey such as "Has the professor made comments that made you uncomfortable." With these additions, we plan to continue investigating factors that influence psychological safety in college and university classrooms.

25. Brandy Sweigart '27, Olivia Dewan '27, & Lillian Hayden '26, Bridgewater College

Disrupting Stigmas: The Challenges of True Voice in Writing Studies, Advisor: Dr. Vanessa Rouillon

Frequently, the vibrant, true voices in writing are drowned out, leaving vital perspectives unheard and marginalized. The presenters, three white women who have experienced marginalization in their studies, grapple with the concepts of voice, agency, and authority, and ask pervasive questions: What constitutes "true" voice? Who decides what "true" voice is? Inspired by their Introduction to Professional Writing class (Fall 2023), each presenter highlights a different aspect of voice: Presenter 1 argues all voices are equally true; presenter 2 claims marginalization and oppression limits voice; and presenter 3 contends that Ebonics should be a valid form of linguistic expression in academic venues. Given their concerns, the presenters have created a multimodal poster, out of a collaborative article draft, detailing true voice in Writing Studies through analyzing the experiences of average and academic folk. They hope that their collaborative poster will invite individuals to consider how voices around them are marginalized, urge attendees to embrace authentic voices, and acknowledge that all matter, regardless of race and ethnicity. In the spirit of resistance and pride that writers Gloria Anzaldua, bell hooks, and Jacqueline Jones Royster have modeled, the presenters' work aims to disrupt stigmas, mischaracterizations, and language standards.

26. Ellie Townsend '26, Phillip Cates '27, Alex Probst '27, & Emily Gundel '25, Virginia Tech

Assessing the Impact of Headphones on Interpersonal Gratitude in Campus Dining Halls: An Exploratory Study, Advisor: Dr. E. Scott Geller Interpersonal gratitude refers to the expression of thankfulness and appreciation towards another person. Research has demonstrated that expressions of interpersonal gratitude increase the overall wellbeing of those who express and receive that gratitude (Rash, Matsuba, & Prkachin, 2011). The use of headphones has decreased perceptions of sociability over the past decade, therefore diminishing potential instances where gratitude can be expressed (Garner, 2012). This leads to an overall decrease in individual wellbeing and life satisfaction. This naturalistic behavioral observation study was designed to observe the potential detrimental effect of headphone use on interpersonal expressions of gratitude. At two university dining halls, trained research students have been systematically observing and recording whether the customers thank their cashier when checking out or when receiving food, and whether the customer is wearing headphones. More specifically, the observers are recording whether the customer has none, one, or two headphones/earbuds covering/in their ears. Two specific Virginia Tech dining halls were chosen for data collection where customers have an opportunity to express gratitude to cashiers. We expect to obtain naturalistic behavioral data demonstrating that headphone or earplug use stifles expressions of interpersonal gratitude, and thereby decreases wellbeing on our campus.

27. Liza Dareing '26, Sweet Briar College

The Effects of Land Use Type and Nutrients on the Growth of Phytoplankton and Water Quality in Freshwater Sources, Advisor: Dr. Lili Lei The primary objective of this study is to examine the relationship between land-use patterns and nutrients to evaluate their influence on nutrient pollution in freshwater sources. Specifically, investigation of eutrophication, phytoplankton production, and the process of nutrient run-off from the land to aquatic environments. Eutrophication is a naturally occurring process, however, in recent years, excessive overload of nutrients has increased. Eutrophication caused by anthropogenic changes increasing the presence of nutrients is termed Cultural Eutrophication. The passage of nutrients, such as nitrogen and phosphorus, into water bodies can lead to the production of phytoplankton, causing algae blooms. Algae blooms have been shown to decrease water quality (Amorim & Moura, 2021). As the phytoplankton begins to decompose, it uses the dissolved oxygen available, taking that needed resource away from aquatic creatures (Amorim & Moura, 2021). Recognizing the intricate relationship between land type and water quality is imperative for maintaining freshwater ecosystem health. Modifications in land use type (LUT) have been shown to influence various water quality parameters (Delkash et al., 2018). Human-induced alterations in LUT can expedite leaching, erosion, and runoff processes (Delkash et al., 2018). The goals of this study are to 1) evaluate the natural processes of nutrient pollution from terrestrial areas to water sources 2) examine how these soil leachates affect water quality and health 3) and provide a representative evaluation of nonpoint sources and provide data to help prevent this type of pollution. The study found that the treatment groups with the highest combination of nitrogen and phosphorus showed the greatest effect on water quality with phosphorus having the greatest individual impact.

Oral Presentations I

11:30 a.m. - 12:30 p.m. Session 1a: Nichols Theatre Moderator: Ann Fabirkiewkicz, PhD

Grayden Holliday '26, Washington and Lee University

Exploring the Tunability of Oxorhenium-MesDAP FLP Complex Reactivity, Advisor: Dr. Caleb A. Brown

Frustrated Lewis Pairs (FLPs) are a rapidly developing class of catalysts that have enabled hydrogenation and other crucial reactions to be catalyzed without the use of transition metals. FLPs utilize a Lewis acid and Lewis base combination wherein the interaction is hindered in some way, resulting in the establishment of an equilibrium between a nonpaired state and a weakly associated adduct. While many FLP systems

are intentionally metal-free, the incorporation of transition metal complexes as the Lewis basic component has provided new avenues for tuning reactivity by utilizing already well-known chemistry. Recently, oxorhenium complexes with a bis(aryl)diamidoamine (DAP) ligand have demonstrated this enhanced degree of tunability. The exploration of a new generation of these complexes was the focus of this research. The incorporation of unsaturated carbon chains of varying lengths was investigated. Attempts at transmetalation with vinyl and allyl grignard reagents displayed unexpected reactivity and complex decomposition, while dimethyl vinyl and longer chain alkenyl grignard reagents were found to properly yield corresponding oxorhenium complexes. As the exact mechanism of reactivity for oxorhenium complex-based FLPs is not yet known, study of these intramolecular FLPs' behavior and equilibrium dynamics may provide useful insight into the issue. Additionally, modification of the MesDAP ligand through methylation of the carbons linking its pyridine and aniline components was explored as an alternative source of tunability. Mono- and di-methylated analogs of the oxorhenium DAP complexes were investigated computationally and synthetically.

Lara Jost '25, Sweet Briar College

12

Predicting Grain Boundaries of Fe-Cr-C Alloys Using Density Functional Theory, Advisor: Dr. Bryan Kuhr

Stainless steel is an important material that is used across various industries. Its mechanical properties are greatly influenced by grain boundaries (GBs). Using the software Abinit, this paper establishes a basis for ab initio DFT simulations, of iron-chromium systems that could be extended to simulate GBs of stainless steel that include iron, chromium and carbon. This study calculates energies of formation and interstitial energies for iron-chromium systems with 1:1 and 7:1 iron-chromium ratios. The interstitial energy of -0.61 eV for the 7:1 system shows that this simulation can produce accurate results for iron-chromium ratios close to those used in alloys.

