



**Virginia Academy of Science
Fall Undergraduate Research Meeting**

Saturday, October 29, 2016

Virginia Union University
Claude G. Perkins Living & Learning Center
Richmond, VA

9:00 am - 3:45 pm

The VAS Fall Undergraduate Research Meeting is a research grant proposal competition, which 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 students (along with their mentors must submit their grant applications/ research proposals by the stated deadline (October 1) and then present posters outlining their research projects at the Fall Undergraduate Research Meeting. Both the research proposals and the poster presentations are evaluated to determine the recipients of the grants.

At least five research grant awards of \$500 each will be given to the top student research proposals-poster presentations selected by the Fall Meeting Judges. The recipients of these grant awards will be announced at the conclusion of the meeting. The grant award recipients will also be awarded Student Membership in the VAS for 2017 and will be expected to present the results of their funded research at the 2017 VAS Annual Meeting in May at Virginia Commonwealth University.

VAS President-Elect Robert Atkinson, Professor of Organismal & Environmental Biology at Christopher Newport University, serves as the Program Chair for the 2016 Fall Undergraduate Research Meeting.

Special thanks are extended to the administration, faculty and staff of Virginia Union University for hosting the VAS 2016 Fall Undergraduate Research Meeting. Catering for this event has been provided by Thompson Hospitality at Virginia Union University.

Special thanks are also extended to the following individuals who are serving as Judges for the 2016 Fall Undergraduate Meeting:

Tarek Abdel-Fattah, Christopher Newport University
Robert Atkinson, Christopher Newport University
Michelle Clark, Christopher Newport University
Richard Curzon, Meadowview Biological Research Station
Michael Hammond, Meadowview Biological Research Station
Wes Hudson, Virginia Institute of Marine Science
David Knight, Christopher Newport University
Conley McMullen, James Madison University
Deborah Neely-Fisher, Reynolds Community College
Christopher Osgood, Old Dominion University
Patrick Young, DuPont



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SCHEDULE OF EVENTS

9:00 - 9:50

**Check In (Atrium)
Poster Set-up and Meet and Greet (Conference Room Two)**

During this time period, all meeting attendees should check in at the Check In and Registration Area.

Following Check In student applicants for the Undergraduate Research Grants should set up their posters on their assigned poster boards.

Coffee, tea and other beverages will be available for all meeting registrants in the Atrium.

9:15 - 9:45

Judges Meeting (Conference Room Three)

During this time period the judges will meet with the VAS President-Elect and review the criteria for judging the proposals and posters as well as the procedure for selecting the grant recipients.

9:50 - 10:00

**Welcome, Opening Remarks and Instructions
(Conference Rooms One Two)**

Robert Atkinson, Dept. of Organismal & Environmental Biology,
Christopher Newport University, VAS President-Elect and Fall
Undergraduate Research Meeting Coordinator

10:00 - 12:30

Evaluation of Posters (Conference Room Two)

During this time period, each poster will be evaluated by a team of judges. The judges will meet with the grant applicants and the applicants should be prepared to give a very brief summary (no more than 5 minutes) of the proposed research and then respond to questions from the judges.

12:00 - 1:30

Lunch Break

Lunch and beverages will be available for all meeting registrants in the Atrium (seating available in Conference Room One).

12:30 - 2:45

Judges Lunch and Meeting (Conference Room Three)

During this time period the judges will select the recipients of the 2016-2017 VAS Undergraduate Research Grant Awards.

