Virginia Academy of Science
Fall Undergraduate Research Meeting

Saturday, November 9, 2024

Ferrum College
Ferrum, VA

8:30 am - 5:00 pm

The VAS Fall Undergraduate Research Meeting is a research grant proposal competition that has been held annually since the Fall of 2001. Undergraduate students conducting research projects under the mentorship of VAS members at Virginia colleges and universities are invited to participate.

Interested undergraduate students, along with their mentors, must submit their grant applications/research proposals by the October 26th deadline. The grant applicants subsequently present posters outlining their research projects at the Fall Undergraduate Research Meeting. Both the grant applications-research proposals and the poster presentations at the meeting are evaluated to determine the recipients of the grants.

Ten research grant awards of $900 each will be given to the top student grant applications/research proposals and poster presentations selected by the Fall Meeting Judges. The recipients of these research grant awards will be announced at the meeting's conclusion. The research grant award recipients will also be awarded Student Membership in the VAS for the remainder of the current year and are invited to present the results of their funded research at the 2025 VAS Annual Meeting held at the University of Virginia on May 22, 2024.

The Academy extends special thanks to the administration, faculty, staff, and students of Ferrum College for hosting the VAS 2024 Fall Undergraduate Research Meeting. Special thanks to the Ferrum College Quality Enhancement Plan and the Institutional Planning Board who helped to provide today's lunch.

VAS President-Elect Chris Osgood, Associate Professor of Biology at Old Dominion University, serves as the Program Chair for the 2024 Fall Undergraduate Research Meeting.

Map of Ferrum College and Parking

Virginia Academy of Science Fall Undergraduate Research Meeting
Saturday, November 9, 2024
Ferrum College
Ferrum, VA

SCHEDULE OF EVENTS

9:00 - 10:00 **Check-in and Registration** *Blue Ridge Mountain Room (Franklin Hall). All meeting attendees should check in at the Registration Area. Coffee, tea, and other beverages to be served*

9:00 - 9:30 **Poster Set-Up** *Blue Ridge Mountain Room (Franklin Hall). Following Check-In, students should set up their posters on their assigned board.*

9:45 - 10:00 **Preliminary meeting of judges** *Virginia Room (Franklin Hall). We will discuss and disperse rubrics and criteria for judging proposals*

10:00 - 10:15 **Welcome and Opening Remarks** *Blue Ridge Mountain Room (Franklin Hall). Parrish Waters, President of VAS, Professor of Biology, University of Mary Washington*

10:15 - 11:15 **Poster session 1** *Blue Ridge Mountain Room (Franklin Hall). Odd-numbered posters. A team of judges will evaluate each poster. Presenters should be prepared to briefly summarize (≥ 5 min) their projects and respond to questions from the judges.*

11:15 - 12:00 **Keynote Speaker** *Blue Ridge Mountain Room (Franklin Hall).*

12:00 - 12:45 **Lunch 1** *Dining Room (Franklin Hall). Even-numbered posters.*

12:00 - 12:45 **Panel 1** *Blue Ridge Mountain Room (Franklin Hall). Odd-numbered posters. A panel of science professionals will discuss post-graduate opportunities and provide advice for recent graduates.*

1:00 - 1:45 **Lunch 2** *Dining Room (Franklin Hall). Odd-numbered posters.*

1:00 - 1:45 **Panel 2** *Blue Ridge Mountain Room (Franklin Hall). Even-numbered posters. A panel of science professionals will discuss post-graduate opportunities and provide advice for recent graduates.*

2:00 - 3:00 **Poster session 2** *Blue Ridge Mountain Room (Franklin Hall). Even-numbered posters. A team of judges will evaluate each poster. Presenters should be prepared to briefly summarize (≥ 5 min) their projects and respond to questions from the judges.*

3:00 - 4:00 **Lightning talks from select students** *Panther's Den (Franklin Hall).*

4:00 - 4:15 **Judges discussion** *Virginia Room (Franklin Hall).*

4:15 - 4:45 **Awards ceremony and closing remarks** *Blue Ridge Mountain Room (Franklin Hall).*

4:45 – 5:00 **Poster take-down and farewell**

POSTER PRESENTATIONS *(Session 1) – 10:15-11:15*

1) A.I. ON THE HOT SEAT: INVESTIGATING ACCURATE A.I. ALGORITHMS FOR PREDICTING VOLCANIC ERUPTIONS

Jennah DiMaggio, Radford University, Department of Geology

Ava Gorski, Radford University, Department of Geology

Mentor: Parvinder Sethi, Radford University, Department of Geology

Mentor: Andrew Foy, Radford University, Department of Geospatial Sciences

As the global human population continues to increase, people are being placed ever-closer to volcanically hazardous areas. To mitigate effects of catastrophic volcanic events and consequent loss of human life, we will be developing a Machine Learning and Artificial Intelligence algorithm for quickly and accurately predicting volcanic eruptions.

3) A NOVEL SOCIAL STRESS CHOICE MODEL TO EXPLORE THE NEUROBIOLOGY OF STRESS.

Caroline Turner, University of Mary Washington, Biological Sciences

Gabriela Valle, University of Mary Washington, Biological Sciences

Mentor: Parrish Waters, University of Mary Washington, Biological Sciences

Social stressors comprise the most intense stressors that animals face. We present a novel 'social stress choice paradigm' that allows us to better explore social stress in laboratory mice. Here, we assess the effects of this paradigm on hormonal and brain dopamine systems to expand our understanding of social stress and improve our ability to treat human stress disorders.