Matthew Miscikowski '26, Hampden-Sydney College (elevator speech)

Generating a FOXC2 Knockout Melanoma Cell Line, Advisor: Dr. Kristian Hargadon

FOXC2 is a critical transcription factor found in humans which binds to DNA and alters gene expression. The transcription factor specifically aids cells in cellular proliferation, growth, and the development of blood vessels. FOXC2 is also an onco-gene and when mutated can cause cancer by altering proliferative signaling, inducing angiogenesis to the tumor, activating the invasion and metastasis to other parts of the body, and even providing drug resistance. This study focused on FOXC2 in a specific line of murine melanoma called B16-F10. The primary focus of this study was to generate a knockout FOXC2 variant of the B16-F10 cell line. The creation of a B16-F10 cell line which could no longer produce the FOXC2 transcription factor would provide a critical tool needed for future experiments. It would serve as a control to compare future studies that alter the functioning of the FOXC2 transcription factor. To create this knockout FOXC2 B16-F10 cell line CRISPR-Cas9 editing was utilized to create multiple clones. Over the summer the clones were analyzed to determine which of the three FOXC2 alleles experienced successful disruptive editing. If any of the clones were successfully edited to eliminate the FOXC2 transcription factor this clone could be utilized as the control for future experiments.

Aaditi Singhal '28, Georgia State University, & Prerna Singhal, Kissan International School, India (elevator speech) Analysis of Non-Invasive Devices and Techniques Involved in Continuous Monitoring of Interstitial Glucose of Patients with Type 1 Diabetes, Advisor: Dr. Roshan Padmanabhan

There are 422 million diabetes patients worldwide according to 2023 census of WHO, and around 100 million cases in India. 8.4 million Type 1 diabetes cases were recorded as of 2021. By 2040, it is projected that the number of people living with Type 1 Diabetes will reach 13.5–17.4 million. The surge in diabetes cases has created the critical need for regular glucose monitoring to effectively manage this prevalent health issue. Currently, glucose levels are predominantly measured invasively by pricking the finger for a blood sample and involves invasive methods, such as fingertip pricks, which can be uncomfortable and inconvenient, particularly for paediatric patients. This method utilizes blood glucose monitoring devices, which measure sugar levels in a small blood sample placed on a disposable test strip and have a certain degree of inaccuracy. Patients do not test as often as they should because of the pain and hassle of finger pricks, and many do not achieve optimal glycaemic control. A shift toward non-invasive continuous glucose monitoring, emphasizing integration into wearable platforms for seamless and real-time monitoring. Despite substantial research and development, challenges persist, including standardizing sweat collection methods, addressing sample degradation, accounting for variations in sweat composition among individuals, optimizing diverse detection methods, improving glucose and techniques to evaluate the most accurate, pain-free, fast, and cost-friendly device. Upon examination and survey, we have theorized the drawbacks persisting in the existing devices and hypothesized techniques. Looking forward this study has a broader application in not only understanding the limitations and creating more accurate devices but also in continuous glucose monitoring for diabetic patient care.

Anna Hyslop '26, University of Oklahoma (elevator speech)

Exploring a Framework for Assessing the Feasibility of Localized Energy Transitions in the United States, Advisor: Dr. Christopher Malloy Net-zero energy transitions, necessitated by the threat of climate change, need to occur on an international scale but powerful economic lobbies and political stagnation often mar the negotiation processes driving national and international action. In this context, local communities become increasingly important in achieving widespread emissions reduction objectives. My analysis centers on exploring a framework that evaluates the feasibility of net-zero energy transitions in U.S. localities. The framework highlights the technological and political feasibility of transitioning the electricity and transportation sectors of a given municipality. While such a framework does not capture the entirety of a community's energy system, it nonetheless serves to address two sectors that dominate emissions production and energy usage. I apply this framework to the suburban community of Norman, Oklahoma, to both highlight the value of such analysis and to provide important information to local officials in my community. My findings suggest that while technology costs may decrease, political opinion could hinder clean energy transitions in Oklahoma.

Session 1b: Klein Boardroom Moderator: Erin Heller, PhD

Ethan Caldwell '25 & Gracie Oliver '26, Randolph College

Determining the Presence and Abundance of Potentially Pathogen-Carrying Ticks, Emphasizing Confirming Ixodes Scapularis Identification, Advisor: Dr. 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. It also aims to confirm the morphometric identification of Ixodes scapularis, a species of ticks at 5 publicly accessible areas and morphometrically identified these ticks in the lab. Then, we used polymerase chain reaction techniques to confirm the morphometric identification of Ixodes scapularis ticks abundance in urban areas. As part of a collaboration with the Ecological Research as Education Network (EREN), 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.

Ainsley John Darling '26, Sweet Briar College

Lycorma delicatula (Spotted Lanternfly) Trapping and Plant Species, Advisor: Dr. Lisa Powell

Spotted lanternfly, (SLF) is an invasive species brought to the United States from Asia (Urban, & Leach, 2023). This insect inflicts economical and agricultural damages to any plants with sugary sap (Harper, Stone, Kelsey, & Kime, 2019) such as vineyards, orchards, native plant species, and any fruit-producing farms. Different trap types have been designed to help control the species due to the current over-abundant population. This article explores two of the most-used current traps vs. two new designs based on the proven effectiveness of past traps. While testing traps, surveying was conducted on site-specific locations to track the feeding and movements of SLF. Location does influence this research as in different climates/areas SLF will act differently (Virginia Cooperative Extension, 2019). All sites and traps were conducted at Sweet Briar College in Virginia.

Hai-Hsin Huang '25, Virginia Military Institute

Mathematical Modeling of Natural Killer Cells, Advisor: Dr. Meagan Herald

The immune system is pivotal in combating viral infections, particularly during the annual flu season. Influenza A, commonly known as the flu, is a highly contagious respiratory illness caused by the influenza A virus, primarily transmitted through droplet transmission (Dhand 2020). Its rapid spread poses a significant global health threat, impacting human health and the economy. Current research has sparked interest in understanding the contribution of natural killer (NK) cells and their role in the resolution of viral infections, including influenza infections. Despite their significance, NK cells' precise mechanisms, immune functions, and their correlation with cytokines like interferon gamma (IFNg) remain unclear. We aim to model immune dynamics and discover potential mechanisms underlying IFNg production during infections. Our study integrates immunology and mathematics to investigate the roles of NK cells, T cells, and IFNg in influenza infections by utilizing data from the University of Tennessee's Department of Pediatrics. This model will allow the exploration of possible mechanisms related to IFNg production during an infection. Our research aims to uncover how the immune system behaves during influenza infections, offering insights that may contribute to developing innovative strategies for improving public health.

Abigail Huling '25, Sweet Briar College (elevator speech) Archaeological Excavation of Matohasanaj, Advisor: Dr. Erin Pitt

Over the summer of 2024, an excavation of the ancient Greek and Roman site of Matohasanaj, Albania, was performed by a small team of archaeologists and excavators. The purpose of this excavation was to recover dateable material to pinpoint an estimated time of the site's earliest occupation, investigate evidence of previous structures such as the fortification walls which encircle the site, and collect physical remains of human interaction such as foodstuffs, pottery, weapons, tools, and altered stone. This presentation is a compilation of the known history of Matohasanaj, the preliminary findings of this first year of excavating, and current theories as to the possible uses of the site in ancient times.

