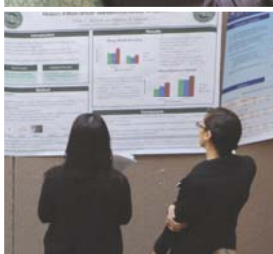




William & Mary  
Graduate Arts & Sciences

# 15<sup>th</sup> Annual Graduate Research Symposium

MARCH 18-19, 2016



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## Schedule at a Glance

### Thursday, March 17, 2016 -- Sadler Center

7:00 pm - 8:30 pm     Jorge Cham Lecture — Book signing to follow  
*Commonwealth Auditorium*

### Friday, March 18, 2016 -- Sadler Center

8:30 am - 9:30 am     Registration  
*Second Floor Lobby*

9:30 am - 10:30 am     Concurrent Sessions  
*Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*

10:45 am - 11:45 am     Concurrent Sessions  
*Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*

11:45 pm - 1:00 pm     Luncheon & Welcoming Remarks  
*Chesapeake A*

1:00 pm - 2:00 pm     Concurrent Sessions  
*Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*

2:15 pm - 3:15 pm     Concurrent Sessions  
*Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*

3:30 pm - 5:30 pm     Poster Presentation and Networking Reception  
*Chesapeake AB*

6:00 pm - 7:30 pm     Jorge Cham Movie "Piled Higher and Deeper"  
*Commonwealth Auditorium*

### Saturday, March 19, 2016 -- Sadler Center

8:00 am - 8:30 am     Registration  
*Second Floor Lobby*

8:30 am - 9:30 am     Concurrent Sessions  
*Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*

9:45 am - 10:45 am     Concurrent Sessions  
*Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*

11:00 am - 12:00 pm     Concurrent Sessions  
*Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*

12:00 pm - 1:30 pm     Luncheon & Awards Ceremony  
*Chesapeake AB*



Dear Members of the College of William & Mary Community, Visiting Presenters, and Guests,

On behalf of the Graduate Research Symposium organizing committee, I would like to welcome you all to the 15<sup>th</sup> Annual Arts & Sciences Graduate Research Symposium at the College of William and Mary! With over 150 presenters from graduate programs at the College of William & Mary and sixteen visiting institutions, this year's symposium promises to be one for the books!

This year, the theme of the Graduate Research Symposium is "Fifteen Years of Excellence in Research." Beginning as and growing out of the 2002 American Cultures Conference, the Graduate Research Symposium has had over 1,000 graduate student presenters from William and Mary and distinguished visiting institutions since its inception. These graduate student presenters have had the opportunity to showcase their research to more than 10,000 symposium attendees over the past fifteen years.

To mark this important milestone for the Graduate Research Symposium, the committee is thrilled to announce that we are having Jorge Cham as a guest speaker on Friday evening. Jorge Cham, creator of "PHD (Piled Higher and Deeper) Comics" will deliver "The Power of Procrastination" on Thursday, March 17<sup>th</sup> at 7:00 pm in Commonwealth Auditorium. Following the poster session and networking reception, all presenters and attendees are welcome to join us in the auditorium to hear Jorge Cham's humorous discussion of graduate student anxieties and the guilt, the myth, and the power of procrastination. We hope to see you all there!

Additionally, the 15<sup>th</sup> Annual Graduate Research Symposium represents the first time that an overall top paper award will be presented to a William and Mary graduate student. The William and Mary Interdisciplinary Award for Excellence in Research will be awarded to the highest ranking paper from all disciplines represented at the symposium. We were very happy to see the quantity and quality of papers submitted for award consideration and heartily congratulate all of this year's winners.

Finally, a big thank you goes out to all of the participants and volunteers at this year's Graduate Research Symposium. We would especially like to thank the William and Mary graduate faculty, staff, and administration, and the Graduate Studies Advisory Board for their commitment to graduate students and graduate research. Last, but certainly not least, I would like to personally thank all of the members of the Graduate Research Symposium committee for all of their hard work and dedication which went into making this year's symposium one to remember!

Best,

Jenna Carlson Dietmeier  
2016 Graduate Research Symposium Chair



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OFFICE OF THE PRESIDENT

Dear Students and Friends,

Welcome to the fifteenth annual Graduate Research Symposium at William & Mary! It's grand to have you here.

Our students contribute seriously to human understanding on their way to advanced degrees. They then continue to do so as teachers and scholars. The Symposium provides an opportunity for our graduate students and their peers from other schools to present their work and receive comments from people in other departments and schools, as well as the greater William & Mary community. This year's theme, "Fifteen Year of Excellence in Research," reflects the Symposium's aim to encourage lively interdisciplinary discussions.

You have my best wishes for an enjoyable and rewarding time together.



Cordially,

A handwritten signature in black ink, reading "W. Taylor Reveley, III".

W. Taylor Reveley, III  
President

# 2016 Graduate Research Symposium

## Program Chair

Jenna K. Carlson, *Anthropology*

## Graduate Student Committee

Andrew Kottick, *Applied Science*

Han Li, *Computer Science*

Summer Moore, *Anthropology*

Elizabeth Scholz, *Anthropology*

Helis Sikk, *American Studies*

Xin Wang, *Physics*

## Office of Graduate Studies and Research

Dean Virginia Torczon, *Graduate Studies*

Chasity Roberts

Wanda Carter

Vicki Thompson Dopp

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Session Chairs

Volunteers and Room Proctors

## Judging Panel

Graduate student poster and oral presenters were eligible to submit a paper for award consideration in the disciplinary category of their choosing. The names and institutions of the students and advisors were removed from the submissions prior to evaluation by the judging panel. Advisors whose students submitted papers recused themselves from ranking those papers.

All W&M students were eligible for the Corporate Awards and the W&M Awards for Excellence. Only W&M Master's students were eligible for the Carl J. Strikwerda Awards.

### Humanities & Social Sciences

Dr. Alan Braddock, *American Studies*

Dr. John Burton, *Graduate Studies Advisory Board*

Diane Caceres, *Graduate Studies Advisory Board*

Dr. Gerard Chouin, *History*

Dr. Jonathan Glasser, *Anthropology*

Prof. Elaine McBeth, *Public Policy*

Dr. Ronald Schechter, *History*

Dr. Betsy Sigman, *Graduate Studies Advisory Board*

Dr. Todd Thrash, *Psychology*

Mr. Edwin Watson, *Graduate Studies Advisory Board*

### Natural & Computational Sciences

Mr. Michael Bracken, *Graduate Studies Advisory Board*

Dr. Christopher Del Negro, *Applied Science*

Mr. Mike Hoak, *Graduate Studies Advisory Board*

Dr. David Hood, *Graduate Studies Advisory Board*

Dr. Oliver Kerscher, *Biology*

Dr. Rex Kincaid, *Computational Operations Research*

Dr. Peter Martin, *Graduate Studies Advisory Board*

Dr. Eugeniy Mikhailov, *Physics*

Dr. David Opie, *Graduate Studies Advisory Board*

Dr. Denys Poshyvanyk, *Computer Science*

Dr. Laura Terry, *Graduate Studies Advisory Board*

### Mentoring Awards: Humanities & Social Sciences

Dr. Alan Braddock, *American Studies*

Dr. Pam Hunt, *Psychology*

Prof. Elaine McBeth, *Public Policy*

Dr. Neil Norman, *Anthropology*

Dr. Hannah Rosen, *History*

### Mentoring Awards: Natural & Computational Sciences

Dr. Gunter Luepke, *Applied Science*

Dr. Pieter Peers, *Computer Science*

Dr. Patricia Vahle, *Physics*

Dr. Matthew Wawersik, *Biology*

Dr. Kristin Wustholz, *Chemistry*

## **The College of William & Mary Interdisciplinary Award for Excellence in Research**

This award acknowledges the graduate student whose research presentation demonstrates original investigation and the integration of knowledge, and distinguished excellence in scholarship through potential contribution to the discipline and recognition by peers. The top three papers submitted in the category of W&M Humanities and the top three papers submitted in the category of W&M Natural & Computational Sciences competed for the overall Award for Excellence in Research. The papers were judged blindly by an independent panel of William & Mary faculty. The paper by the following student was selected to merit an award among the outstanding submissions.