5) ANALYSIS OF ANTI-NUTRITIONAL FACTORS IN SOYBEAN MEALS FOR ANIMAL FEED

William Ngo, Virginia Tech, Department of Biochemistry

Mentor: Daniel Capelluto, Virginia Tech, Department of Biological Sciences

Mentor: Ayoyinka Okedigba, Virginia Tech, Department of Chemistry

This project aims to isolate and biophysically characterize lectin, a soybean antinutritional factor, to quantify its binding affinity for animal carbohydrates and lipids. The goal is to elucidate the mechanism of lectin-ligand interactions, providing insights into optimal meal preparation methods for animal feed.

7) ANALYSIS OF PPI TOXICITY IN JURKAT T LYMPHOCTYES

Emma Jones, University of Mary Washington, Chemistry and Physics

Caroline Sampson, University of Mary Washington, Chemistry and Physics

Mentor: Randall Reif, University of Mary Washington, Chemistry and Physics

Jurkat T lymphocytes were used to examine the effects of doxorubicin, dexlansoprazole, esomeprazole and omeprazole on cell viability over the course of 72 hours in 24 hours increments with concentrations between 1 and 100 uM.

9) ANTHRAQUINONE-BASED FLUOROPHORES FOR PROTEIN LABELING

Aidan Clancy, Liberty University, Department of Biology and Chemistry

Meghan Gardiner, Liberty University, Department of Biology of Chemistry

Mentor: Michael Korn, Liberty University, Department of Biology and Chemistry

This research involves synthesizing fluorescent dyes for protein labeling. Modified anthraquinone fluorophores with various binding groups, such as biotin, maleimide, and the N-hydroxysuccinimide ester will be synthesized. Their solubility, binding efficiency, Stokes shift, and fluorescence will be investigated and compared to other (known) protein-binding fluorophores.

11) ASSESSMENT OF THE PUTATIVE DASH COMPLEX GENE DCM1 IN CRYPTOCOCCUS NEOFORMANS.

Nyle Shank, Liberty University, Department of Biology and Chemistry

Mentor: Michael Price, Liberty University College of Osteopathic Medicine, Molecular and Cellular Sciences

Cryptococcus neoformans is a yeast that exhibits titan cell formation and pH regulation to assist its survival in host cells. Our research will examine dcm1Δ cell ploidy and evaluate the rim101Δ and sre1Δ pathways for their role in regulating pH in alkaline conditions.

13) AUDIOGRAM EMULATOR

Cole Bowyer, Virginia Military Institute, Electrical and Computer Engineering

Mentor: James Squire, Virginia Military Institute, Electrical and Computer Engineering

This research project involves app development to allow people to understand and experience a hearing impairment. This could raise awareness for a population of children that have a hearing impairment and do not receive some treatment.

15) CHARACTERIZATION OF THE EFFECT(S) OF SELECT COFFEE-DERIVED COMPOUNDS, OF LOW MOLECULAR WEIGHT, ON THE GROWTH OF METABOLIC SYNDROME-ASSOCIATED GUT MICROFLORA

Emily Bayliss, Liberty University, Department of Biology and Chemistry

Oliva Mankos, Liberty University, Department of Biology and Chemistry

Josiah Chung, Liberty University, Department of Biology and Chemistry

Mentor: William Moore, Liberty University, Department of Biology and Chemistry

Our research project is aimed at determining whether specific coffee-derived polyphenols and/or their metabolites affect the growth of representative species of the Bacteroidetes and Firmicutes phyla associated with metabolic syndrome.

17) CHARACTERIZATION OF THE MECHANISM(S) BY WHICH ENTERODIOL STIMULATES GLUCOSE UPTAKE IN 3T3-L1 DIFFERENTIATED ADIPOCYTES

Brooke Chapple, Liberty University, Department of Biology and Chemistry

Jack Spiaggia, Liberty University, Department of Biology and Chemistry

Mentor: William Moore, Liberty University, Department of Biology and Chemistry

Type 2 diabetes (T2D) is characterized by chronic fasting hyperglycemia due to insulin resistance and reduced glucose uptake. Several compounds from coffee have been shown to enhance glucose uptake in skeletal muscle and adipose cells, yet the underlying mechanism(s) remain largely unclear. Thus, we aim to characterize these molecular mechanisms.

19) CHARACTERIZATION OF THE MECHANISMS BY WHICH ENTEROLACTONE, A METABOLITE OF MATAIRESINOL, PROMOTES GLUT4-DEPENDENT GLUCOSE UPTAKE IN 3T3-L1 ADIPOCYTES

Rochelle Miller, Liberty University, Department of Biology & Chemistry

Heidi Bosch, Liberty University, Department of Biology & Chemistry

Merritt Smith, Liberty University, Department of Biology & Chemistry

Mentor: William Moore, Liberty University, Department of Biology & Chemistry

Type-2 diabetes (T2D) is characterized by chronic fasting hyperglycemia. We recently found thatenterolactone, a metabolite of matairesinol, which is derived from coffee, promotes Glut4-mediated glucose uptake and protein kinase B (Akt) phosphorylation in 3T3-L1 differentiated adipocytes. Here, we propose to further characterize the mechanism underlying these effects.