Session 1c: Psychology Room 101 Moderator: Blair Gross, PhD

Bridgett Burgos '24, Virginia Tech

Role of Medication Status in the Social and Academic Profiles of College Students with ADHD, Advisor: Dr. Rosanna Breaux

The average college student faces many stressors and responsibilities as they transition into adulthood. Previous research has suggested that college students with attention-deficit/hyperactivity disorder (ADHD) experience less academic success and greater psychological distress. Medication treatment for ADHD can have positive effects on school performance and overall well-being (Jangmo et al., 2019). This study examines the academic, social, and employment profiles of college students with ADHD based on whether they were taking ADHD medication. Participants were 63 college students, 54% of whom reported currently taking ADHD medication. Participants reported their demographic information (employment status, involvement in Greek Life/sports, and typical grades) in spring 2022 via an online survey. College students on ADHD medication were significantly more likely to be involved in Greek Life and to be an athlete (55.9% and 23.5%, respectively) than those not on medication (31.0% and 3.4%, respectively); 2=3.91 and 5.15, ps<.05. However, students on medication were also more likely to have some C grades than those not on medication (47.1% vs. 13.8%); students on and off medications did not significantly differ in their likelihood to be earning all A grades or As/Bs (2=8.48, p=.01). Findings suggest that individuals with ADHD who are medicated may do better socially in college, but medication does not necessarily improve academic performance.

Madeline Little '25, Longwood University

The Hujum Campaign in Uzbekistan and its Consequences, Advisor: Dr. Yulia Uryadova

The Hujum (meaning "attack") Campaign was an assault on veils worn by Islamic women between 1927-1929. This campaign started in Uzbekistan, the most conservative part of Central Asia, and was led by the Zhenotdel (the women's department of the Soviet Union). Why did the Soviets begin the Hujum campaign and were women in Uzbekistan better or worse off afterwards? The Soviets felt that they had to liberate women in Central Asia to fix what they saw as a backwards society. Uzbek women were worse off due to the severe violence they faced as a direct cause of the Hujum campaign, and they did not see positive results until years later. Women who unveiled had to live in fear of their life, whether it be violence from strangers or relatives. This research uses primary accounts from women who participated and viewed the Hujum campaign as well as accounts from the Soviet government itself. It also uses secondary sources which analyzed the Hujum campaign and its outcomes.

Emily Matthews '26, Randolph-Macon College

Employing the Memory of the English Civil War Era in Virginian Revolutionary Print, Advisor: Dr. Mathias Bergmann

English history was often invoked by Virginia elites grappling with the conflict against Great Britain in the late 1760s and early 1770s that resulted in the American Revolution. Events and people from the English Civil War era were pertinent to Virginian leaders because of the perceived similarities between the two conflicts. Printed materials made for public consumption grew increasingly important in the 18th century as engines for the dissemination of information, including history, to non-elites. This development facilitated the creation of a common memory about the English past that Virginia elites could exploit for political purposes by the 1760s. This coincided with a rise in the significance of public opinion during the Revolution because patriot leaders depended on the support of non-elites to legitimize their authority and actions. Virginia leaders relied on print to mobilize popular support during the imperial crisis, and in doing so, they often looked back to mid-17th-century England for historical examples and symbols that could be utilized in a contemporary script. Patriot elites crafted a narrative of those tumultuous times that best suited their socio-political agenda, and by disseminating that history in the public prints, their narrative was propagated to the widest possible audience in Virginia.

Alaina Snider '26 & Gregory Wietrzykowski '26, Randolph College The Bumpy Ramp Problem, Advisor: Dr. Peter Sheldon

Describing motion of a vehicle in one-dimension (1D) is a common situation used to teach motion in general physics. It requires the understanding of the kinematic variables and differential relationships between displacement, velocity, acceleration, and time. In teaching general physics, there are not too many variations on 1D motion problems, and one also finds that it can be surprisingly easy to complicate a problem to the point where it is no longer tractable. On the 2016 Advanced Placement (AP) Physics 1 Exam, a variation to the 1D motion question was asked about a vehicle going down an inclined plane with regular bumps. This engendered many comments because it turns out the question may not easily be answered with the physics learned by a first-year student. Over seven weeks, we investigated this problem with computational and physical models to determine the motion of a car on a bumpy ramp.

LUNCH 12:30 P.M. - 1:30 P.M. Location: Smith Banquet Hall

Oral Presentations Session II 1:45 p.m. - 2:45 p.m.

Session 2a: Nichols Theatre Moderator: Sarah Sojka, PhD

Owen Clarke '25, Virginia Military Institute

Assessing Abundance, Quality, and Stability of Trout Spawning Habitat in the Jackson River, Advisors: Dr. Robert Humston & Dr. Mary-Beth Manjerovic

Dams disrupt natural flow and hydrology of rivers, often resulting in adverse effects on river ecosystems and fauna. The degradation and/ or siltation of salmonoid spawning gravel is acknowledged as a primary factor contributing to the ubiquitous decrease of trout and salmon populations in North America and Europe. I assessed the abundance, quality, and stability of possible trout spawning habitat in the Jackson River tailwater below Gathright Dam in Covington, Virginia. I compared gravel particle distribution values of possible spawning habitat to literature values to assess river wide spawning habitat quality. I produced a heuristic habitat survey which ranked spawning habitat as high, medium, or low probability of spawning success based off an "expert scoring system" derived from literature. Using a chi-squared test, I found no significant relationship between location (upriver or downriver) of surveyed possible trout spawning habitat and probability of trout spawning success. I found a significant relationship between habitat type of surveyed possible trout spawning habitat and probability of trout spawning success (high, medium, or low). These results may help guide the Virginia DWR in future habitat assessments in the Jackson River.

Emma Evans '26, Sweet Briar College

From Rivers to Fountains: Microplastic Content Found in Tap Water in Amherst, Virginia, Advisor: Dr. Lili Lei

Plastics are used all over the world in many ways, because of how durable they are. They eventually begin to break down into smaller pieces over time, called microplastics. Microplastics have found their way into our soil, air, and surface water, and tap water is no exception. Our understanding and research on microplastics is fairly new and limited, especially when it comes to tap water. This project aims to investigate how many and what kinds of microplastics are in tap water, and answer the question: what characteristics and how many microplastics can be found in Amherst County, Virginia's local tap water? The objectives of the project are to observe what kinds and how many microplastics are in the tap water in Amherst and use the information to inform best management practices for microplastic removal from tap water. Water samples from a variety of different sites were taken and processed, then analyzed to reveal the kinds and amounts of microplastics in the samples. A comparison of the kinds and amounts of microplastics in different sites from Sweet Briar College's area was made from which conclusions were drawn about which given areas have higher amounts of microplastics.

Ariel Hullender '25, Sweet Briar College

Milkweed, Monarchs, and Amassed Azoxystrobin, Advisor: Dr. Megan Kobiela

The widespread use of pesticides has raised concerns about their impact on non-target species. Azoxystrobin, a broad-spectrum fungicide, is commonly used in agricultural and turf fields, posing potential risks to native plants like the common milkweed (Asclepias syriaca) and the Monarch butterflies that rely on them. This study aims to investigate the effects of azoxystrobin on milkweed and the potential cascade effects on Monarch butterfly conservation. Much of the milkweed available to Monarchs is near agricultural activities, making it vulnerable to pesticide contamination. To assess the impact of azoxystrobin on common milkweed, I focused on the plant's life history traits and growth patterns. Understanding how azoxystrobin affects the chemical and physical defenses of milkweed, like latex production, cardenolide levels, and trichomes, is crucial for developing conservation strategies for Monarch butterflies and other insect species that rely on milkweed habitats. Data analysis is ongoing, but preliminary results on initial data show no significant effects on plant growth. This research contributes to the broader effort to mitigate the environmental impact of pesticides and protect vulnerable plant and animal species in agricultural and recreational landscapes.