### **ANDREW KOTTICK**

Advisor: Dr. Christopher Del Negro

***Understanding the genetic origins of breathing behavior in mammals***



***As a Ph.D. student in the department of Applied Science at the College of William & Mary, Andrew investigates the properties of biological motor pattern generating networks in the mammalian central nervous system.***

***Join Andrew as he presents his award winning research  
Friday, March 18, 2016  
1:00pm-2:00pm in Tidewater B***



The 15th Annual Graduate Research Symposium  
is proud to present:

Jorge Cham, creator of "PHD Comics,"  
with his talk:

# The Power of Procrastination

Thursday, March 17<sup>th</sup> at 7:00 pm  
Sadler Center Commonwealth Auditorium

book signing to follow



In his talk, Jorge Cham recalls his own experiences as a graduate student. Through humor and empathy, Jorge examines the source of graduate student anxieties and explores the guilt, the myth, and the power of procrastination.

**The event is free and all W&M students are encouraged to attend!**

Can't get enough PHD Comics? Be sure to see *The PHD Movie 2: Still in Grad School* on Friday, March 18<sup>th</sup> at 6:00 pm in Commonwealth Auditorium.



## **The Arts & Sciences Graduate Studies Advisory Board at the College of William & Mary is a proud sponsor of the 2016 Graduate Research Symposium**

The Graduate Studies Advisory Board is a group of educational, corporate, and community leaders with a commitment to enhancing the quality of graduate education in Arts & Sciences at William & Mary. We commend the attendees of the Graduate Research Symposium for their dedication to excellence in research.

The missions of the Graduate Studies Advisory Board are:

- Development/fundraising to increase graduate Arts & Sciences financial resources
- Assisting in the building of a graduate Arts & Sciences community
- Enhancing professional development opportunities for graduate students
- Advocating for graduate Arts & Sciences within the William and Mary community

Arts & Sciences graduate programs are critical to the mission of William & Mary and to its status as a research university. Graduate programs strengthen the undergraduate program by providing research and mentoring opportunities, and are essential in retaining approximately a third of William and Mary's faculty members in Arts & Sciences.

By sponsoring the 2016 Graduate Research Symposium, initiating the Distinguished Thesis and Dissertation Awards, the Carl J. Strikwerda Awards for Excellence and the S. Laurie Sanderson Awards for Excellence in Undergraduate Mentoring in Arts & Sciences, as well as providing recruitment fellowships to outstanding entering graduate students, the Graduate Studies Advisory Board is playing a vital role in advancing William & Mary's graduate programs in Arts & Sciences.

### **Members of the Graduate Studies Advisory Board, 2015-16**

**President:** Brian J. Morra '78 BA History

**Vice-President:** Robert Saunders '00 BS Physics

**Past President:** Diane Alleva Cáceres '87 BA Economics, '89 MA Government

**Chair, Communications and Advocacy Committee:** Laura J. Terry, '03 BS Biology

**Chair, Development Committee:** Michael Bracken, '86 BS Mathematics

**Chair, Recruitment Committee:** Debbie Allison '77 BS Chemistry

**Chair, Student Professional Development Committee:** Kathryn Caggiano '90 BS Math

John D. Burton '89 MA History, '96 PhD History

Jeffrey Deitrich, '04 BA Political Science

Kurt Erskine '92 BA Public Policy

Mike Hoak '02 MA History

David K. Hood '90 BS Chemistry, '92 MA Chemistry, '96 PhD Applied Science

Peter Martin '71 MS Physics, '72 PhD Physics

George Miller '67 BS Physics, '69 MS Physics, '72 PhD Physics

Cynthia C. Morton '77 BS Biology

David Opie '88 MS Physics, '91 PhD Physics

Betsy Page Sigman '78 BA Government

Jeffrey Voas, '86 MS Computer Science, '90 PhD Computer Science

Edwin Watson II '68 BA History, '70 MA History

Gail Williams Wertz '66 BS Biology

## **The College of William & Mary Award Recipients for Excellence in Scholarship**

These awards acknowledge graduate students whose research presentation demonstrates original investigation and the integration of knowledge, and distinguished excellence in scholarship through potential contribution to the discipline and recognition by peers.

To be considered for an award, presenters had to submit a 5-6 page paper describing their research. The papers were judged blindly by an independent panel of William & Mary faculty and Graduate Studies Advisory Board members. The papers by the following students were selected to merit an award among the many outstanding submissions. The corporate sponsored awards listed below were open to students from the College of William & Mary.



**MARKET ACCESS INTERNATIONAL, Inc.** ([www.marketaccessintl.com](http://www.marketaccessintl.com)) is an international trade, investment and enterprise growth consulting firm. The company was founded by Arts & Sciences Graduate Studies Advisory Board member Diane Alleva Cáceres (W&M '87 BA Economics, '89 MA Government).

### **MARKET ACCESS INTERNATIONAL, Inc. Award for Excellence in Scholarship in the Humanities and Social Sciences**

#### **SUMMER MOORE**

The College of William and Mary, Anthropology, Advisor: Dr. Jennifer Kahn  
*"Fond of Fine Linnen Cloth":*

*Cloth Fragments from a 19th-Century Hawaiian Community on Kaua'i Island, Hawai'i*