1:30 - 1:45

Welcome to Virginia Union University (Conference Room One)

Zakir Hossain, Vice-President of Academic Affairs, Virginia Union University

Latrell Green, Dean of the School of Mathematics, Science and Technology, Virginia Union University

1:45 - 2:45

Invited Speaker (Conference Room One)

David S. Torain II, Dept. of Mathematics, Montgomery College (MD)

***Topic:* Using Torain's Equations as a Predictable Model in the Sciences**

Torain's equations are essentially a set of parametric non-linear differential equations that use an analytical tool as a mathematical model. These equations offer a global science view that computer calculations cannot provide. Since only numerical methods have been previously developed in the sciences to investigate this problem, this research proposes a new analytical approach. This approach is based on the notion that when one of the sixteen parameters of Torain's equations is sent to infinity, the general solution, involving the remaining fifteen parameters can be expressed in terms of elementary functions. This is made possible because, in this limit besides the time invariance group, an exact invariance-scaling group exists. This approach uses the science field to study the resulting mathematical model.

2:50 - 3:15

Announcement of Grant Recipients (Conference Room One)

Deborah Neely-Fisher, Reynolds Community College, VAS President

3:15 - 3:30

2016-2017 Undergraduate Grant Recipients Assemble for Photographs (Conference Rooms One & Two)

3:15 - 3:45

Poster Removal (Conference Room One)

Check Out and Departure (Atrium)

During this time period student applicants for the Undergraduate Research Grants should remove their posters from their assigned poster boards and leave the poster board and binder clips on the table for subsequent pickup.

Also, during this time period, all meeting attendees should check out by returning their name tag holders at the Check In and Registration Area.

POSTER PRESENTATIONS

1 **Antiviral Effects of Sweet Basil Components**

Julie Arnold

Mentor: Lynn Lewis, Dept. of Biological Sciences, University of Mary
Washington

The purpose of this research is to test sweet basil extract as well as individual components of sweet basil for their antiviral effects against mouse encephalomyocarditis virus.

2 **Atmospheric Muon Lifetime, Standard Model of Particles and the Lead Stopping Power for Muons**

Cioli Barazandeh

Mentor: Walerian Majewski, Div. of Mathematics, Science & Engineering,
Northern Virginia Community College-Annandale,

The purpose of this experiment is to investigate muons. Specifically, we will be investigating muons on several fronts. This includes: muon lifetime (in material and in vacuum), average flux density in air and after passing different layers of lead shielding, standard model applications, calculating the vacuum expectation value of the Higgs Field, finding the muon stopping power in lead and its energy dependence both in low-energy area and in high-energy interval of several GeV.

3 **Mutations in Fungal Carbon Metabolism Genes Impact Host-parasite Immune Interaction**

Landon Anderson, Elizabeth Rasmussen and Yansirre Aviles

Mentor: Michael Price, Dept. of Biology & Chemistry, Liberty University

These experiments will shed light on the interaction of the host organism's immune defenses with the H99 capsule, furthering the fungal and medical research community's knowledge of the mechanism of interaction between these two elements, and hopefully provide a path to a medical solution for the *C. neoformans* infection epidemic.

4 **Social Stress Induced Sex-specific Expression of BDNF and CRH in the BNST: A Study in the Neurobiological Mechanisms of Anxiety**

Hannah Belski

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

This study explores physiological mechanisms that underlie sex differences in the anxiety that results from social subordination. Candidate systems include neuropeptides in select brain regions and stress related hormonal systems.

5 **Comparison and Application of Fluorescent and Non-fluorescent Methods of Low Concentration Amino Acid Separation using HPLC**

Matthew Anderson

Mentor: Michael Korn, Dept. of Biology & Chemistry, Liberty University

This project involves the comparison and evaluation of different analytical methods for the most effective identification of low concentration mixtures of amino acids by HPLC, testing (a) ortho-phthaldialdehyde (OPA) derivatization; (b) dansyl choride derivatization; and (c) non-modified amino acids via a polar end-capped HPLC column.

6 **The Role of Alpha-melanocyte Stimulating Hormone in Avian Adipose Physiology**

Stephanie Bishop

Mentor: Mark Cline, Dept. of Animal & Poultry Sciences, Virginia Tech

Neuropeptide Y (NPY) was identified as a hunger and lipid deposition-stimulating peptide in adipose tissue in chicks. In rodents, α -melanocyte stimulating hormone (α -MSH) has the opposite effect and promotes lipid breakdown. This project will study the effects of α -MSH on mRNA abundance of lipid metabolism factors in chick adipose tissue.