Gyabaah Kyere Gyeabour '27, & Ashby Bonin '27, Hampden-Sydney College (elevator speech) The Final Winter: A Videogame on Climate, Advisor: Dr. Jacob Euteneuer

This research focuses on how we can impact people's thinking on environmental damage by portraying the effects of climate change through a videogame. Using the GameMaker Studio engine which runs on C#, we developed a simple 2D videogame. The story of the videogame focuses on the hero, Tempest, trying to save his town but destroying important aspects of the environment through the process. While many researchers communicate their findings about climate change through other media, our approach could reach a bigger audience using a videogame. Videogames are often viewed as more fun way of engaging people of all age groups. This research highlights the importance of protecting our environment and how we can individually contribute to solving climate challenges.

Session 2b: Klein Boardroom Moderator: Siavash Sattar, PhD

Christian Guinto-Brody '25, University of Virginia

Refining the Quality Assurance, Quality Control of Detector Modules for the CMS Barrel Timing Layer, Advisor: Dr. Chris Neu

The Large Hadron Collider (LHC) will enter its High-Luminosity era in 2028, during which it will begin collecting 20 times more data than it is currently collecting. Increasing the LHC's luminosity will increase the chances that rare processes are observed, providing insight into undiscovered physics. To achieve these goals, a new subsystem of the CMS experiment, the Minimum-Ionizing-Particle Timing Detector (MTD), is being constructed to measure the time of arrival of particles with unprecedented precision. A key component of the MTD is the Barrel Timing Layer (BTL), which will be composed of detector modules comprising two 16-bar LYSO scintillating crystals and four silicon photomultipliers (SiPMs) connected to Time-of-Flight High-Rate (TOFHiR) electronics. Detector modules must operate at temperatures of -45°C to achieve maximum light yield and operating lifetimes. I refined a method developed by colleagues at CERN to test the thermoelectric coolers (TECs) in the detector modules, which cool the SiPMs (elevator speech)when current is supplied to them. These improvements to the quality assurance and quality control (QA/QC) of detector modules will prime the MTD to work at maximum capacity for as long as possible, helping the LHC achieve its luminosity goals so new physics can be discovered.

Jay Joseph '26, Randolph College, with David Shatwell & Kevin Zhai, University of Central Florida Fellows Time-of-Capture Prediction in Outdoor Videos, Advisor: University of Central Florida, Advisor: Dr. Mubarak Shah, University of Central Florida

Estimating the precise time-of-capture for videos is crucial for applications in digital forensics, ecological studies, and social media management. While previous research has focused on images, video-based time prediction remains largely unexplored. This paper introduces a novel classification model for predicting the hour and month of outdoor videos using a combination of a pre-trained CLIP ViT backbone, a shallow transformer for frame aggregation, and semantic pseudo-labels derived from the CLIP text transformer. We evaluated our models on a driving video dataset and demonstrated superior performance compared to an image-only baseline and two pretrained video-specific models. Our contributions include a new method for time-of-capture prediction in videos, exploration of different model architectures, identification of the best-performing architecture, and ablation studies on optimal frame and batch size configurations.

Danielle Nunez '27, Randolph College

Development of a Cosmic Ray Trigger Test Stand for Quality Control of the High Granularity Calorimeter Scintillator Tile-Modules at Fermilab, Advisor: Dr. Daniel Guerrero, USCMS/PURSUE program

The High-granularity calorimeter (HGCAL) is a major upgrade of CMS, which is necessary to maintain calorimetric performance in the endcaps during the HL-LHC (High Luminosity Large Hadron Collider) operation (2027-2040). This new endcap calorimeter is designed to have a higher radiation tolerance, better 3D granularity, precise timing. At Fermilab, the Scintillator Tile detector Modules (Tile- Modules) of the Hadronic Compartment will be assembled using a robot pick and place machine. A post assembly quality control test will be performed for electrical validation using a multi- module test stand. I developed the first prototype of the cosmic ray trigger system of this test stand.

Elizabeth Wells '26, Sweet Briar College

Cost-effective Method for Detecting Water Leaks on a Large Rural College Campus, Advisor: Dr. Jonathan Bender

The goal of this research was to determine the most cost-effective and efficient method to detect water leaks on a rural college campus. This was accomplished through studying previously established maps of the water pipe network of Sweet Briar College's campus. Several possible water meter locations were assessed and examined to decide whether water meters would be feasible and helpful in those locations. Ultimately, three locations were chosen to install water meters. To avoid costly installation, the time transit ultrasonic water meter's operation. Through a 42.5-hour sample of one of these tests, it was found that the instantaneous flow rate peaked at 192.8875 GPM and reached a low instantaneous reading of 0 GPM. In the end, the installation of these meters will be used to detect leaks in this water pipe network in the hopes of greatly limiting the amount of wasted water on the campus.

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

1. Zach Alam '24 & Bridget Little '27, Christopher Newport University

Imbalanced Emotions: Positive and Negative Affect Fade Differently with Esteem and Sexual Addiction across Events, Advisor: Dr. Jeffrey A. Gibbons

Pleasant affect fades slower than unpleasant affect, and this fading affect bias (FAB) has been negatively and positively related to negative and positive outcomes, such as depression, self-esteem, and respectively. The current study examined the relations between FAB and relationship satisfaction, self-esteem, partner-esteem, sexual activity, and sexual addiction across pleasant and unpleasant sexual and non-sexual, non-relationship events. Participants provided written consent, completed a basic demographic questionnaire, and other questionnaires. Participants were then asked to recall, describe, and provide rehearsal ratings for two pleasant/unpleasant, sexual/non-sexual events, rating their initial and current emotions for each on a scale from -3 (extremely unpleasant) to 3 (extremely pleasant). Strong relations were expected between FAB and 1) self-esteem, partner-ewilliasteem, and relationship satisfaction for non-sexual, non-relationship events and 2) sexual activity and sexual addiction for sexual events. Robust FAB was found and it was positively predicted by sexual addiction, partner-esteem, and sexual satisfaction. Low partner-esteem and self-esteem showed a negative link between sexual satisfaction and FAB. Self-esteem positively predicted FAB for sexual events but negatively for non-sexual events. Participants with low partner-esteem/self-esteem showed a negative link between sexual satisfaction and FAB.

2. Joseph T. Bui '25, Camdyn C. Allen '26, & Alielyx E. Aponte '26, Christopher Newport University

Thematic Analysis of Final Statements of Inmates on Texas Death Row, Advisor: Dr. Sherman Lee

Death row inmates are in a unique, rare, and extraordinarily high-stress situation. The mental health of death row inmates before execution is well-researched but not modern- more than four years have passed since another study was conducted about the Texas Death Row Inmates. This research analyzed trends within their last statements using modern AI. The researchers found ten core themes within the last statements: Acceptance, Forgiveness, Regret, Peace, Hope, Beliefs, Fear, Love, Gratitude, and Praise. Knowledge of these themes can increase understanding of the psychological state of death row prisoners and the effect death row can have on inmates leading up to their death.