21) CHARACTERIZING A NOVEL IN VITRO SYSTEM FOR THE INVESTIGATION OF HUMAN POST-TRAUMATIC FIBROSIS

Jasmin Palmer, James Madison University, Department of Biology

Mentor: Jaira Ferreira de Vasconcellos, James Madison University, Department of Biology

The post-traumatic cellular microenvironment consists of many immunomodulatory cells, including macrophages that secrete pro-fibrotic TGFβ1. Studies show that TGFβ1 demonstrates wound-healing properties. The purpose of this project is to characterize an in vitro system consisting of nanofiber cell culturing plates to further study post-traumatic environments and the role of TGFβ1.

23) CHARACTERIZING AN IN VITRO CO-CULTURE SYSTEM FOR SECONDARY ACUTE MYELOID LEUKEMIA STUDIES

Leah Friedman, James Madison University, Department of Biology

Mentor: Jaira Ferreira de Vasconcellos, James Madison University, Department of Biology

Acute myeloid leukemia (AML) is a poor-prognosis cancer that often leads to bone marrow failure. Secondary AML (sAML) appears in patients with a history of hematological disorders. The progression to sAML is not comprehensively understood. Our overall goal is to establish a novel in-vitro 3D model to further characterize sAML.

25) CHRONOTHERAPEUTIC IMPACT OF NANOCELLULOSE-ENCAPSULATED 5- FLUOROURACIL DELIVERY ON COLORECTAL CANCER CELL VIABILITY

Lacey Ngo, Virginia Tech, College of Science

Mentor: Carla Finkielstein, Virginia Tech, College of Science

Colorectal cancer treatment includes continuous intravenous infusion of 5-fluorouracil (5-FU), a drug with low specificity and short half-life. This project aims to explore bacterial nanocellulose as a delivery system for oral 5-FU and determine the optimal time-of-day for maximum impact on colon cancer cell viability.

27) COMPARING EFFECTS OF ELEVATION ON CORT PRODUCTION AND BODY CONDITION IN PLETHEDON HUBRICHITI

Jason Porter, Liberty University, Depart of Biology and Chemistry

Sarah Kate Meetze, Liberty University, Department of Biology and Chemistry

Mentor: Cory Goff, Liberty University, Department of Biology and Chemistry

Our research compares the corticosterone levels of salamanders from different elevations, simultaneously measuring body conditions. A non-invasive water borne hormone collection technique allows for the measurement of corticosterone levels. This data indicates to what degree environmental conditions affect salamander populations as a whole.

29) COMPETITION IMPACT ON CORT AND BODY CONDITION IN MONTANE SALAMANDER (PLETHODON HUBRICHTI)

Makenna Landis, Liberty University, Department of Biology and Chemistry

Rachel Wineman, Liberty University, Department of Biology and Chemistry

Mentor: Cory Goff, Liberty University, Department of Biology and Chemistry

This study will compare Plethodon hubrichti body condition and corticosterone release rates collected via a non-invasive hormone collection method and quantified using ELISA plating. Corticosterone release rates and body condition will help to determine the health of the population and show the possible effects of competition between salamanders.

31) COUNTERACTING ANTIBIOTIC RESISTANCE IN BACILLUS BACTERIA WITH PHAGE THERAPY

Rebecca Cherian, University of Mary Washington, Biological Sciences

Natalie Fox, University of Mary Washington, Biological Sciences

Michael Combs, University of Mary Washington, Biological Sciences

Mentor: Swati Agrawal, University of Mary Washington, Biological Sciences

The increased use of antibiotics has contributed to increasing antimicrobial resistance, a leading public health threat. Bacteriophages, specialized viruses that selectively infect bacterial strains, emerge as a valuable alternative. This research utilzes bacteriophages Atlee and JackRabbit, discovered at UMW, along with select antibiotics to infect pathogenic Bacillus cereus isolates.

33) CRAYFISH AS A BIOLOGICAL RESERVOIR FOR THE AMPHIBIAN SKIN PATHOGEN BATRACHOCHYTRIUM DENDROBATIDIS

Kyra Goyette, Liberty University, Biology

Jordan Tennis, Liberty University, Biology

Delilah Hughes, Liberty University, Biology

Joshua Sorenson, Liberty University, Biology

Jonah Partin, Liberty University, Biology

Mentor: Matthew Becker, Liberty University, Biology

Mentor: Kyle Harris, Liberty University, Biology

Batrachochytrium dendrobatidis (Bd) is a chytrid fungus that infects amphibians globally and is linked to widespread population decline. Crayfish are documented as potential carriers of Bd in aquatic ecosystems. This study aims to evaluate the susceptibility of crayfish to Bd by exposing crayfish to this fungal pathogen in a lab-based setting.

35) CRISPR CAS9 MEDIATED GFP TAGGING OF CD79A IN DANIO RERIO

Oluwakonyinsola Adebayo, Liberty University, Department of Biology and Chemistry

Broderick Adams, Liberty University, Department of Biology and Chemistry

Gavin Litchford, Liberty University, Department of Biology and Chemistry

Mentor: Lindsey Stevenson, Liberty University, Department of Biology and Chemistry

The research team aims to identify the location of B-cells throughout Danio rerio immune development by tagging CD79a, also known as Igα, with green fluorescent protein (GFP). Tagging Igα will be accomplished using a CRISPR Cas-9 delivery system..

37) DEGRADATION OF FLUORINATED PHENOLS BY HORSERADISH PEROXIDASE: STRUCTURE ACTIVITY RELATIONSHIPS

Ashton Ware, Liberty University, Department of Biology and Chemistry

Mentor: Gregory Raner, Liberty University, Department of Biology and Chemistry

Mentor: Hector Medina, Liberty University, Department of Engineering

The degradation of mono- and polyfluorinated phenolic compounds was recently demonstrated using two different plant peroxidases. A dependence of the reaction rate on the number of fluorine substituents was observed, but the underlying basis for selectivity was not established. This work aims to establish structure/activity relationships governing catalysis in these systems.