7 **O-GlcNAc Transferase May Affect the Activity of Succinate Dehydrogenase**

Joel Brenny and Emily Berguson

Mentor: Pei Zhang, Dept. of Biology & Chemistry, Liberty University

O-GlcNAc Transferase (OGT) glycosylates proteins on Ser/Thr residues. We are exploring whether this modification occurs on succinate dehydrogenase (SDH) and what effect it may have on SDH activity. This will be investigated by mutating target sites on SDH, transfection of mutated SDH into a cell line, and an enzymatic assay.

8 **Survey of Parasites in Back Bay Largemouth Bass**

Jonathan Blubaugh

Mentor: David Gauthier, Dept. of Biological Sciences, Old Dominion University

Largemouth bass, *Micropterus salmoides*, are a top predator in the Back Bay ecosystem of south-eastern Virginia and are affected by a variety of parasites that may be negatively impacting their health and population growth. My project aims to perform, for the first time, a comprehensive survey of parasites infecting these ecologically and recreationally important fish using DNA sequencing and morphological study.

9 **The Effects of a Common Herbicide (Atrazine) on Juvenile Crayfish Growth and Development**

Nathan Chandler, Savannah Froese, Samuel Owens and Abbie Suttle

Mentor: Kyle Harris, Dept. of Biology & Chemistry, Liberty University

A range study of atrazine (ppb) on the growth and development of juvenile male crayfish.

10 **Morphometric Study of Visceral Adipose Tissue Composition and its Correlations with Molecular Signaling Events and Progression of Non-alcoholic Fatty Liver Disease (NAFLD)**

Joseph Bradley

Mentor: Ancha Baranova, School of Systems Biology, George Mason University

Visceral adipose tissue (VAT) serves as an endocrine organ that contributes to Metabolic Syndrome (MS) and Non-alcoholic Fatty Liver Disease (NAFLD). In adults, some brown adipose tissue (BAT) is present within VAT and interferes with its endocrine function. We plan to assess BAT component in VAT composition and correlate it with NAFLD stages.

11 **Community Assembly in a Freshwater Ecosystem**

Joey Davis, Sherrie Jeffers, Joy Hart and Thomas Holman

Mentor: Kyle Harris, Dept. of Biology & Chemistry, Liberty University

The purpose of our research is to study the effect of worm density on microbial life and crayfish growth.

12 **Assessment of Copper Nanoparticle-doped Metal-organic Frameworks for Clean Water Applications**

Karter Couser

Mentor: Karl Jackson, Dept. of Natural Sciences, Virginia Union University

The antibacterial properties of copper nanoparticles will be investigated when encapsulated inside the porous metal-organic frameworks (MOFs). The efficiency of this system will be compared to the copper nanoparticles alone using fecal coliform levels as an indicator.

13 **Preparation for Saliva Collection from the Tick *Amblyomma americanum***

Brianna Gasterland, Daniel Burmeister, Daniel Reddy, Jacob Colello, Jessica Rhodes, Joseph Fabrizi and Timothy Bloom

Mentor: Davis McGuirt, Dept. of Biology & Chemistry, Liberty University

We would like to begin studies on tick saliva from the Lone Star tick at several research sites in Lynchburg, VA. The first steps are to choose and document our tick capture sites and to make an apparatus to hold ticks for saliva collection.

14 **Elucidating the Hunger-inhibiting Mechanisms of Oxyntomodulin**

Meredith Essandoh

Mentor: Mark Cline and Elizabeth Gilbert, Dept. of Animal & Poultry Sciences, Virginia Tech

Oxyntomodulin (OXM) has been identified as a factor that reduces food intake in both birds and mammals. This study is proposed to determine the mechanism under which OXM induces satiety and reduction in food intake in chicks.