3. Isaac Chenoweth '25, James Madison University

Queer Intersectionality in 20th Century Rights Movements, Advisor: Dr. Jared Featherstone

99% of people never see past the first page of Google, yet it takes until page three to find the first mention of James Baldwin, a world-famous Civil Rights figure and author, as a homosexual. Why does Baldwin's queer identity remain so underexplored, and what does this reveal about queer intersectionality in 20th century American Rights movements? This project conducts a comparative study of queer representation in a variety of 20th century American Rights movements with respect to Queer Theory as well as Intersectionality Theory, alongside textually analyzing selected figures' more prominent works. Misrepresentation and lack of visibility has inevitably led to the marginalization of LGBTQIA+ voices in America; how have other movements and figures attempted to circumvent this issue, and is it possible to implement successful instances of intersectional frameworks in present-day America? This project will offer insights into how we can avoid similar silencing of minorities from history in the future.

4. Matthew Drumheller '25, James Madison University

Exploring the Intersection of Systems Between a Business Start-Up and a Hospital, Advisor: Dr. Jared Featherstone

This research investigates the intersection of systems between business start-ups and health administrations, with a particular focus on how organizational frameworks influence operational efficiency in both environments. Drawing on my recent experience working at a start-up business, I aim to identify key similarities and differences in how start-ups and hospitals manage their systems and structures. The goal is to understand how start-ups' organizational efficiency may offer new insights into healthcare operations, particularly within hospitals. This comparative approach will explore whether start-up methodologies could inform and improve hospital administrative systems. A review of scholarly literature reveals that the healthcare industry is increasingly borrowing innovative operational strategies from the retail sector. This study will highlight the gap between traditional healthcare practices and new business-driven approaches, focusing on how these systems impact overall effectiveness. By examining these intersections, I aim to provide insights into whether start-up organizational models can streamline hospital management. This research will explore how these systems contribute to patient outcomes, operational success, and overall healthcare efficiency, offering new perspectives on how hospitals can adapt to changing environments.

5. Jackson Greer '25, James Madison University

Ethical Innovation in the Coming Technological Revolution, Advisors: Dr. Jared Featherstone & Dr. Philip L. Frana

The four industrial revolutions have been marked by periods of growth and transformation, but not without consequences. In an arguable fifth revolution marked by rapid development in artificial intelligence, surveillance, and military technology, we face significant challenges. These include potential for mass surveillance and loss of privacy, job displacement due to automation, unmanned military devices lacking regulation, misuse of generative artificial intelligence, and a growing target being placed on the technology sector as society becomes more and more reliant on it. We must draw lines and make rules in a world never experienced before, rather than picking up the pieces after the fact, or we will be left vulnerable to unimaginable consequences. This research will involve an in-depth analysis of case studies, current technological trends, and ethical frameworks to develop a comprehensive code of ethics. The resulting code of ethics is intended to guide the responsible development of new technologies, minimizing the risk of misuse, and fostering accountability among those who develop them.

6. Jake Hazelwood '26, James Madison University

U.S. Policies and their Impact on Japan, Advisor: Dr. Jared Featherstone

After the second world war, the United States and Japan have had their governments interlinked. With Japan and USA military ties being expanded in the last year, with new pacts creating what some are calling "a Southeast Asian NATO." I believe it is time to start looking back at how United States policy has affected Japan's people. Answering this question will require reviewing the history of USA relations in the region and how they have grown over the years. Revisiting when new policies were put into place, one can see the effect they had on Japan's people by analyzing public opinion surveys capturing how they felt. This research could shed light on the general opinion that the average Japanese citizen feels about USA involvement. By highlighting the opinions and effects that the USA has had on the Japanese people, we can try to work on improving the policies that the USA has implemented.

7. Karsen Hudson '25, James Madison University

Treatments for Stuttering Disorders, Advisor: Dr. Jared Featherstone

Children with stuttering disorders find difficulty communicating with others effectively; they often have a common fear of speaking out loud. With the help of a speech and language pathologist, these children will be able to have better control over their stutters and will feel more confident when speaking or talking with their friends and/or family. When it comes to finding out what resources speech and language pathologists use to better help children with their stuttering, it is important to look into the different types of techniques they use to help improve a child's speech and overall confidence. I will review current studies done by speech and language pathologists to find better ways to improve the speech of children with this disorder. This research will show how the impact of a speech and language pathologist has on a child with a stuttering disorder, including positive reinforcements on the child's speech. The importance of improving a child's stuttering disorder may prevent their stuttering disorder from becoming a lifelong issue.

8. Aamirah McDonald '26, James Madison University

Reimagining History: Amplifying BIPOC Voices and Challenging Stereotypes through an Octoroon, Advisor: Dr. Jared Featherstone

Focusing on An Octoroon by Branden Jacobs-Jenkins, this research investigates how theater can interrogate historical and present-day depictions of people of color. An Octoroon is a reimagining of the 19th-century play The Octoroon by Dion Boucicault, which originally perpetuated racial stereotypes and reflected a deeply racist society. This study explores how An Octoroon has contributed to amplifying marginalized voices both within and beyond the theater. By reimagining the original play from a contemporary perspective, this research highlights underrepresented narratives and examines the role of art in either perpetuating or dismantling racism. Ultimately, the research advocates for increased access to BIPOC histories and the amplification of silenced stories, pushing for more equitable representation in the arts through creative social justice and art advocacy.

9. Brenna McManus '26, Krystal Langhorne '24, & Sevrin Vandevender '25, Christopher Newport University Predicting the Fading Affect Bias in Political and Non-Political Events, Advisor: Dr. Jeffrey A. Gibbons

The Fading Affect Bias (FAB; Walker et al., 2003a) describes the faster fading effect of negative than positive emotions. As winning and losing voters experience positive and negative emotions, respectively (Anderson, 2005), Gibbons expected and found that losing voters in the 2016 (Gibbons et al., 2000) and 2000 Presidential elections (Gibbons et al., 2024) showed smaller FAB for political events than non-political events, and the opposite was found for winning voters. Participants in the current study will recall and describe 1 pleasant and unpleasant non-political and political event (with one political event involving the 2024 Presidential election) online. Participants will then provide initial and final effects as well as rehearsal ratings at time 1. After 7 days, participants will be sent a link to recall and describe their events online from 7 days prior as well as provide initial affect ratings, affect ratings 7 days ago, and current affect ratings. Participants will then provide rehearsal ratings. We expect to replicate the previous findings and find that correct recall positively predicts FAB and false recall negatively predicts FAB for winning voters rating political events.

10. Matthew Miscikowski '26, Hampden-Sydney College

Generating a FOXC2 Knockout Melanoma Cell Line, Advisor: Dr. Kristian Hargadon

FOXC2 is a critical transcription factor found in humans which binds to DNA and alters gene expression. The transcription factor specifically aids cells in cellular proliferation, growth, and the development of blood vessels. FOXC2 is also an onco-gene and when mutated can cause cancer by altering proliferative signaling, inducing angiogenesis to the tumor, activating the invasion and metastasis to other parts of the body, and even providing drug resistance. This study focused on FOXC2 in a specific line of murine melanoma called B16-F10. The primary focus of this study was to generate a knockout FOXC2 variant of the B16-F10 cell line. The creation of a B16-F10 cell line which could no longer produce the FOXC2 transcription factor would provide a critical tool needed for future experiments. It would serve as a control to compare future studies that alter the functioning of the FOXC2 transcription factor. To create this knockout FOXC2 B16-F10 cell line CRISPR-Cas9 editing was utilized to create multiple clones. Over the summer the clones were analyzed to determine which of the three FOXC2 alleles experienced successful disruptive editing. If any of the clones were successfully edited to eliminate the FOXC2 transcription factor this clone could be utilized as the control for future experiments.