***Join Summer as she presents her research  
Friday, March 18, 2016  
1:00pm-2:00pm in Tidewater A***

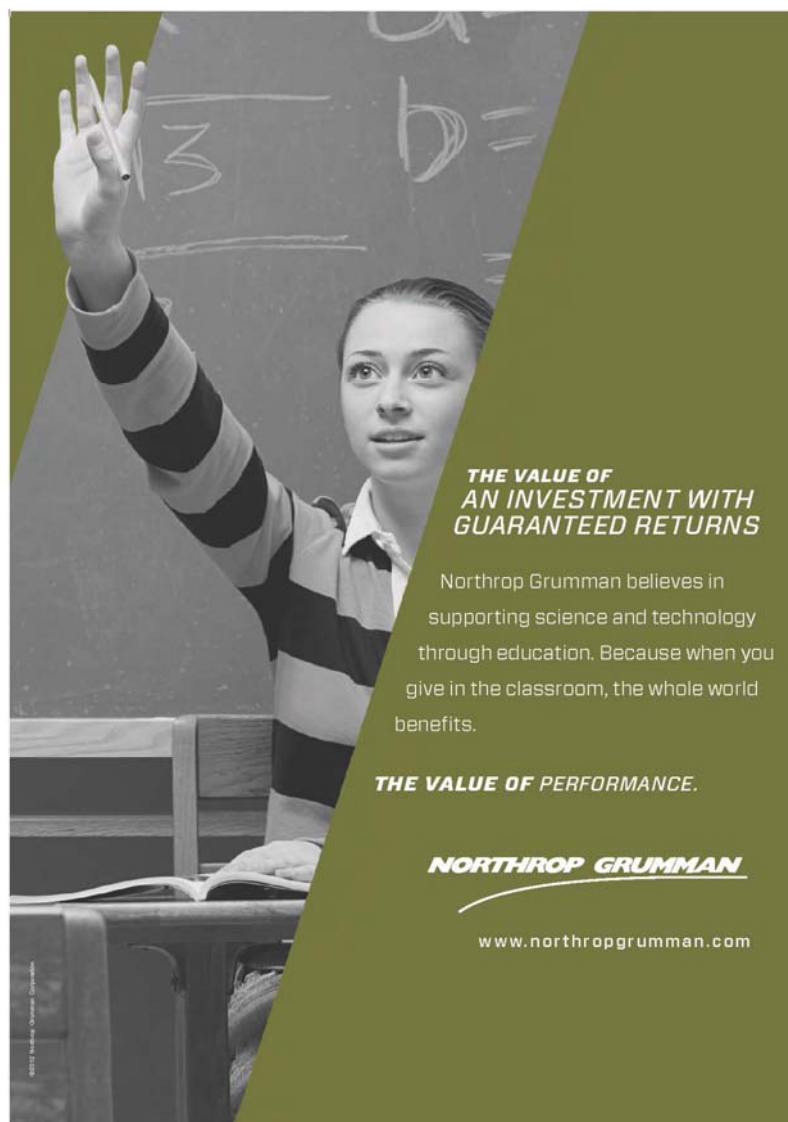
**NORTHROP GRUMMAN CORPORATION** ([www.northropgrumman.com](http://www.northropgrumman.com)) Northrop Grumman Corporation is a leading global security company whose 120,000 employees provide innovative systems, products, and solutions in aerospace, electronics, information systems, shipbuilding and technical services to government and commercial customers worldwide.

**NORTHROP GRUMMAN CORPORATION Award for Excellence in Scholarship  
in the Natural and Computational Sciences**

**CHARLES FANCHER**

The College of William and Mary, Physics, Advisor: Dr. Seth Aubin  
*Experimental Observation of the AC Zeeman Effect*

***Join Charles as he presents his research  
Friday, March 18, 2016  
2:15pm-3:15pm in Chesapeake C***



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**The College of William & Mary  
Award Recipients for Excellence in Scholarship**

**William & Mary Awards for Excellence in the Humanities and Social Sciences**

**RENEE M. KINGAN**

American Studies, Advisor: Dr. Hermine Pinson  
*Pushing Back: Jayne Cortez and Unesco's War on War*

**NICOLE M. PENN**

History, Advisor: Dr. Christopher Grasso  
*French "Idolators," British "Heretics":  
The Seven Years' War in North America as a Religious Conflict*

**William & Mary Honorable Mention**

**JANINE Y. BOLDT**

American Studies, Advisor: Dr. Susan Webster  
*Family Matters: Portraiture and Genealogical Narratives in Colonial Virginia*

**Visiting Scholar Award for Excellence in the Humanities and Social Sciences**

**ANUSHREE VICHARE**

Health Behavior and Policy, Virginia Commonwealth University, Advisor: Dr. Lindsay Sabik  
*Perceptions of Healthcare Provider Communication Skills in Race and Sex  
Concordant Interactions: Does Income Matter?*

**Visiting Scholar Honorable Mentions**

**MANDAR BODAS**

Health Behavior and Policy, Virginia Commonwealth University, Advisor: Dr. Tiffany Green  
*Did Medicaid Primary Care Reimbursement Rate Increase in 2013 and 2014 under the  
Affordable Care Act Impact Access to Primary Care of Medicaid Populations?*

**TIMOTHY LOH**

Arab Studies, Georgetown, Advisor: Dr. Sara Singha  
*"Maybe Jesus Knows Sign": The Formation of a Deaf Christian Identity*

**The College of William & Mary  
Award Recipients for Excellence in Scholarship**

**William & Mary Award for Excellence in the Natural & Computational Sciences**

**RONY G. KALFARISI**

Physics, Advisor: Dr. Gina Hoatson

*Investigation of cation ordering in dielectric oxides microwave ceramics using  $^7\text{Li}$  and  $^{93}\text{Nb}$  solid-state NMR and first principle calculation*

**William & Mary Honorable Mentions**

**XIN WANG**

Physics, Advisor: Dr. Sasha Mordijck

*Role of Turbulence and Shear Flow in Determining Plasma Density Profiles in Tokamaks*

**SHANHE YI**

Computer Science, Advisor: Dr. Qun Li

*HISE: Head Gesture Interface for Smart Eyewears*

**Visiting Scholar Award for Excellence in the Natural & Computational Sciences**

**NICHOLAS GEORGE**

Applied Science, VCU, Advisor: Dr. Jeffrey Dupree

*Axon Initial Segment Loss in Chronic Experimental Autoimmune Encephalomyelitis is Reversible*

**Visiting Scholar Honorable Mention**

**MICHAEL ANTHONY CARLO**

Biology, Clemson, Advisor: Dr. Michael Sears

*Can lizard embryos survive climate warming? Thermal constraints on the physiology of developing Eastern fence lizards*



**The College of William & Mary  
Carl J. Strikwerda Awards for Excellence**

These awards recognize W&M Arts & Sciences graduate students for an outstanding written paper by a student who is engaged in thesis research/scholarship to earn an MA, MS, or MPP degree. In the spring of 2011, the Arts & Sciences Graduate Studies Advisory Board voted unanimously in support of the Board's concept for initiating these annual awards. To be considered for an award, Graduate Research Symposium presenters had to submit a 5-6 page paper describing their research. The papers were judged blindly by an independent panel of William & Mary faculty and Graduate Studies Advisory Board members. Awardees are listed in alphabetical order.

**Award for Excellence in the Humanities and Social Sciences**

JEREMY B. ABRAMOWITZ

Public Policy, MA, Advisor: Dr. Sarah Stafford

*Modeling Information Signals in a Composite Social Vulnerability Index*

**Awards for Excellence in the Natural and Computational Sciences**

GERARDO AYALA

Chemistry, MS, Advisor: Dr. Robert Pike

*Synthesis, Structure, and Optical Memory Properties of Copper (I)*

*Thiocyanate-Amine Networks*

OHAD J. PARIS

Biology, MS, Advisor: Dr. Dan Cristol

*The Effect of Developmental Mercury Exposure on the Reproductive Success  
of Dosed Zebra Finches*





**The College of William & Mary**  
**S. Laurie Sanderson Awards for Excellence in Undergraduate Mentoring**

These awards recognize Arts & Sciences graduate students for outstanding undergraduate mentoring in scholarship and research outside of classroom teaching. Such mentoring includes graduate students who mentor undergraduates in the context of the undergraduate students' senior theses, honors theses, writing projects, term papers, or research in a laboratory, field site, museum, or archive. In the spring of 2009, the Arts & Sciences Graduate Studies Advisory Board and the Arts & Sciences Committee on Graduate Studies voted unanimously in support of the Board's concept for initiating and funding these annual awards.