39) DETECTION OF PFAS USING MOLECULARLY IMPRINTED POLYMERS

Elizabeth Montgomery, Liberty University, Department of Biology and Chemistry

Jaice Thurber, Liberty University, Department of Biology and Chemistry

Mentor: Stephen Hobson, Liberty University, Department of Biology and Chemistry

Proposed herein is the synthesis of fluorinated molecularly imprinted polymers (fMIP) from two novel crosslinking monomers to bind perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). The binding capacity of the fMIP will be determined using HPLC/MS and the selectivity/sensitivity will be determined using quartz crystal microbalance (QCM).

41) DEVELOPING A MINIMALLY INVASIVE METHOD FOR ASSESSING AN INDIVIDUAL,ÄÔS CHRONOTYPE USING HAIR FOLLICLE CELLS

Chloe Nyhart, Virginia Tech, College of Science

Hannah Puskar, Virginia Tech, Biological Sciences

Mentor: Carla Finkielstein, Virginia Tech, College of Science

We are developing a novel and minimally invasive method of assessing a patient's chronotype by measuring circadian gene expression in hair follicle cell samples. Ultimately, we will be able to assess an individual's chronotype with a single collection time point using the machine-learning program CYCLOPS 2.0.

43) EFFECTS OF NATIVE SUBSTRATES ON PUTATIVE HISTONE ACETYLTRANSFERASES IN CRYPTOCOCCUS NEOFORMANS.

Timothy Naff, Liberty University, Dept. of Biology and Chemistry

Mentor: Gary Isaacs, Liberty University, Dept. of Biology and Chemistry

The goal of this research is to further the knowledge concerning the pathogen C. neoformans through the study of transcriptional regulators. More specifically, my focus has been the development of an appropriate histone deacetylase assay (HDAC assay) and the testing of a putative HDAC active during stressors potentially involved in virulence.

45) EMOTION DYSREGULATION AND SUBSTANCE

MeKayla Smith, Virginia State University, Psychology Department

Mentor: Larry Keen, Virginia State University, Psychology Department

The current study sought to examine the association between Emotion Dysregulation and substance use.

47) EXPRESSION OF PLASMODESMAL REGULATORY GENES IN RESPONSE TO BRASSINOSTEROIDS

Max De La Cruz Morrobel, University of Mary Washington, Biological Sciences

Mentor: April Wynn, University of Mary Washington, Biological Sciences

Brassinosteroids are phytohormones that regulate cellular growth/division. They were recently found to transport through the plasmodesmata, a cytoplasmic sleeve between plant cells. Plasmodesmata have a regulatory mechanism that pinch the channel shut and slows the movement of molecules. This study works to elucidate the mechanisms between brassinosteroids and plasmodesmata.

49) FLORA OF CANDLER'S MOUNTAIN: DOCUMENTING NATURAL COMMUNITIES AND ESTABLISHING AN HERBARIUM

Jordan Whitt, Liberty University, Biology **Christian Gilbert**, Liberty University, Biology

Jenna Morris, Liberty University, Biology **Elizabeth Williams**, Liberty University, Biology

Alexis Snyder, Liberty University, Biology

Mentor: Kyle Harris, Liberty University, Biology

Herbaria are natural history collections containing dried plant material and function as the working tool of taxonomists to support understanding plant identification, nomenclature, classification, distribution, ecology, and further consideration of the societal implications of plants. This project involves a herbaria collection conducted on Candler’s Mountain.

POSTER PRESENTATIONS *(Session 2) – 2:00-3:00*

2) FORMALIN-INDUCED CHRONIC PAIN IN MICE

Abigail Pendell, Liberty University, Biology and Chemistry

David Mendes, Liberty University, Biology and Chemistry

Mentor: Ersilia Mirabelli, Liberty University, Biology and Chemistry

Establishing a mouse model for the study of chronic pain using a non-surgical approach via subcutaneous formalin injections.

4) GENOME-WIDE CYTOTOXICITY EFFECTS OF MYCOBACTERIOPHAGE MERCURIO

Tyler Downs, University of Mary Washington, Department of Biology

Mentor: Swati Agrawal, University of Mary Washington, Department of Biology

Approximately 75% of bacteriophage gene functions are unknown. Part of the SEA-GENES initiative, this project will systematically screen bacteriophage genes to determine functionality, advancing efforts against the growing public health threat of antimicrobial-resistant bacteria. Mycobacteriophage Mercurio,Äôs 64 genes will be studied for cytotoxicity (host cell lysis) and superimmunity (host protection).

6) IDITAROD'S EFFECT ON DM1 DISEASE PROGRESSION IN A DROSOPHILA MELANOGASTER MODEL

Delaney Humphrey, University of Mary Washington, Biology

Mentor: Ginny Morriss, University of Mary Washington, Biology

This study investigates the therapeutic potential of irisin in Myotonic Dystrophy type 1 (DM1) using a Drosophila model. It focuses on modulating Iditarod (Drosophila homologue of Irisin) to assess its effects on muscle function and hypertrophy through genetic manipulation and exercise training, aiming to counteract DM1-induced muscle wasting.