11. Vanessa Perez '25, Andrews University

Structures for Lossless Ion Manipulations Printed-Circuit Board Production for High Resolution Ion-Mobility Spectrometry, Advisor: Dr. Carlos Larriba-Andaluz

An ion mobility spectrometer (IMS) provides the ion velocity within a drift tube to ascertain ion mobility based on their arrival times at the detector. Smaller ions exhibit higher velocities and greater mobility, while larger ions have more resistance. In current IMS devices, ions can collide with tube walls and neutralize. Lossless ion manipulation techniques, such as Structures for Lossless Ion Manipulations (SLIM), extend ion flight times and distances, enhancing separation efficiency and minimizing ion loss. SLIM employs direct current (DC) and radio frequency (RF) electric fields to create an isopotential surface (preventing loss of ions) as well as a traveling wave that efficiently transports ions. This method involves constructing electrode arrays—comprising five rows of traveling wave electrodes, six RF strips, and two DC guards—on parallel printed-circuit boards (PCBs) using software like KiCad, followed by fabrication. Ions underwent electrospray ionization, were trapped, and subsequently separated by the SLIM PCB before detection, thereby determining resolving power. The results showed that the SLIM board partially separated the sample. One compound had a peak at 38 mV and the other had a peak at 64.7 mV. Future work includes finding the optimal combination of amplitude, frequency, and pressure for complete separation.

12. Angela Victoria Rojas Rivera '26, George Mason University

Monitoring Metabolic Plasticity in The Tumor Microenvironment In Vivo By Mitophagy Generated Extracellular Vesicles, Advisor: Dr. Marissa Howard

Metastasis is the major cause of suffering and death for patients who were diagnosed with cancer. Extracellular Vesicles (EVs) resident within Interstitial fluid (IF) of the tumor tissue microenvironment plays an essential role in cell-cell communication processes driving tumor progression. Tumor IF EVs are an unappreciated source of information surrounding a tumor that could provide insights into mechanisms that aid tumor immune escape and metastasis. We developed a method to isolate the IF from an excised tumor without damaging the underlying tissue cellular morphology. Our team discovered that the key mitophagy initiator molecule, PINK1, is exported into an EV in vivo. It has been shown that the tumor suppressor p53 is tagged for degradation by PINK1. We hypothesize that p53 is exported into PINK1+ EVs to aid tumor formation. To test this hypothesis, we used the syngeneic BALB/c animal model and injected 106 4T1 triple negative breast cancer cells into the mammary fat pad. After 14 days, N=5 mice were treated with anti-PDL1 and N=5 were treated with a loading control. After 48 hours, the animals were sacrificed, tumor IF collected, and EVs were purified by centrifugation. We performed IHC on the metastasis against F4/80, CD206, Ly6G/C, CD11b, Arginase-1, and PINK1 to determine mitophagy level and the immune cell infiltrate. We found PINK1 and phospho-p53 were elevated in the IF EVs. By IHC and mass spectrometry we found that the treated tumors had greater immune cell infiltrate such as markers for neutrophil degranulation and T-cell activation indicative of the drug treatment's effect on the tumor. In conclusion, we have developed a MS analytical workflow which eavesdrops on the tumor pre- or post-treatment state using IF EVs as a novel tumor biomarker. Moreover, we identified a potential pro-tumor adaptation mechanism through the PINK1/p-p53 EV secretion.

13. Ravyn Rodriguez '25, James Madison University

The Relevance of Body Art in Connection to Human Cultures, Advisor: Dr. Jared Featherstone

Throughout history humans have adorned their bodies in multitudes of ways. From hair and nails to clothing and accessories, to tattoos and body modifications, human desire to change the physical form has shown its prevalence time and time again. This project will explore the history of tattoos and body modifications, their role and importance in society, and different techniques and tools used. Tattooing and body art have origins dating back to over two thousand years creating the foundation for the art form as well as the beauty and cosmetic world we know today. With these historic ties, and the continued use, the form has grown, changed, and created an entire subculture that can be found worldwide. Through means of traditional research, industry worker perspective, and social inquiry, I will explore how tattoos and modifications made their way into the modern beauty realm and explore their relevance into modern society.

14. Makayla Snyder '26, Mila Norte '27, & Josiah Mou '26, Christopher Newport University

True Headlines are More Influenced by Sourcing than Unbelievable Headlines, Advisor: Dr. Jeffery A. Gibbons

Unbelievable media headlines have been recognized more accurately and rated as more believable over time than believable media headlines (Gibbons et al., 2005). Matching headline conditions across learning and tests were expected to be better recognized than mismatching headline conditions. The media source was expected to strongly influence the believability of headlines. Participants completed one of three priming conditions (series of tweets, simple math equations, or short news article), followed by rating the believability of 24 media headlines (12 believable, 12 unbelievable). Participants rated believability on a scale from -3 to 3. Participants returned after 48 hours and rated the believability of 48 media headlines. Participants marked any headlines they recognized from time one. The results supported the hypothesis that unbelievable headlines would be recognized more accurately than believable headlines. Less believable items were noticed more accurately than believable headlines, which matches the results of Gibbons et al. (2005). Over time, the believability of believable headlines decreased for all three media primes. Although the changes in believability across time for unbelievable headlines varied, none of the changes were significant. However, the study is still active so the results are potentially subject to change.

15. Gracie Stewart '25, James Madison University

The Principles of Culturally Responsive ESL Instruction, Advisor: Dr. Jared Featherstone

As the English language continues to gain importance as a facet of international commerce and diplomacy, linguists, and Teaching English to Speaker of Other Languages (TESOL) experts, have observed a steady increase of the English learner population in recent decades, which can be seen amongst educational systems across the globe. Despite this growing student population, many school administrations are facing a lack of funding for essential multilingual resources, an understaffing of trained TESOL specialists, and often less than adequately contextualized curriculum. To address these common weaknesses within acquisitional language instruction, research has been compiled from pervious personal English as a Second language (ESL) and English as a Foreign Language (EFL) instructional experiences, as well as literature from experts globally. By properly educating English Language Learner (ELL) specialists in the celebration of linguistic and cultural diversity, the utilization of contextualized language tasks and resources, displaying authentic language use, scaffolding, or differentiating as needed, and building a supportive classroom environment, educators will feel prepared to offer effective, culturally responsive instruction in a welcoming setting. Therefore, by applying these fundamental principles of sound ESL instruction, multilingual students will have all tools necessary for gaining proficiency in their target language.