Nominations consisted of supporting statements from current or past W&M undergraduate students and faculty members. A panel of W&M faculty and Graduate Studies Advisory Board members ranked the nominations. Awardees are listed in alphabetical order.

**Award for Excellence in Undergraduate Mentoring  
in the Humanities and Social Sciences**

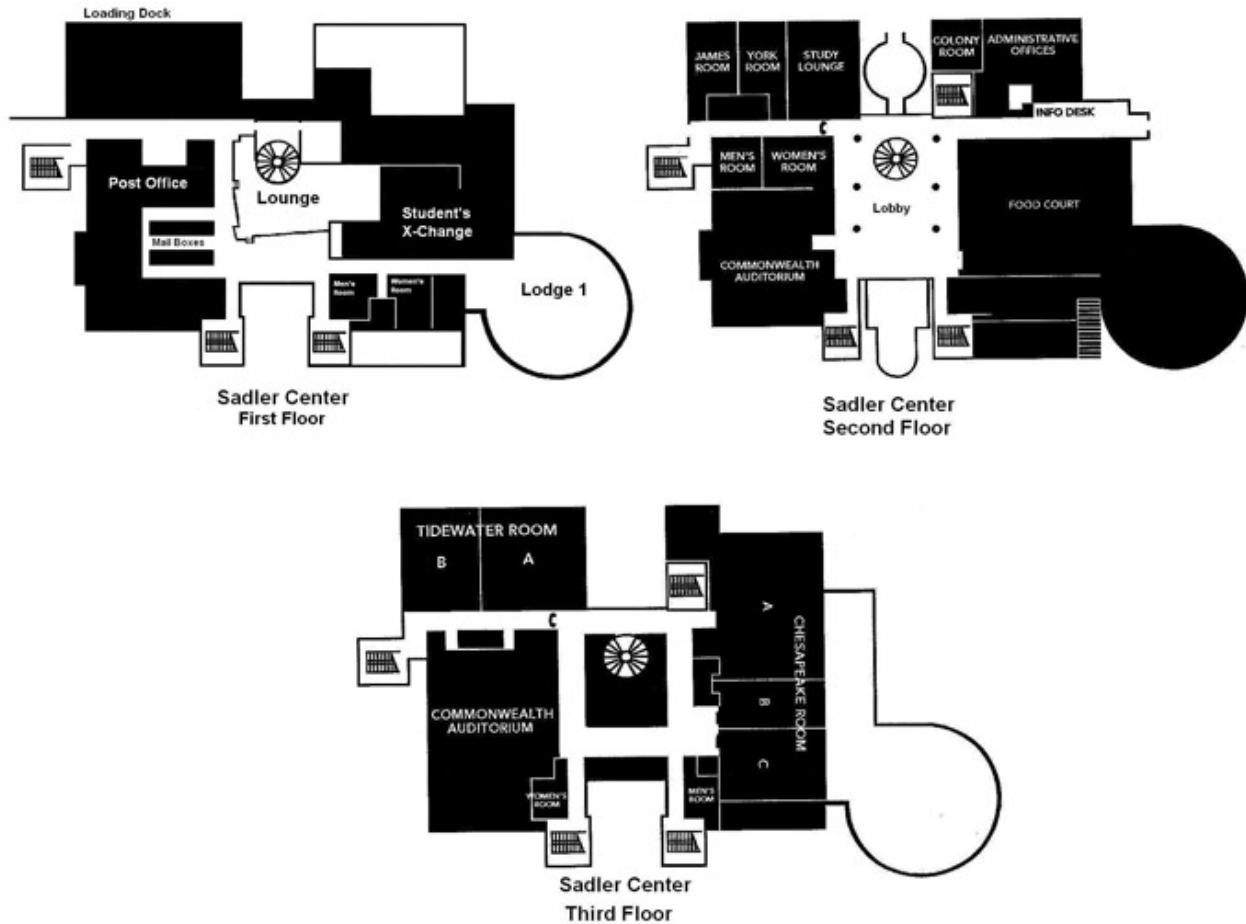
ELIZABETH A. SCHOLZ  
Anthropology Department, MA  
Advisor: Dr. Neil Norman

**Awards for Excellence in Undergraduate Mentoring  
in the Natural and Computational Sciences**

CASSANDRA E. COOK  
Biology Department, MS  
Advisor: Dr. Randy Chambers

EDMUND J. NOVAK  
Computer Science Department, PhD  
Advisor: Dr. Qun Li

# William and Mary's Sadler Center



Friday, March 18, 2016

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**9:30 AM**

James Room – **ALL AROUND THE ATLANTIC WORLD**

The Power of Ceramics: An Analysis of Ceramics and Military Order at Fort Stanwix

**Elizabeth Scholz**

Prior Knowledge: The Treaty of Utrecht of 1713 and How a Few Maps, Books, and Globes Gave Men in London the Confidence to Claim and Divide the World

**Phillip Louis Emanuel**

“A Spirit of Insubordination”: Arson as a Means of Protest at Heckingham Workhouse, 1836

**Kristin Victoria Brig**

Chesapeake C – **WHAT DOESN'T KILL YOU MAKES YOU STRONGER?**

Identifying Protective and Risk Factors in Aging Out Youth Outcomes

**Jenika C. Hardeman**

The Influence of Adolescent Stress on the Relationship between Anxiety and Depressive Symptomology over Time

**Casey E. Snyder**

Allelic Variation in the Oxytocin Transporter Gene Relates to Social by Non-Social Risk Taking Behavior

**Amrita Lamba**

Tidewater A – **FUELING LIFE AND LOCOMOTION**

Morphometric Properties of Dbx1+ Neurons That Contribute to Respiratory Rhythm and Pattern Generation in Mice

**Victoria Akins**

Silencing Dbx 1 preBötzinger Neurons Disrupt Breathing in Mice

**Nikolas C. Vann**

Highway Infrastructure Development for Alternative Fuel Stations

**Menuka Ban**

Using Atomic Force Spectroscopy to Investigate the Effects of High Pressure and High Temperature on Crude Oil/Rock Interactions

**William Winsor Dickinson**

# 15<sup>th</sup> Annual Graduate Research Symposium

**9:30 AM**

**Tidewater B – GETTING TO THE BASE (PAIRS) OF THINGS**

Epigenetics of an Interploidy Hybridization Event in *Mimulus*

**Taliesin J. Kinser**

A Different Way to Make a Hermaphrodite: Investigating a Wild Nematode Species' Cell Differentiation and Cell Cycle Progression in Germline Development

**Caitlin Marie McCaig**

Clonal Integration in *Asclepias Syriaca*

**Mary D. Seward**

Morphology of the Caudal Fin Skeleton of Toadfishes and Its Impact on Their Systematic Relationships (Percomorphacea: Batrachoidiformes)

**Diego Francisco Biston Vaz**

**10:45 AM**

**York Room – WHOSE CULTURE, WHOSE BODIES?**

Pacific Islanders and “Brownness” in American Mass Culture

**Leah M. Dagen**

Factors Determining Receipt of Breast Reconstruction Surgery-Systematic Review and Meta-analyses