15 **Histological Protocol: Bridging Paraffin and Cryostat Processing**

Nicole Hawkins

Mentor: Randall Hubbard, Dept. of Biology & Chemistry, Liberty University

This project will seek to establish a standardized pretreatment and staining protocol for cryostat processing of murine intestinal tissues harvested during infection trials which have been fixed longterm in formalin. This will be accomplished by comparison of various cryoprotective solutions, freezing methods, additional fixations, and staining times.

- 16 **Molecular Examination of DNA in Rodlet Cells of Teleost Fish**
Brandon Hamel
Mentor: David Gauthier, Dept. of Biological Sciences, Old Dominion University

Rodlet cells are an unusual cell type found in bony fishes (teleosts). Their unique structure and ambiguous function raise questions among biologists as to their evolutionary origin. This project will utilize molecular genetic techniques in an attempt to more clearly define the identity and origin of these enigmatic cells.

- 17 **Deciphering Mechanisms for Matrix Stiffness Sensing**
Jihyun Kim and Kevin Betsch
Mentor: Pei Zhang, Dept. of Biology & Chemistry, Liberty University

Cells have been demonstrated to sense their microenvironment through bidirectional heterodimer receptors called integrin. Specific motifs of integrin may be responsible for matrix stiffness sensing. This will be investigated by introducing wild-type or mutant integrin into a cell line, seeding onto matrices of different stiffness, and examining subsequent intracellular signaling.

- 18 **Language Translates to Executive Functions: Investigating the Bilingual Advantage in Inhibitory Control**
Melina Knabe
Mentor: Sarah Blythe, Neuroscience Program, Washington and Lee University

This study investigates the effect of mono- and bilingualism on non-linguistic domains using three executive function tasks. Results will demonstrate which linguistic experiences contribute advantageously to cognitive control and task performance.

- 19 **Synthesis of Water-stable Material-organic Framework at Room Temperature**
Nhat Le
Mentor: Karl Jackson, Dept. of Natural Sciences, Virginia Union University

MIL-101, a well-known nanomaterial with amazing physical and chemical properties, could however only be synthesized at the extreme temperature conditions. Fortunately, with our alternative concept by using salt organic linkers, the thermal disadvantages associated with the conventional synthesis approach will be eliminated.

20 **Influence of Environmental Factors on Migration Dynamics of Northern Saw-whet Owls**

Hannah Murphy

Mentor: Gene Sattler, Dept. of Biology & Chemistry, Liberty University

A long-term effort to band Northern Saw-whet Owls in the inner Piedmont of central Virginia near Lynchburg is being conducted to investigate these owls' migration dynamics. This report documents the relationship of environmental variables on nightly capture rates and the possible significance of this relationship.

21 **Characterizing a New Miocene Mysticete Fossil**

Courtland Lyle

Mentor: Deborah O'Dell, Dept. of Biological Sciences, University of Mary Washington

The project consists of describing the taxonomic identity of a fossil mysticete whale. The majority of the specimen is comprised of a partial skull, including largely intact earbones. In addition, another key component of this project will be determining this whale's phylogenetic and evolutionary relationship to other mysticetes.

22 **The Antifungal Properties of Curcumin**

Ruth Nair

Mentor: Michael Price, Dept. of Biology & Chemistry, Liberty University

Curcumin is a naturally occurring compound in turmeric, a common spice from India. It is known to have antibacterial and antifungal properties. The main aim of this project is to quantify its effects on particular fungal strains like *Aspergillus* and *Cryptococcus*.

23 **Evaluation of Chiropteran Ectoparasites from Rose Guano Cave, NV**

Megan Moran

Mentor: Michael Meyer, Dept. of Organismal & Environmental Biology, Christopher Newport University

The aim of this project is to identify ectoparasites from a population of Mexican-free tailed bats (*Tadarida brasiliensis*) as well gain a deeper understanding of the ecological relationships among ectoparasites and the bats.