8) INFLUENCE OF PRM1 ON CRYPTOCOCCUS NEOFORMANS VIRULENCE

Cate Plaisance, Liberty University, Department of Biology and Chemistry

Mentor: Michael Price, Liberty University College of Osteopathic Medicine, Molecular and Cellular Sciences

The gene CNAG_05866 in Cryptococcus neoformans, an ortholog of PRM1 in S. cerevisiae, was found in a mutagenesis screen to influence pH regulation/adaptation. This research project will investigate the mating phenotypes, virulence, and intracellular survival of prm1delta as well as its role in the SRE1 and RIM101 pH regulatory pathways.

10) INFLUENCE OF SCP1 ON CRYPTOCOCCUS NEOFORMANS PH ADAPTATION AND VIRULENCE.

Carleigh Warsing, Liberty University, Department of Biology and Chemistry

Mentor: Michael Price, Liberty University College of Osteopathic Medicine, Molecular and Cellular Science

SCP1 gene ortholog CNAG_01580 was identified as influencing pH adaptation in Cryptococcus neoformans. This gene was previously deleted and reconstituted using a gene gun. Wildtype, scp1Œî mutant, and reconstituted strains will be evaluated for virulence phenotypes in invertebrate and murine models of disease, including real time expression using qPCR.

12) INFLUENCE OF THE GLP-1 SYSTEM IN THE POSITIVE COGNITIVE EFFECTS OF ENVIRONMENTAL ENRICHMENT

Christopher Anderson, University of Mary Washington, Biological Sciences

Lexi Miller, University of Mary Washington, Biological Sciences

Mentor: Parrish Waters, University of Mary Washington, Biological Sciences

Ozempic activates the GLP-1 system and is used to treat diabetes and curb appetite in obese individuals. Ozempic may also increase memory. We will test this using in mice using an enriched environment. We will use GLP-1 agonists and antagonist to explore this relationship. Our results should increase our understanding of the long-term effects of this new drug.

14) INSIDE DROSOPHILA MELANOGASTER'S FIGHT TO SURVIVE ONLY ONE MOVE, THE INNATE IMMUNE SYSTEM

Destinee Biyoudi-Monthe, George Mason University, Department of Biology

Mentor: Sasha Stoddard, George Mason University, Department of Biology

This research project investigates the immune response of Drosophila melanogaster, focusing on the potential link between Immune Deficiency (IMD) and Toll pathways. By challenging flies with various pathogens, we aim to uncover gene interactions and enhance pest control strategies through environmentally friendly methods.

16) INVESTIGATING HONEY BEE PARASITE LOAD AS RELATED TO IMMEDIATE ENVIRONMENTAL FACTORS

Megan Kirby, Liberty University, Biology and Chemistry

Julia Weinand, Liberty University, Biology and Chemistry

Mentor: Morgan Horning, Liberty University, Department of Biology and Chemistry

Several factors are associated with colony collapse disorder in European honey bees (Apis mellifera), particularly pests and the impact of vegetation in the surrounding environment. This study examines the relationship between environment and pest presence in A. mellifera colonies located in central Virginia.

18) INVESTIGATING SAS3 FUNCTIONALITY IN C. NEOFORMANS

Kayla Riggleman, Liberty University, Department of Biology and Chemistry

Mentor: Gary Isaacs, Liberty University, Department of Biology and Chemistry

This research is seeking to prove or discredit the role of C. Neoformans SAS3 in histone acetylation. Particularly, this will be an investigation into whether it functions in an acetylating protein complex.

20) INVESTIGATION OF A SMALLER ISOFORM OF THE "PROMISCUOUS" P300 PROTEIN

Caroline Wethington, Liberty University, Biology and Chemistry

Mentor: Vhuthuhawe Madzinge, Liberty University, Biology and Chemistry

We are investigating the activity of a p300 isoform that has not been studied in detail. The objective of the study is to determine whether this isoform has HAT activity. This study is important because the isoform could have similar or opposing effects on their targets compared to other isoforms.

22) METABOLISM OF MATAIRESINOL TO ENTEROLACTONE BY GUT MICROFLORA ASSOCIATED WITH METABOLIC SYNDROME

Josiah Chung, Liberty University, Department of Biology and Chemistry

Olivia Mankos, Liberty University, Department of Biology and Chemistry

Emily Bayliss, Liberty University, Department of Biology and Chemistry

Mentor: William Moore, Liberty University, Department of Biology and Chemistry

Gut microbiome composition influences whole-body metabolism, with elevated Firmicutes:Bacteroidetes linked to obesity and type 2 diabetes (T2D). Polyphenols can attenuate gut dysbiosis. Our lab found that matairesinol (MA) inhibits Enterococcus faecalis growth, while its metabolite, enterolactone (ENL), promotes growth. We aim to determine whether E. faecalis metabolizes MA to ENL.

24) METHIONINE RESTRICTION INDUCES SYNERGISTIC EFFECTS WITH CHEMOTHERAPY APPLICATION

Briza Valdes-Llamas, University of Mary Washington, Department of Biology

Mentor: Laura Sipe, University of Mary Washington, Department of Biology

In this research, triple negative breast cancer adjacent cells were subdued to low methionine environments with or without chemotherapy application to evaluate its effects on cellular viability & proliferation rates

26) MICROWAVE-ENHANCED SYNTHESIS OPTIMIZATION OF BGF

Jessica Bryant, Liberty University, Department of Biology and Chemistry

Mentor: Stephen Hobson, Liberty University, Department of Biology and Chemistry

Bisphenol A (BPA) is a monomer used to produce epoxy resins and in thermal printing processes. BPA is problematic from environmental and toxicological perspectives since it is synthesized from non-renewable sources and is an estrogenic compound. Research is being conducted on the synthesis of monomers with structures mimicking BPA.