**Jaya Shankar Khushalani**

What Every Child Ought to Know: Sex Education in the Self and Sex Series

**Laura M. Ansley**

**James Room – SOUTHERN LIVING AND DYING**

“a very excellent race of animals”: George Washington and the American Mule

**Jenna Kay Carlson Dietmeier**

“It must have been beautiful”: Haunted Houses and the Aesthetic of Abandonment

**Mariaelena DiBenigno**

Feminized Farmers: Native American Views of English Colonists in the Virginia Chesapeake 1607-1623

**Morgan McCullough**

Rudresh Mahanthappa's Gamak: “Inescapable Hybridity,” Teleological Subversion, and New Jazz Methodology

**Brian Edward Jones**

# 15<sup>th</sup> Annual Graduate Research Symposium

**10:45 AM**

## Chesapeake C – **YOU ARE WHAT YOU EAT**

Why Do We Overeat? The Role of Impulsivity in Dietary Restraint

**Wen Winnie Zhuang**

“Build, Buy, or Modernize”: Mechanization and Designs of American Kitchens, 1900-1959

**Khanh V. Vo**

Immovable Feast: The Edible Built Environment of the Wheatsworth Gingerbread Castle

**Sarah Adams**

The Affect of Calorie and Health Information on Women’s Food Choices and Intake

**Lisa Stephanie Goldberg**

## Tidewater A – **HUMAN-ENVIRONMENT INTERACTIONS**

Feeding Behaviors of the Invasive Kudzu Bug, *Megacopta cribraria*, on Soybean

**Francesca Stubbins**

Understanding Northeastern North American Riverine Trail Systems through Network Analysis

**Mallory L. Moran**

Potential Threats to Diamondback Terrapin Nesting Success Caused by the Invasive Reed *Phragmites australis*

**Cassandra Cook**

Behavioral Responses and Sublethal Impacts of PAHs on Juvenile Sablefish, *Anoplopoma fimbria*

**Megan Marie McConville**

The Effect of Mercury Exposure on Mate Choice in Birds

**Virginia Greene**

## Tidewater B – **FROM LARGE SCALE CLOUD COMPUTING TO SMALL SCALE MOBILE COMPUTING**

Performance Modeling and Scalability Optimization of Distributed Deep Learning Systems

**Feng Yan**

Managing Datacenter Tickets: Prediction and Active Sizing

**Ji Xue**

Improving Thick-Restarting Lanczos Method by Subspace Optimization for Large Sparse Eigenvalue Problems

**Lingfei Wu**

HISE: Head Gesture Interface for Smart Eyewears

**Shanhe Yi**

A Platform across Smart Mobile Device and Cloud

**Zijiang Hao**

# 15<sup>th</sup> Annual Graduate Research Symposium

**1:00 PM**

**York Room – CRISIS AVERTED?**

The Judgment of Solomon: Jerusalem

**Kathleen Baugh**

The Aid Effectiveness Debate: The Impact of Aid on Health Outcomes in Uganda

**Robert A. Marty**

**James Room – HEALTH AND POLITICS: THE AFFORDABLE CARE ACT**

Effects of the ACA Dependent Coverage Expansion on Virginia's Young Adults

**John J. Snouffer**

Did Medicaid Primary Care Reimbursement Rate Increase in 2013 and 2014 under the Affordable Care Act Impact Access to Primary Care of Medicaid Populations?

**Mandar Vinayak Bodas**

The Effects of the Affordable Care Act on Non-emergent Use of Emergency Departments Among Young Adults

**Robert Tyler Braun**

**Colony Room – EXPLORING “THE OTHER”**

The Biopolitics of Disaster

**Jennifer Ross**

Interactions with Latinos/as as a Predictor of Explicit and Implicit Bias

**Jasmine Koech**

Is Transformation Surviving?

**Michael Redmond Daly**

**Chesapeake C – ADAPTATION AND AGGREVATION**

Using Auditory Brainstem Response Testing to Investigate the Potential Effects of Methylmercury Exposure on Hearing in the Zebra Finch

**Sarah Elizabeth Wolf**

Competition Affects Function Trait Responses of Dune Grasses to Abiotic Stressors

**Joseph Karl Brown**

Predicting the Impact of Sea Level Rise on the Distribution of *Phragmites australis* and *Spartina alterniflora* in Tidal Freshwater Marshes of James City County, Virginia

**Abbey Humphreys**

Can Lizard Embryos Survive Climate Warming? Thermal Constraints on the Physiology of Developing Eastern Fence Lizards

**Michael Anthony Carlo**



# 15<sup>th</sup> Annual Graduate Research Symposium

**1:00 PM**

## Tidewater A – **OLD AND NEW FRONTIERS**

Study on the Stereotype of American Imperialism in China from the View of Peking Review (1965-1970)

**Shaofan Zhang**

“Fond of Fine Linnen Cloth”: Cloth Fragments from a 19<sup>th</sup>-Century Hawaiian Community on Kaua’i Island, Hawai’i

**Summer Moore**

Protected Peripheries and Excavated Edges: Archaeological Investigations at Two Protected Frontier Sites

**Megan Rhodes Victor**

## Tidewater B – **GREY MATTER**

Understanding the Genetic Origins of Breathing Behavior in Mammals

**Andrew Kottick**

Calcium Activity in Embryonic Neural Development

**Sudip Paudel**

Relationship Between Event-Related Potentials and Response Kinematics in Older and Younger Adults

**Kenneth Juston Osborne**

**2:15 PM**

## York Room – **RISK, HEALTH, AND DIVERSITY**

Modeling Information Signals in a Composite Social Vulnerability Index

**Jeremy Ben Abramowitz**

Perceptions of Healthcare Provider Communication Skills in Race and Sex Concordant Interactions: Does Income Matter?

**Anushree M. Vichare**

HIV/AIDS in Times of Equality: Queer Health and Homonormativity

**Jan Hübenthal**

## James Room – **THE BUSINESS OF AMERICA IS BUSINESS**

Serving Hibernian Heritage: The Irish Pavilion Coffee Bar at the 1964 New York World’s Fair

**Neeve Kelly**

Gentry Magazine’s Post-Consumer Vision in the Age of Conformity

**John Barrington Matthews**

“The Worst Citizens in the World”: Merchants and the Struggle for Social Success in Colonial Virginia

**Kasey Marie Sease**

## 15<sup>th</sup> Annual Graduate Research Symposium

**2:15 PM**

### Colony Room – **DISEASE AND DISRUPTIONS**

Antibody Responses to Marine Bacterial Pathogens in Loggerhead, *Caretta caretta*, and Kemp's ridley, *Lepidochelys kempii*, Sea Turtles from the Southeastern United States

**Maria L. Rodgers**

Non-Vertebrate Model to Screen Pathogenicity of Isolated Salmonella from Animal Feed Ingredients

**Matthew Garrett**

Intervention Strategies for Epidemics: Does Ignoring Time Delay Lead to Incorrect Predictions?