- 24 **Microbial Effects of Chemically Modified Essential Oils**
Stefany Orellana, Meghan Ehko and Katherine Phillips
Mentor: Michael Korn and Todd Allen, Dept. of Biology & Chemistry, Liberty University

This proposal is an interdisciplinary project between organic chemistry, microbiology and analytical chemistry to investigate chemically modified essential oils and their ability to inhibit the growth of gram-positive and gram-negative bacteria.

- 25 **Antioxidant and Antimicrobial Effectiveness of Starch Nanocomposite Films for Chicken Meat**
Nasreen Rehmani
Mentor: Yixiang Xu, Agricultural Research Station, Virginia State University

Starch nanocomposite films incorporating grape pomace extract and cellulose nanocrystal will be prepared and their properties will be characterized. The prepared films will be applied to ready-to-eat chicken meat and their antioxidant and antimicrobial effectiveness will be determined.

- 26 **HPLC Determination of Folate-linked DNA Alteration Ratios: A Mouse Study**
Caroline Roberts
Mentor: Gary Isaacs, Dept. of Biology & Chemistry, Liberty University

This study will examine the cellular response (DNA modifications) at various developmental time points to diets containing a naturally available folate source (5-MTHF) and compare to diets with or without folic acid.

- 27 **Seed Germination in *Amianthium***
Cierra Sullivan
Mentor: Janet Steven, Dept. of Organismal & Environmental Biology, Christopher Newport University

This study will investigate the seed dormancy-breaking requirements of *Amianthium muscitoxium* (Melanthiaceae) via three experiments: a soil substrate experiment, a hormone experiment, and a stratification experiment.

- 28 **Effects of Dietary Folate on Cognition and Learning in Mice**
Caleb Schreiner
Mentor: Gary Isaacs, Dept. of Biology & Chemistry, Liberty University

Mice will be raised on 4 different diets: Folic acid until weaned and then deficient, folic acid continuous, 5-methyl tetrahydrofolate (5-MTHF) until weaned and then deficient, and 5-MTHF continuous. These mice will then be run in behavioral tests to determine their cognition and learning capabilities.

- 29 **Is Ignorance Bliss? A Prospective Study Examining the Relationship between News Exposure and Anxiety Levels in Adults**
Rebecca Reidy
Mentor: Antonina Farmer, Dept. of Psychology, Randolph-Macon College

This study examines the relationship between news exposure and anxiety levels over time. We will address emotion regulation as a possible moderator, such that greater news exposure may predict higher anxiety levels concurrently and prospectively, but use of more adaptive emotion regulation strategies may serve as a protective factor.

- 30 **ncRNA Gene Expression Associated with Alzheimer's Disease (AD) and Nutrition**
Christopher Schreiner
Mentor: Gary Isaacs, Dept. of Biology & Chemistry, Liberty University

qPCR will be used to confirm the expression of genes discovered via RNA-Seq analysis in AD mice. These methods will later be applied for gene expression analysis in a dietary folate model.

- 31 **Antibacterial Properties of Metallic Nanoparticle-doped MOF's in Water**
Jasmine Walker
Mentor: Karl Jackson, Dept. of Natural Sciences, Virginia Union University

The antibacterial properties of silver nanoparticles will be investigated when doped inside the pores of two water-stable metal-organic frameworks (MOFs) when compared to that of the bare nanoparticles. The level of fecal coliform bacteria in local water samples will be used as a determining factor.

- 32 **Epitope Mapping of *C. rodentium*/antigen-specific IgY Interactions**
Robert Welch
Mentor: Randall Hubbard, Dept. of Biology & Chemistry, Liberty University

Antibodies (IgY) specific to *C. rodentium* can ameliorate symptoms of disease in mice infected with *C. rodentium*. This project is to determine which epitopes are important for protection.