28) OBSERVING THE MECHANISTIC LINK BETWEEN TUMOR SUPPRESSOR GENES REACTIVATION AND THE ANTI-PROLIFERATIVE EFFECTS IN STARVED BREAST CANCER CELLS FROM METHIONINE

Loren Delgadillo-Llano, University of Mary Washington, Biology

Mentor: Laura Sipe, University of Mary Washington, Biology

Triple-negative breast cancer (TNBC) is an aggressive subtype, emphasizing the need for better treatments. One approach is depriving TNBC cells of methionine, an essential amino acid. This proposal aims to investigate the mechanistic links between tumor suppressor genes reactivation and the anti-proliferative effects in TNBC in limited methionine restricted environment.

30) PETROGRAPHIC INVESTIGATION OF TYRANNOSAURUS REX FROM THE HELL CREEK FORMATION, MONTANA: IMPLICATIONS FOR PALEOENVIRONMENTAL ANALYSIS

Katelyn Harris, Radford University, Geology

Kristen Zimmerman, Radford University, Geology

Bode Lindauer, Radford University, Geology

Mentor: Parvinder Sethi, Radford University, Geology

This project focuses on the creation of microscopic thin sections of dinosaur bones and observation of diagnostic structures on a microstructural level for interpretation of ancient environments. State-of-the-Art 3-D models will also be produced for digital preservation and free 24/7 online access of dinosaur samples utilized in the project.

32) QUANTIFICATION OF BIOGENIC AMINES FROM CADAVERIC TISSUE USING GCMS

Lydia Buxa, Liberty University, Department of Biology and Chemistry

Mentor: Todd Allen, Liberty University, Department of Biology and Chemistry

Three biogenic amines (cadaverine, putrescine, and methylamine) are commonly produced during human decomposition as a result of the decarboxylation of amino acids. The level of decomposition correlates to the concentration of these amines, which can be determined using GCMS following amine extraction from cadaverine tissue and chemical derivatization.

34) SPIN AND ORBITAL MAGNETIC STRUCTURE OF TOPOLOGICAL ORBITAL MAGNET γ-FeMn

Emilio Corrales, Virginia Polytechnic and State Institute, Department of Physics

Mentor: Rachel Maizel, Virginia Polytechnic and State University, Department of Physics

Mentor: Tatsu Takeuchi, Virginia Polytechnic and State University, Department of Physics

Mentor: Satoru Emori, Virginia Polytechnic and State University, Department of Physics

Mentor: Vsevolod Ivanov, Virginia Polytechnic and State University, Department of Physics

In conventional magnetic materials, a large spin-orbit coupling due to the presence of heavy elements can lead to an orbital component to their magnetism. In topological materials, a sizeable orbital magnetism can instead arise due to nontrivial Berry curvature in the material, which itself is driven by the spin component of the magnetic structure. It was recently predicted that the non-coplanar antiferromagnetic order together with strain in the alloy γ-FeMn can lead to a sizable orbital magnetism despite the minimal spin-orbit coupling interactions in this material. To better understand the spin and orbital magnetic order in γ-FeMn we perform first principles simulations using the DFT+U method. The alloy structure is treated using the virtual crystal approximation (VCA) which allows for probabilistic occupations of the atomic sites, while the strain is modeled as a simple rhombohedral distortion of the cubic unit cell along the direction. We study the relative magnitudes and orientations of the spin and orbital magnetic moments as function of strain and Mn concentration, and compare with experimental results.

36) THE ACETYLATION OF S6K1 K516 AND ITS DOWNSTREAM EFFECTS

John Zelenka, Liberty University, Biology and Chemistry

Rachel DeKlerk, Liberty University, Biology and Chemistry Department

Mentor: Vhuthuhawe Madzinge, Liberty University, Biology and Chemistry

S6K-1 is a key protein responsible for regulating protein synthesis. P300 acetylates S6K1 at Lysine 516 (K516). However, the effects of this acetylation are as yet unknown.

38) THE EFFECTS OF MYOGLIANIN KNOCKDOWN IN DROSOPHILA MELANOGASTER WITH MYOTONIC DYSTROPHY TYPE ONE

Eleni Kepler, University of Mary Washington, Department of Biological Sciences

Mentor: Ginny Morriss, University of Mary Washington, Department of Biological Sciences

Myotonic Dystrophy Type One (DM1) leads to muscle atrophy and insulin resistance. Muscle growth is regulated by myoglianin in Drosophila. Inhibition of myoglianin promotes faster muscle growth and reduces insulin resistance. This study investigates the link between myoglianin and insulin resistance in a Drosophila melanogaster DM1 model.

40) THE EFFECTS OF PDGFRŒ≤ ACTIVATION ON VASCULATURE IN HUVEC CELLS TRANSFECTED WITH MYOTONIC DYSTROPHY TYPE 1 REPEATS

Bonnie Butler, University of Mary Washington, Department of Biology

Mentor: Ginny Morriss, University of Mary Washington, Department of Biology

The objective of this research is to determine how the introduction of platelet derived growth factor-BB (PDGF-BB) affects vasculature development in cells transfected with DM1 repeats. Vasculature length and width will be imaged and analyzed to determine the effect of PDGF-BB on vasculature development.

42) THE EFFECTS OF PUTATIVE HISTONE ACETYLTRANSFERASES ON NATIVE SUBSTRATES IN CRYPTOCOCCUS NEOFORMANS.