16. Alyx Strong '26, James Madison University

Optimizing Modular Rigging Systems for Touring Productions: An Evaluation of Strengths and Weaknesses, Advisor: Dr. Jared Featherstone This study explores the pros and cons of existing rigging systems used in touring productions. These shows demand rigging setups that can be assembled swiftly and adapted to various locations while remaining dependable in different environments. Many current systems face challenges, such as restricted weight capacity, complex assembly procedures, and safety concerns. This research aims to find ways to enhance the safety standards of rigging systems while improving their portability and efficiency. To address these issues, a range of academic papers, industry reports, and real-world examples to assess how well current modular rigging systems perform are examined. The research highlights strengths, such as rapid setup times and versatility, while also addressing key weaknesses, including unstable connections and limited scalability for larger projects. Additionally, this study investigates enhancing rigging system designs by utilizing a variety of materials and engineering methods. This research offers suggestions for improving rigging systems to enhance their strength, durability, and safety measures, while simplifying setup. These enhancements aim to support touring productions in adopting better rigging solutions, thus improving performance and safety standards in the long run.

17. Addie Suter '25, Daya Rivera '25, Christopher Newport University

Sex Differences on a Rodent Model of Anxiety and Exploration: The Effect of Adolescent Nicotine and Ethanol Exposure, Advisor: Dr. Gina Fernandez

We employed a rodent model of adolescent drug exposure to examine how alcohol, nicotine, or the combination of both drugs affects long- term anxiety-like behavior. When male and female Sprague Dawley rats reached 28 days of age, they were exposed to 0.4 mg/kg nicotine (1 ml/ kg dose; equivalent to the dose found in a JUUL pod) and 20% alcohol (5 g/kg dose; equivalent to binge drinking doses), or a combined dose. Control rats were exposed to saline and water. All animals received 12 exposures on a 2 day on/ 2 day off schedule and were tested as adults in a drug free state. While adolescent drug pre-exposure did not affect time spent in the open (anxiety-inducing) arm of an elevated plus maze (EPM), we found that females spent more time in the open arm compared to males. On measures of exploratory behavior, male rats engaged in less risky, exploratory behavior (peering over the edge of the apparatus from behind a safe enclosure) compared to females. On the other hand, female rats engaged in more risky, exploratory behavior (peering over the edge of the apparatus from an open platform). Our findings indicate that early drug exposure does not impact EPM measures of anxiety or exploration. These results also suggest that female rats are less anxious as adults, compared to males.

18. Sevrin VanDevender '25, Kameron Wiliams '26, & Tylicia Fields '25, Christopher Newport University

The Relationship Between Marijuana, Memory, and the Fading Affect Bias: A Diary-Based Investigation, Advisor: Dr. Jeffery A. Gibbons The Fading Affect Bias (FAB; Walker et al., 2003) is the tendency for negative emotions to fade faster than positive emotions (Walker et al., 1997). The FAB has been deemed a coping response (Walker et al., 2003; Gibbons et al., 2024) because it is positively related to healthy outcomes and negatively related to unhealthy outcomes (Gibbons et al., 2023). Interestingly, Pillersdorf and Scoboria (2019) found that non-marijuana consumers exhibited higher FAB than marijuana consumers for non-marijuana events, whereas Fernandez et al. (2021) found that marijuana consumers exhibited higher FAB than non-marijuana consumers for marijuana events. Therefore, in the present diary study, we expected to replicate the past marijuana findings. In addition, based on a social media diary study (Gibbons et al., 2022), we anticipated that falsely reported memories of marijuana and non-marijuana events would negatively predict the FAB. We also predicted that these results would be mediated by rehearsal ratings. The results supported the hypotheses with the exception that falsely reported non-marijuana memories positively predicted the FAB. Aside from that outcome, accurate memory consistently and positively predicted the FAB, and this relation increased with marijuana consumption.

19. Marcelo Viteri '27, Christopher Newport University

Observations of Procedural Justice in Deserved and Undeserved Rewarding Work Environments, Advisor: Dr. Jeffrey A. Gibbons

Procedural justice has been defined as the perceived fairness of the means or procedures used to determine outcomes (Folger & Konovsky, 1989). Past research has found that employees' levels of job satisfaction are related to their perceptions of fairness (Forrest, 2002; Moorman et al., 1993), and perceptions of fairness can also influence employees' levels of trust in their supervisors (Barling & Phillips, 1993; McFarlin & Sweeney, 1992). The current study examined perceptions of fairness in third-party observers regarding employee responsibility in a reward scenario. Participants will read scenarios pertaining to an employee interaction and complete a variety of demographic, scenario comprehension, perceived fairness, responsibility, organizational commitment, and recommended consequences questionnaires. Participants will portray the role of third-party employees who witnesses a supervisor rewarding a subordinate for excellent job performance. Information will state that the rewarded employee was or was not responsible for the excellent performance, and then participants will make ratings related to fairness. Subsequently, employee responsibility will change, and participants again will provide the same ratings. We expect our results to support past results from supervisor-subordinate punishment scenarios, which produced opposite and extreme fairness ratings at time 2 after employee responsibility changed compared to time 1 (contrasting-away effect).

20. Olivia Walker '27, Brenna McManus '26, & Krystal Langhorne '24, Christopher Newport University

Combined Effects of Anxiety and Sleep Deprivation in Predicting Fear Created from Differing Courage Levels, Advisor: Dr. Jeffery A. Gibbons Prior research demonstrated that fear and poor sleep can hinder cognition and increase emotional distress (Hicks et al., 1979; Zenses et al, 2020). Sleep deprivation can increase stress, as demonstrated in university students who showed high levels of anxiety with low overall sleep time (rsal et al., 2012; Rosa et al., 1983). Conversely, sleep deprivation may be related to courage since military personnel engage in courageous actions while heavily sleep deprived (Sleep Foundation, 2022). Research on anxiety and bravery showed that participants acted courageously after being informed they would be exposed to a fear-inducing stressor (Norton et al., 2009; Rachman et al., 1984). This study examined if the combination of sleep deprivation and anxiety would predict courage; we inferred that the interaction would predict everyday courage more than heroic courage. The study tested 256 undergraduates who completed the Depression Anxiety Scales (DASS), Pittsburgh Sleep Quality Index (PSQI), and a modified version of the Woodbury-Pury Courage Scale (WPCS-23). The correlational analyses showed that fear/anxiety negatively predicted every courage measure except willingness to engage in everyday courageous acts when fearful. Additionally, regression analyses showed that the fear/anxiety and sleep deprivation interaction helped account for additional, unique variance above and beyond fear/anxiety in several measures.

21. Rachel Walker '25, University of Mary Washington

5-Fluorouracil Induced Oxidative Stress and Cell Death is Variable Across Breast Cancer Cell Lines, Advisor: Dr. Laura Sipe

Triple negative breast cancer (TNBC) is an aggressive subtype with treatment limited to chemotherapy. Not all patient tumors respond to chemotherapy. The variable cytotoxic effects of chemotherapies may be due to how cancer cells regulate reactive oxygen species (ROS). In this study we examined whether the chemotherapy 5-Fluorouracil (5FU) induces oxidative stress and cell death in the mouse breast cancer cell lines EO771 and 4T1. Cell viability after 48-hour treatment of 5FU by MTT assay showed significant cytotoxic effects only in EO771. To test if oxidative stress induces cell death, we examined the effects of 5FU and the antioxidant, N-acetyl cysteine (NAC), on cell viability. As observed in an MTT, NAC did not impact EO771 and 4T1 cell viability. Additionally, relative gene expression as measured by a qPCR concluded that 4T1 cells increase the antioxidant gene expression of heme-oxygenase 1 (HO-1). Overall, this difference suggests that EO771 cells are susceptible to 5FU treatment while 4T1 cells are more resistant because they can better regulate oxidative stress.