- 33 **Nanoscale Determination of Common Metal Contaminants in Drinking Water via Quantum Dot-based Fluorescence**
Corshai Williams
Mentor: Karl Jackson, Dept. of Natural Sciences, Virginia Union University

A quick and simple method of nanoscale metal ion determination via quantum dot-based fluorescence will be developed for common contaminants in drinking water. The quenching of fluorescence in semiconducting nanoparticles by analyte species will be measured and used to determine optimal conditions.

- 34 **Active Chitosan Nanocomposite Films Incorporating Cellulose Nanocrystals and Grape Pomace Extracts**
Shakeyla Willis
Mentor: Yixiang Xu, Agricultural Research Station, Virginia State University

An environmentally friendly nanocomposite film will be developed by incorporating cellulose nanocrystals and grape pomace extract into chitosan polymer matrix. In order to determine if the developed film would have potential to be used as an active food packaging application, a series of properties, including mechanical, structural, water vapor permeability, and antioxidant activity testing of the films will be evaluated.

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Richmond, VA**

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The Virginia Academy of Science

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.

The **2017 VAS Annual Meeting** will be held on May 17-19 at Virginia Commonwealth University in Richmond. All participants in the Fall Undergraduate Research Meeting are encouraged to participate in this meeting. Detailed information will be provided on the VAS website (www.vacadsci.org) as it becomes available.

VAS and VJAS Scientific Research Grants, Awards, Scholarships, Assistantships, 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.

To Create an Endowment or Make a Donation, please contact Philip M. Sheridan, Executive Officer, Virginia Academy of Science at psheridan@vacadsci.org or 804-864-1451.

For Information and Applications for Research Grants, please contact Philip M. Sheridan, Executive Officer, Virginia Academy of Science at psheridan@vacadsci.org or 804-864-1451.

To become a VAS Member, Institutional Member, or Business Member, please contact The Virginia Academy of Science at vasoffice@vacadsci.org or 804-864-1450. VAS Membership Applications for Individuals, Institutions and Businesses, are available at <http://vacadsci.org/vas-membership/>.

**Virginia Academy of Science
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Richmond, VA 23220
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Remember

Founded the Science Museum of Virginia ... With the Garden Clubs of Virginia, established the Virginia State Parks System ... Established, with the early support of the DuPont family, the first Scientific Research Fund in Virginia ... Founded the Virginia Institute for Scientific Research (erected at the University of Richmond), the forerunner of Virginia Centers for Innovative Technology, funded by the Virginia General Assembly ... Founded The Virginia Junior Academy of Science to foster original research in Virginia middle and high schools ... Published the Flora of Richmond and Its Vicinity ... Leaders' testimony at the Scopes Trial and later resolutions on evolution and its teaching in science curricula of Virginia schools ... Advocated inclusion of women and African-American scientists and science educators in professional meetings ... Founded the Virginia Journal of Science ... Hundreds of teacher education and training programs in the sciences, mathematics, medicine, and technology ... Established the Kiser Fund for Science Teacher Education ... Published The James River Basin: Past, Present, and Future, funded by the Virginia General Assembly, the first comprehensive, multidisciplinary account of the James and its resources, landforms, flora, fauna, industries and businesses ... Established the VJAS Research Fund to support scientific investigations by Virginia's secondary school students ... Annually sponsors "The VJAS Experience" bringing hundreds of secondary students to Virginia colleges and universities to stay on campus and visit research facilities ... Founded the Virginia Science Resource Network to mentor Virginia's teachers and students ... Established the Annual Undergraduate Research Conference to financially support original research in four-year and two-year curricula ... Established scientific advisory service to Virginia Governors and state agencies beginning with the state's kepone disaster ... Supported the founding of the Virginia Institute of Marine Science (College of William and Mary) ... Decades of leadership for the publication of the first *Flora of Virginia* since 1739 (to be published 2012)... ... Annually awards over \$80,000 in sponsored/endedowed scholarships and prizes to Virginia middle and high school students for original research ...

NEXT ...???

*Write Virginia's History
with
The Virginia Academy of Science!*