Ethan Carlile, Liberty University, Department of Biology and Chemistry

Joseph Whaley, Liberty University, Department of Biology and Chemistry

Mentor: Gary Isaacs, Liberty University, Department of Biology and Chemistry

Histone acetyltransferases (HATs) are important epigenetic enzymes that are highly selective, recognizing their targets with high precision. After purifying several putative Cryptococcus neoformans proteins with significant homology to proven HATs, we have turned our attention to purifying their native substrates, histone subunits, to determine if they possess HAT activity.

44) THE INTERPLAY OF MOVEMENT AND REWARD: AN INVESTIGATION OF THE EFFECTS OF ENHANCED ANTICIPATION ON DIFFERENTLY MOTIVATED RESPONSES IN RATTUS NORVEGICUS

Yulia Shatalov, University of Richmond, Biology

Mentor: Kelly Lambert, University of Richmond, Psychology

Mentor: Sarah Catherine Hartvigsen, University of Richmond, Psychology

Deficits in motivation are among the most commonly recognized symptoms of depression. We aim to investigate how anticipation-enhanced training impacts intrinsic and extrinsic motivational behaviors and explore associated changes in c-fos activation and D1 and D2 receptor expression in the nucleus accumbens and striatum.

46) THE MEASUREMENT OF THE RELATIVE RATE OF EFFUSION VIA AN ULTRASONIC SENSOR

Jamie Sims, University of Lynchburg, Chemistry

Mentor: Matthew Brynteson, University of Lynchburg, Chemistry

We propose the construction of a gas-sealed apparatus to measure the relative effusion rate for two gasses in a mixture. To achieve effusion, the mixture will evacuate through a small (~1 micron) pinhole for a short time duration. An ultrasonic sensor will measure the speed of sound to determine the mixture composition.

48) THE MOLECULAR BASIS OF 24-METHYL CHOLESTEROL AS AN ANTI-RENAL CLEAR CELL CARCINOMA AGENT IN THE CONTEXT OF ALTERED GLUCOSE METABOLISM

Esti Dautaj, Liberty University, School of Health Sciences: Biology & Chemistry

Mentor: William Moore, Liberty University, Department of Biology & Chemistry

Our lab recently found that 24-methyl cholesterol, a natural phytoestrogen, inhibits glucose uptake and AMPK phosphorylation. In this study, we aim to further investigate the effects of varying concentrations of 24-methyl cholesterol on NAMPT activity and correlate these findings with the NAD+ production in renal cell carcinoma (RCC) cells.

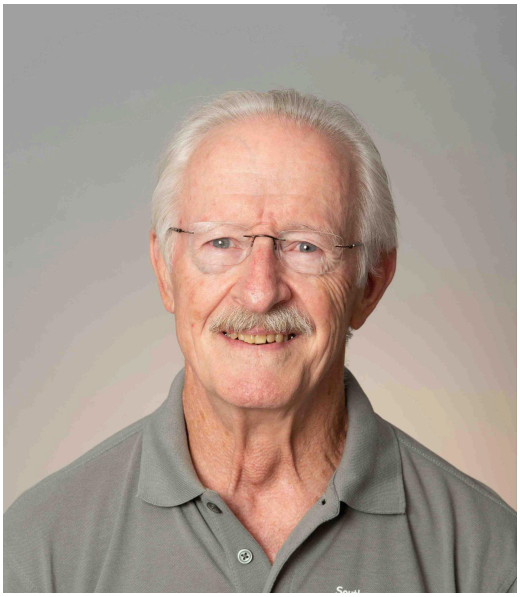
50) FINITE FIELDS AND MUTUALLY UNBIASED BASES.

Hampton Smith, Virginia Tech, Physics

Mentor: Tatsu Takeuchi, Virginia Tech, Physics

Mutually Unbiased Bases are used to construct efficient quantum algorithms. Open questions exist concerning their structure and predictions on quantum systems. We present a proposal for discerning whether these systems can be modeled in non-prime dimensions. A mathematical model over the finite fields and the resulting classical computational model is described.

Keynote Speaker



Dr. David Johnson

Professor Emeritus, Ferrum College

Smith Mountain Lake Water Quality Monitoring Program

I grew up in northern Michigan, swimming in Crystal Lake and Lake Michigan, and earned my BS in chemistry and an MS and Ph.D. in environmental chemistry from The University of Michigan. After teaching chemistry and environmental science for 36 years at Ferrum College and serving as Dean of the School of Natural Sciences & Mathematics, I retired in 2015 and am now Faculty Emeritus. I've been doing water quality research at Smith Mountain Lake for 40 years and Three Gorges Reservoir for 20 years, traveling to China every year from 2004 to 2019. I still work a little on the Smith Mountain Lake project and with an environmental chemistry group at China Three Gorges University.

Panel Topic: Graduate School and Beyond

Navigating the University and the Job Market

In parallel with the two lunch blocks, Tim Durham of Ferrum College will host two professional scientists who can speak to opportunities open to those with a bachelor's degree in science. This will be an informal discussion/Q&A session that may guide our undergraduates in their best options and practices as they approach graduation (and even after graduating).