**Adrienna Nicole Bingham**

### Chesapeake C – **PHYSICS AT THE ATOMIC AND SUBATOMIC LEVELS**

Understanding Nuclear Structure with Beam-Normal Single-Spin Asymmetries

**Kurtis D. Bartlett**

Experimental Observation of the AC Zeeman Effect

**Charles T. Fancher**

Four-Wave Mixing Reduction for Electromagnetically Induced Transparency Based Quantum Memory

**Gleb Romanov**

Detector Calibration for the NOvA Neutrino Oscillation Experiment at Fermilab

**Marco Colo**

### Tidewater A – **TECHNOLOGY AND THE INDIVIDUAL**

Matching Learning Method for Estimating Heterogeneous Causal Effects of the World Bank Projects

**Jianing Zhao**

Mining and Analysis of Public Information for Insight into Personal Fitness Tracker Reliability, Operations and User Performance

**Nancy Carter**

Your Switch is Mine: Man-in-the-middle Attack Threat in SDN

**Cheng Li**

Micro Sleep Detecting Wearables

**Amanda Annette Watson**

# 15<sup>th</sup> Annual Graduate Research Symposium

**2:15 PM**

## Tidewater B – **RESEARCH ON DEVELOPMENT**

Differences in Sockeye Salmon Antibody and Pathogen Infection Patterns During the Spawning Journey

**Maxwell Elliott Chappell**

Integrative Genomic Analysis of Long Non-Coding RNAs Associated with Autism Spectrum Disorders

**Brian Lee Gudenas**

Probing Conformational Propensities of Histidine in Different Protonation States of the Unblocked GlycylHistidylglycine Peptide by Vibrational and NMR Spectroscopy

**David M. DiGuiseppi**

**3:30 PM**

## Chesapeake A & B – **POSTER PRESENTATIONS**

The Nutrition Education for Children Attending Preschool Program, the NECAP Program

**Ibtehal Alsallaiy**

Understanding Post-Assault Distress via Attachment Theory: Dynamics among Anxious Attachment, Worldview, and Coping Self-Efficacy

**Gabrial T. Anderson**

Salt at the Crossroads: Cayo Sal, Los Roques Archipelago, within the 18<sup>th</sup>-century Southern Caribbean

**Konrad Andrzej Antczak**

Synthesis, Structure, and Optical Memory Properties of Copper (I) Thiocyanate-Amine Networks

**Gerardo Ayala**

Variance in Oxidative Stress levels of Zebra Finch, when Exposed to Mercury at Different Stages in Development

**Juan Mateo Botero**

Adolescent Emotion Regulation Coping: Links to Unsupportive Emotion Socialization Responses

**Kara Braunstein**

Verification and Validation Study of the InterAxon Muse EEG Headband

**Andrew Ninian Burdette**

Multi-level Model Based Clustering with Parameter and Pairwise Constraints

**Paul Gerard Diver**

Laser Amplifier System for Ultracold Potassium Experiments

**Shuangli Du**

The Influence of MED1 on Thyroid Hormone Receptor Nuclear Localization

**Matthew Robert Femia**

## 15<sup>th</sup> Annual Graduate Research Symposium

### 3:30 PM – POSTER PRESENTATIONS

Axon Initial Segment Loss in Chronic Experimental Autoimmune Encephalomyelitis is Reversible

**Nicholas Matthew George**

Differential Reactivity of Microglia in Mouse Models of Multiple Sclerosis

**Rebecca K. Hartley**

Diffusion Tensor Imaging and Neurometabolic Analysis of Normal Brain Development

**Neggin Keshavarzian**

Effects of Muscarinic-1 Receptor Stimulation on Attentional Deficits Induced by Loss of Cortical Cholinergic Projections

**Eden Maness**

The Effect of Developmental Mercury Exposure on the Reproductive Success of Dosed Zebra Finches

**Ohad Jonathan Paris**

Characterization and Functional Analysis of Chinmo (Chronologically Inappropriate Morphogenesis), a Presumed Transcriptional Regulator of Cell Fate and Behavior in *Drosophila*

**Leanna Rinehart**

Antimicrobial Activity of Novel Amphiphiles

**Elizabeth Rogers**

Experimental Apparatus for the Observation of the Topological Change Associated with Dynamical Monodromy

**Daniel Salmon**

This Old Virginia House: An Anthropological Analysis of Architecture at Buffalo Forge's Mount Pleasant

**Erin Stock Schwartz**

Predicting Recidivism: Maternal Stress and Intimate Partner Violence

**Morgan Jane Thompson**

Iron-Polypyridyl Sensitized TiO<sub>2</sub> for Photocatalytic Hydrogen Generation

**Wanji Zhang**

# 15<sup>th</sup> Annual Graduate Research Symposium

Saturday, March 19, 2016

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**8:30 AM**

## York Room – **DIFFERENCES THAT MAKE A DIFFERENCE**

The Effect of Cross-Cultural Differences on Team Performance within an Educational Setting: A Mixed Methods Study

**Sevinj Iskandarova**

Being Bossy and Being Female: Identity Integration in the Workplace

**Megan Jessie Buys**

Trust, Cooperation, and Synchrony: A Socio-Ecological Approach

**Thomas Granville McCauley**

## James Room – **UNEXPECTED ENCOUNTERS**

Aid Allocation among Non-Traditional Donors: A Study of Chinese and Venezuelan Aid in Latin America and the Caribbean

**Darice Xue**

The Information Market: Employing Mutual Information Distance in Modeling Evaluation and Portfolio Selection

**Anthony John Finch**

Bayesian Mind or Problem Solving? Making Sense of Probability Based Decision Making Strategies

**Kunjoon Byun**

## Chesapeake C – **LANGUAGE AND SECURITY**

Corpus Linguistics and Computer Code: Connections Across the Disciplines

**Lindsay Michelle Stinson**

Private Proximity Detection for Content Access Control

**Edmund Novak**

EasyPass: How to Generate Strong and Easy-to-Memorize Passwords?

**Zhengrui Qin**

PmDroid: Permission Supervision for Android Advertising

**Xing Gao**

## Tidewater A – **SMALL AND FAST QUANTUM WORLD**

Ultrafast Dynamics of VO<sub>2</sub> Thin Films Measured in Pump-Probe Configuration

**Elizabeth Radue**

Agile Radio Frequency Generation for Manipulation of Ultracold Atoms

**Andrew Rotunno**

Optical Constants of Niobium Dioxide Thin Films

**David Lahneman**

Scattering of Ultracold Atoms from an Oscillating Barrier

**Andrew James Pyle**

## 15<sup>th</sup> Annual Graduate Research Symposium

**8:30 AM**

### Tidewater B – **RESEARCH ON THE CATWALK: MODELING IN APPLIED SCIENCE**

Modeling preBötC Dbx1 Neurons

**Hanbing Song**

Modeling Pattern Formation in the York River Tidal Marshes Through the Interaction of Salt Marsh Cordgrass, Mussels and Sediment

**Sofya Zaytseva**

Dynamical Behavior in a Coupled Two-Cell Brusselator Model

**Yan Wang**

Minkowski Product of Convex Sets and Product Numerical Range

**Diane Christine Pelejo**

**9:45 AM**

### York Room – **TEXTUAL ANALYSIS FROM INSPIRATION TO LASTING REPERCUSSIONS**

Inspired Writers Produce Imagery-Laden Texts Through an Efficient Process of Expression

**Will Belzak**

Pushing Back: Jayne Cortez and Unesco's War on War

**Renee Kingan**

In Search of Askia Mohammed

**Joseph Daniel Wilson**

### James Room – **NURTURE VS. NATURE**

Assessing Temporal and Contextual Factors Affecting Preferential Attention to Faces in Individuals with High and Low Levels of Autistic Trait

**Catherine I. Mitchell**

The Relationship between EEG & ERP Based Neurometrics and Autism Spectrum Disorder

**Leigh Catherine Gayle**

The Effects of Entitativity on the Neural Processing of Homosexual Couples

**JoEllen Joy Blass**

Good, Bad, and the Indifferent: Do Habits Have Trait-Like Qualities?