22. Meghan Weaver '24, James Madison University

Speak Chinese in the US: Demand vs. Availability, Advisor: Dr. Philip L. Frana

How many Americans in the United States are proficient in Chinese and how is the demand for the language growing across the world? As someone who has a proficiency in the language, I hope to share the importance of Chinese speakers. I researched my topic by utilizing existing records mainly from censor.gov and "New American Economy" news reports to determine how many Americans are proficient in Mandarin. I've also researched the rate at which the necessity of Mandarin Chinese is growing across the world. Prior to my research, I anticipated a low number of Americans proficient in Chinese and a large growth rate for the demand for Chinese. My preliminary and actual results indicated that my initial assumptions were true on both counts; very little of the American population speaks Chinese, and there is an increasingly high demand for speakers in the U.S. The results of my research suggest that the supply of Chinese speakers in the U.S. is not meeting the demand, and if this continues, America may be at a disadvantage as many jobs requiring proficiency in Mandarin are not being filled. Beyond the scope of this conference, I aim to inspire programs that endeavor to create an interest in Chinese in the younger population.

23. Ella White '25, Josephine Brumfield '26, & Jaden Moore '26, Christopher Newport University

Does the Fading Affect Bias for Nicotine Events Enhance Nicotine Use? Advisor: Dr. Jeffrey A. Gibbons

The Fading Affect Bias (FAB; Walker et al., 2003) is the faster fading of negative emotions than positive ones (Walker et al., 1997), and is considered a healthy coping mechanism (Gibbons & Lee, 2019) with positive relations to pleasant/healthy variables and negative relations to unpleasant/unhealthy variables. As previous studies have shown that chronic nicotine use is associated with unhealthy psychological outcomes (Goriunova & Mansvelder, 2012; Parrott, 1998), the current study will test the expectation that chronic nicotine use will negatively predict the FAB. After completing a consent form and briefing, participants will fill out personality, nicotine, and demographic questionnaires, and then they will describe eight different events, including pleasant/unpleasant nicotine/non-nicotine events. Participants will then rate their initial/ current affect and rehearsal frequencies (talking as well as thinking/talking). After four days, participants will complete the second part of the study where they will recall each event and re-rate their affect and rehearsal frequencies. After completion, the participants will be thanked and debriefed. The FAB is expected to be positively related to nicotine use for nicotine events and negatively related to nicotine use for non-nicotine events and negatively related to nicotine use for nicotine events and negatively related to nicotine use for non-nicotine events and negatively related to nicotine use for non-nicotine events and negatively related to nicotine use for non-nicotine events and negatively related to nicotine use for non-nicotine events and negatively related to nicotine use for non-nicotine events with rehearsal as a mediator.

24. Emily Wilks '25, James Madison University

Emphasizing Dignity in the Treatment of Prisoners: A Solution to Recidivism and Restoration, Advisor: Dr. Jared Featherstone

The loss of dignity that people incarcerated experience is often neglected by larger society. This loss of dignity results from poor living conditions and mistreatment while behind bars, many times causing both physical and mental health issues. Once released from prison, it is not uncommon for people to struggle to successfully reenter society. Social psychological research points to the fact that how people are treated while behind bars will affect whether rehabilitation is achievable. To ensure rehabilitation, our system must move away from punishment and retributive processes to restorative practices. I will use previous research on the topic along with interviews and first-hand accounts by people formally or presently incarcerated. These results will emphasize new approaches to the treatment of people while incarcerated that will protect their dignity. Furthermore, while incarcerated, there must be an assurance of dignified treatment and the ability to participate in programs that facilitate skills and a sense of community. This project emphasizes that upholding one's dignity while incarcerated can ensure justice endures.

25. Jenna Williams '26, Christopher Newport University

Rule Breaking and Following Behaviors in Relation to the Fading Affect Bias, Advisor: Dr. Jeffery A. Gibbons

The Fading Affect Bias (FAB) is a psychological phenomenon where negative emotions tend to fade faster than positive emotions (Walker et al., 2003). The FAB has been studied in literature across different autobiographical memory events but has not been examined in recalled rulebreaking and rule-following behaviors. In this study, participants recalled and described eight different events including two pleasant and two unpleasant events regarding rule-breaking and rule-following. The initial valence of these events was defined at either the time of the event ("initial") or at the time of the survey ("current"). Data for the current study are still being collected. Based on prior research, the FAB is expected to be positively predicted by healthy variables and negatively predicted by unhealthy variables. Rule following was expected to positively predict the FAB and a greater correlation was predicted for occurrences of rule-following as opposed to instances of rule-breaking. It was anticipated that social rehearsal would influence rule-following events while thinking events would impact rule-breaking events. Finally, events labeled as "initial" were expected to yield a greater FAB than those categorized as "current." Results showed a significant FAB effect, with events defined initially fading more than events defined currently. However, this interaction was not significant. Negative Positive and Negative Affect Schedule (PANAS), depression, and stress all negatively predicted the FAB.

26. Alenna Zhu '27, James Madison University

Assistance Animal Impact on Life with Disabilities, Advisor: Dr. Jared Featherstone

Every day, millions of people deal with a variety of disabilities, and not all of those people are receiving as much assistance as they could be. One resource that could be utilized is assistance animals, which can be aids for a wide range of disabilities spanning across physical, medical, and mental impairments. This project examines the lengths to which the help of assistance animals improve the quality of life for those with disabilities. How are lives changed by their furry companions? Can a bond between a human and an animal help with the emotional turmoil that comes with having a disability? I aim to answer these questions by delving into previously conducted research, as well as surveying people with first-hand experience with their own disabilities. The results I obtain could open a door of opportunity for those suffering with disabilities who may not be utilizing the full potential of service animals.

27. Tessa Bayer '25, James Madison University

Social Media's Role in Sex Trafficking, Adisor: Dr. Jared Featherstone

This research will look at how social media has provided sex traffickers new ways to stalk, contact, and control their victims using various platforms and approaches. Articles and information provided by various anti-trafficking affiliations and laws created by governments will serve as means to understanding how traffickers are able to pervert social media for their criminal agendas. Identifying and understanding the platforms and tactics used by virtual sex traffickers and recognizing the common signs of trafficking are critical elements to stopping the spread of this worldwide multi-billion dollar industry. This information is collected by examining data and trends, reviewing policies and laws, and defining sex trafficking for both adults and juveniles. Additionally, this information will identify the myths and truths of human and sex trafficking, assist in recognizing its prevalence in our everyday lives, and inform how to help to stop the spread.

SPECIAL THANKS

Dr. E. Scott Geller, Alumni Distinguished Professor of Psychology, Virginia Tech

CENTER FOR STUDENT RESEARCH

Holly Tatum, Professor of Psychology and Director of the Center for Student Research Luisa Carrera, Administrative Coordinator

FACULTY MODERATORS

Blair Gross Erin Heller Ann Fabirkiewicz Siavash Sattar Sarah Sojka

OFFICE OF COLLEGE RELATIONS

PRINTWORKS, INC.



2500 Rivermont Avenue Lynchburg, Virginia 24503-1526

To learn more about Randolph College, visit www.randolphcollege.edu