Tim is a lifelong agriculturist. His family operates Deer Run Farm – a 30 acre "truck" farm on Long Island, New York. As one of a handful of farms in the area, it faces unique challenges, especially those associated with urban-edge agriculture. As a result, Tim has a keen interest in the interplay between science, sustainability, and policymaking. After graduating from Cornell University in 2001 with a B.S. in Plant Science, he worked in various levels of state and federal government while continuing to work seasonally at the farm. In 2004, he was awarded a Rotary Foundation Ambassadorial Scholarship for study at Lincoln University, New Zealand. The Department of Homeland Security awarded Tim a graduate fellowship in 2005. In the summer of 2006, he was a visiting fellow at Los Alamos National Lab, working with crop biosecurity. In 2008, he was awarded an NSF sponsored travel grant to participate in the Rice: Research to Production Course at the International Rice Research Institute (IRRI) in the Philippines. In 2008, Tim graduated from the University of Florida with a degree in Plant Medicine, the equivalent of a "plant M.D." He is currently an Associate Professor of Crop Science at Ferrum College.

Valarie Roberts is an Admissions Application Appraiser with the Virginia Tech Carilion School of Medicine in Roanoke, Virginia. She began her journey toward higher ed administration with an undergraduate degree at the University of Central Florida in 1999 and completed her postgraduate studies in school administration at Virginia Tech in 2013, having worked in both undergraduate and graduate admissions, her passion is to empower students with the knowledge, resources, and skills to show up as the best and most uniquely positioned candidate for their ideal school and profession.

Matthew Hull serves as Research Professor and Director of the Nanoscale Characterization and Fabrication Laboratory (NCFL) in Virginia Tech's Institute for Critical Technology and Applied Science (ICTAS). He also serves as Associate Director for Innovation and Entrepreneurship for the NSF-funded US National Nanotechnology Coordinated Infrastructure (NNCI) and Virginia Tech's National Center for Earth and Environmental Nanotechnology (NanoEarth). In 2007, Hull founded NanoSafe, Inc., a provider of nanotechnology environmental health and safety (EHS) services. After 16 years leading the company, Hull successfully exited NanoSafe, Inc. in 2023, through an acquisition by ITA International, LLC. He received his Ph.D. in Civil and Environmental Engineering from Virginia Tech in 2011 and an M.S. in Biology from Virginia Tech in 2002. He received his B.S. In Environmental Science from Ferrum College in 2000.

Lightning Talks

Selected students will deliver their proposals in an oral format, allowing them to elaborate on their projects. These students volunteered for this portion of the meeting, and their talks are not considered in the judging for awarded grants. Instead, these presentations provide students the chance to deliver a seminar-style talk (albeit brief), expanding the experience they will gain from this meeting.

LT1 **Cole Bowyer**
Virginia Military Institute, Electrical and Computer Engineering
Audiogram Emulator

LT2 **Destinee Biyoudi-Monthe**
George Mason University, Department of Biology
Inside Drosophila Melanogaster, a fight to survive only one move, the innate immune system

LT3 **Eleni Kepler**
University of Mary Washington, Department of Biological Sciences
The Effects of Myoglianin Knockdown in Drosophila melanogaster with Myotonic Dystrophy Type One

LT4 **Nyle Shank**
Liberty University, Department of Biology and Chemistry
Assessment of the putative DASH complex gene DCM1 in Cryptococcus neoformans.

LT5 **Chloe Nyhart and Hannah Puskar**
Virginia Tech, College of Science
Developing a minimally invasive method for assessing an individual's chronotype using hair follicle cells

LT6 **William Ngo**
Virginia Tech, Department of Biochemistry
Analysis of Anti-Nutritional Factors in Soybean Meals for Animal Feed

LT7 **Yulia Shatalov**
University of Richmond, Biology
The interplay of movement and reward: An investigation of the effects of enhanced anticipation on differently motivated responses in Rattus norvegicus

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The Virginia Academy of Science

Spring Meeting

The **2024 VAS Annual Meeting** will be held on ***Thursday, May 22 at The University of Virginia in Charlottesville, VA***. During this meeting, the participating sections will hold Oral Presentation Sessions and a general Poster Session will take place in the afternoon.

- Morning oral presentations will be scheduled at 15-minute intervals and presenters should be prepared for a talk of 10-11 minutes followed by 3–4 minutes Q&A.

- The poster session will be held from approximately 2 – 5 pm. Poster presenters are assigned an hour during which they should be present to discuss their posters and answer questions.

Award recipients from the Fall Undergraduate Research Meeting are invited and expected to present the results of their projects at the Annual Spring Meeting, and all of today's participants are encouraged to present the results of their projects at the 2025 Annual Meeting.

Specific details about the online submission of titles and other information for both oral and poster presentations, as well as more detailed information about the 2025 Annual Meeting, will be made available on the VAS website (www.vacadsci.org) as it becomes available.

Grants and Scholarships

VAS and VJAS Scientific Research Grants, Awards, Scholarships, etc. are made possible by hundreds of corporate and individual donors who believe in our work to benefit the people of Virginia. Many have found this a meaningful way to memorialize a loved one, support a student's education, or recognize the work of a colleague.

For Information and Applications for Research Grants, please contact: Philip M. Sheridan, Executive Officer, Virginia Academy of Science at psheridan@vacadsci.org or 804-633-4336

The Virginia Academy of Science

General information

The **Virginia Academy of Science** (VAS) is the fifth largest state, region, or city academy of science in the US; it was founded in 1923 to promote the civic, academic, agricultural, industrial, and commercial welfare of the people of Virginia. Exemplary programs have included *Flora of Richmond and Vicinity* (published, 1930), the first comprehensive multidisciplinary studies of the James River Basin and the Great Dismal Swamp, volunteer research assistance to Virginia in the instance of the kepone pollution disaster, and leadership in establishing the Science Museum of Virginia.

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