**Kathryn Mary Rehberg**

### Chesapeake C – **EXPLORING THE LEAVES OF FAMILY TREES**

Family Matters: Portraiture and Genealogical Narratives in Colonial Virginia

**Janine Yorimoto Boldt**

"I before the altar stood": Marriage Ties Among Antebellum Petersburg's Prosperous Free African Americans

**Elizabeth Wood**

Defective Communication in Flannery O'Connor's Fiction

**Istvan Szokonya**



# 15<sup>th</sup> Annual Graduate Research Symposium

**9:45 AM**

## Tidewater A – **YOU SPIN ME ROUND**

Experimental Apparatus to Observe Dynamical Manifestation of Hamiltonian Monodromy

**M. Perry Nerem**

Inverse spin-galvanic effect in topological-insulator graphene heterostructures

**Martin Rodriguez-Vega**

Twisted Van der Waals Systems

**Yohanes Satrio Gani**

Spin-Orbit Coupling in the Strongly Interacting Fermi Gas: an Exact Quantum Monte Carlo Study

**Peter Rosenberg**

## Tidewater B – **MATERIAL SCIENCE AND SOLID STATE PHYSICS**

Additive Manufacturing of Multifunctional Components Using High Density Carbon Nanotube Yarn Filaments

**John Michael Gardner**

Investigation of cation ordering in dielectric oxides microwave ceramics using <sup>7</sup>Li and <sup>93</sup>Nb solid-state NMR and first principle calculation

**Rony Gustam Kalfarisi**

Optical Spectroscopy of the M2 and T Phases of Vanadium Dioxide

**Tyler J. Huffman**

Temperature Dependent Near Field Infrared Microscopy of La<sub>0.67</sub>Sr<sub>0.33</sub>MnO<sub>3</sub> Thin Films

**Peng Xu**

**11:00 AM**

## York Room – **TAKE ME TO CHURCH**

More than Words Alone: The Altarpiece and Affective Piety in Medieval Prayer

**Rory Ellis Sullivan**

“Maybe Jesus Knows Sign”: The Formation of a Deaf Christian Identity

**Timothy Y. Loh**

French “Idolators,” British “Heretics”: The Seven Years’ War in North America as a Religious Conflict

**Nicole Marie Penn**

# 15<sup>th</sup> Annual Graduate Research Symposium

**11:00 AM**

Colony Room - **IDENTITY TAKES PLACE**

The Limits of Homosexual Citizenship: News Media and Identity Politics in the 1960s

**Helis Sikk**

The Interaction of Existential Thinking and Religiousness on Mental Health Concerns in an Undergraduate Sample

**Derek Anthony Giannone**

Railroads, America, and the Formative Period of Historical Archaeology: A

Documentary and Photographic Investigation into the Historic Preservation Movement

**Lauren Alston Bridges**

Chesapeake C – **PERFORMANCE, WSN, AND GRAPHICS MODELING**

A Large-Scale Study of the Impact of Temperature on Soft-Errors on GPUs in the Field

**Bin Nie**

Mixed-Weight OLD-sets in Wireless Sensor Networks

**Robin Givens**

Two-Stage BRDF Fitting

**James Bieron**

Analysis of Data-Driven BRDF Model

**Victoria Cooper**

Tidewater A – **FROM MACROSCOPICS TO MICROSCOPICS**

Role of Turbulence and Shear Flow in Determining Plasma Density Profiles in Tokamaks

**Xin Wang**

Bayesian Analysis and Modeling of Gravitational Microlensing Events with Implications for the Wide-Field Infrared Survey Telescope

**Sean K. Terry**

Generation of a Squeezed Vacuum Field in a Multi-Pass Setup

**Mi Zhang**

Optical Spectroscopy of Superconducting Pt-Doped BaFe<sub>2</sub>As<sub>2</sub>

**Zhen Xing**

Tidewater B – **MAGICAL NANOSCALE MATERIALS**

Toughness-Enhancing Structure of Recluse Spider Webs

**Sean Koebley**

Revealing the Structure of Loxosceles Silk at the Molecular Scale

**Qijue Wang**

Ultrafast Pump-Probe Studies of the Light-Induced MIT and Recovery of Niobium Dioxide Thin Films

**Melissa R. Beebe**

Pulsed Energetic Condensation of Nb Thin Films on Cu Cavities

**Matthew Burton**

### **Immovable Feast: The Edible Built Environment of the Wheatsworth Gingerbread Castle**

*Presenter:* Sarah Adams  
*Advisor:* Charles McGovern  
 College of William & Mary,  
 American Studies

The Wheatsworth Gingerbread Castle in Hamburg, New Jersey, was a monument to commerce, fantasy, and entertainment. Conceived by biscuit magnate Frederick H. Bennett and designed by Austrian-American designer Joseph Urban, the concrete-and-stucco structure featured an aesthetic that was equal parts fairy tale and confectionery fantasia, with building materials manipulated to resemble edible treats and tours led by children playing the roles of Hansel and Gretel. Sharing the site was a 130-year old, Wheatsworth-branded, operational flour mill, which together with the Gingerbread Castle comprised an attraction that showcased archaic industry and decadent whimsy while advertising Wheatsworth baked goods to legions of tourists. Opened in 1930, less than a year after the collapse of the U.S. stock market, the Gingerbread Castle both survived and thrived throughout the ensuing decade despite national economic crises and an attendant decline in motor tourism. Consequently, the Castle may be seen as more than mere tourist attraction, assuming greater cultural significance as an institution that appealed to, engaged, and satisfied some portion of the zeitgeist. This edible built environment, built on color and artifice and imbued with narrative romance and drama, draws on sweets' ability to provide a kind of emotional satiation, a phenomenon all the more evident in relief with the poverty and want of the Great Depression.

*Sarah Adams is a Ph.D. candidate in American Studies at the College of William & Mary. She is currently writing a dissertation on the visual and material culture of sweets during the Great Depression.*

### **Family Matters: Portraiture and Genealogical Narratives in Colonial Virginia**

*Presenter:* Janine Yorimoto Boldt  
*Advisor:* Susan Webster  
 College of William & Mary,  
 American Studies



During the eighteenth century, nearly every prominent Virginia family commissioned portraits. These portrait collections formed visual narratives about individual and familial identities and household relationships. The importance of genealogical fictions in family portraiture has been well-established by art historians. However, most scholarship focuses on urban areas in northern colonies and on group portraits and pendant portraits of married couples. My paper uses examples from the multi-generational Virginia collections of the Byrd family of Westover, the Tayloe family of Mount Airy, and the Carter families of Shirley and Sabine Hall plantations and asks what stories these collections can tell. Except for the well-documented Byrd collection, these paintings have remained with the same house and families since the eighteenth century. My research finds patterns regarding which family members were or were not painted and why they were painted at specific times in their lives. Further, by considering larger family networks, I ask how family portraits connected family members residing on different plantations through the movement and copying of portraits. I argue that the social world of Virginia's gentry, where plantation houses were sites of social gatherings, can inform how colonial domestic portraits functioned both privately and publically as expressions of family and self-representation. My paper contributes to scholarship on colonial American portraiture as well as on social and family life in Virginia through rarely examined visual evidence.

*Janine Yorimoto Boldt is a Ph.D. candidate in American Studies at the College of William & Mary. Her dissertation focuses on family portrait collections to study how paintings constructed household relationships, gender, sexuality, and race within a transatlantic context.*

### **Pacific Islanders and "Brownness" in American Mass Culture**

*Presenter:* Leah M. Dagen  
*Advisor:* Lynn Weiss  
 College of William & Mary,  
 American Studies

My research elucidates the entanglements between mass culture, race, imperialism, and technology through an examination of Pacific Island imagery in America. In this presentation, I outline a visual history of Pacific Islander imagery in mass culture from the "primitive" native Filipinos in National Geographic Magazine during the 1890s to the rise of sexualized "hula girl" imagery in post-war America. The early to mid-twentieth century Pacific Island cultural imagery in the form of magazine photographs, toys, films, and tourist memorabilia became highly popular. Late nineteenth and early twentieth century mass culture depictions of Pacific Islanders highlight primitivism and dark skin, but as the twentieth century progressed, Pacific Islander imagery shows lighter skin tones and reflects a Westernized standard of female beauty. I argue that changing relationships between Pacific Islanders and white America was reflected and shaped by mass culture. Pacific Islanders had a comparatively lower rate of immigration to America than other ethnic groups, and are therefore underrepresented in historical and theoretical scholarship on race and ethnicity in the twentieth century. I argue that mass culture shows the importance of Pacific Islanders as part of the twentieth century American racial imaginary impact of Pacific Islanders on the same issues.

*Leah M. Dagen is a graduate student in the College of William & Mary's American Studies Program. Her research interests include race, ethnicity, visual culture, and histories of science and technology in nineteenth and twentieth century America.*

### **"It must have been beautiful": Haunted Houses and the Aesthetic of Abandonment**

*Presenter:* Mariaelena DiBenigno  
*Advisor:* Susan Donaldson  
 College of William & Mary,  
 American Studies

In American literature of the South, haunted houses often represent hidden, unspeakable histories. From William Faulkner's *Absalom, Absalom!* to Toni Morrison's *Beloved*, the haunted house is more than a creepy setting. Recent literary scholarship calls for an exploration into how spectrality symbolizes the decaying Lost Cause and positions the South as a haunted landscape littered with the vestiges of antebellum enslavement and Jim Crow brutality. Literary characters, such as Milkman from Morrison's *Song of Solomon*, travel to haunted houses in order to understand these very genealogies. I am interested in how literary haunted houses, as imagined archives of Southernness, parallel the more recent photography of haunted, abandoned spaces. Photographers like Walker Evans, Shellburne Thurber, and Deborah Luster document the decline of Southern structures, often curating their haunting images with well-researched histories. They produce photographs of rural decay, and their subjects are ethereal, ghostly ruins of a once thriving world. Like their literary counterparts, photographers of abandonment are not only interested in the aesthetics of hauntedness, but also the broader socio-cultural and historical implications. I plan to argue that photographic projects of abandonment still project the South as an imagined space of decay, but with more social critique and less nostalgia.

*Mariaelena DiBenigno is a Ph.D. candidate in American Studies at the College of William & Mary. Her research interests include connections between spectrality, memory and public history; popular American narratives about war; and death commemoration in the United States.*

### **HIV/AIDS in Times of Equality: Queer Health and Homonormativity**

Presenter: Jan Hübenthal  
 Advisor: Leisa Meyer  
 College of William & Mary,  
 American Studies

In May 2014, the Centers for Disease Control and Prevention (CDC) launched a PSA campaign titled "Start Talking. Stop HIV." Accentuating soft focus images of handsome gay couples, a disembodied narrator emphatically repeats the phrase "start talking" and emphasizes disclosure "whether you're looking for Mr. Right or Mr. Right Now, never stop talking." Evocative of ACT UP's "Silence = Death" slogan, these videos do not demand systemic change to public health policy but promote an apolitical ethos of personal responsibility. Rather than advocating for HIV-suppressant drugs to become widely accessible, the aim of these PSAs is to make more potential consumers aware of the products' availability, hailing rights-bearing queers into health while charging a premium for access to this healthiness. Able-bodiedness as well as whiteness are implicit in gay rights claims: only non-disabled gay folks, with well managed HIV infection should they be positive, are imagined to enjoy marital bliss, serve in the military, or adopt children. A disability studies approach problematizes this presumption and elucidates the degree to which queer health is differentially accessible. Post-marriage equality homophobia, in that sense, is enabling for some while disabling others as it ties survival to racial, material, and political privilege. Some of the questions this paper engages are: In what ways is "post-AIDS" queer health a marker of racial privilege? How do biopolitical arrangements of healthy queer life coexist with specters of queer suffering and sickness?

*Jan Hübenthal is a Ph.D. candidate in American Studies at the College of William & Mary. His dissertation project focuses on narratives, memories, and futures of HIV/AIDS vis-à-vis neoliberal LGBT rights-based movements. resistance.*

### **Rudresh Mahanthappa's Gamak: "Inescapable Hybridity, Teleological Subversion, and New Jazz Methodology"**

Presenter: Brian Edward Jones  
 Advisor: Charles McGovern  
 College of William & Mary,  
 American Studies

Since its inception, jazz has been an incubator of what Paul Gilroy coined "inescapable hybridity": musical identity is an illusion, in constant flux, and often misinterpreted. Rudresh Mahanthappa's 2013 release *Gamak* continues to propel this tradition of unfixed amalgamation by fusing the aesthetics of Indian Carnatic music with American jazz. Beyond the South Asian musical influence, his quartet destroys the standard jazz teleology -- where normative practices indicate an enforced format of performance structure. By creating a sonic playground that defies the status quo and tests new ideas, Mahanthappa's *Gamak* is an uncompromising recording, a leading light providing a glimpse into the future modalities of jazz praxis.

*Brian Jones is a Ph.D. student in American Studies at the College of William & Mary. His research interests include the intersections between jazz and Indian music, the life and work of drummer/composer Paul Motian, and jazz during the Civil Rights era.*

### **Serving Hibernian Heritage: The Irish Pavilion Coffee Bar at the 1964 New York World's Fair**

Presenter: Neeve Kelly  
 Advisor: Charles McGovern  
 College of William & Mary,  
 American Studies

In the late-twentieth century, the significance of Irish ethnicity in America was uncertain. While John F. Kennedy's election unofficially marked full assimilation for the Irish in America, and the white ethnic revival enabled the Irish to celebrate their heritage with unchallenged pride, the newly accepted Irish-American character was threatened. Reduced immigration led to a weakened Irish identity and the violence of the Troubles undermined the admittedly inaccurate perceptions of bucolic fields and friendly provincials that Americans were newly entertaining. No sooner than they had made it, some Irish were afraid of losing it. One such Irish American, Rosaleen Cahill-Fitzgibbon, addressed these uncertainties by promoting a sophisticated version of Irish heritage on an international stage.

*Neeve Kelly is a Ph.D. candidate in American Studies at the College of William & Mary. Her dissertation uses social geography, visual and material culture theory, and consumer, ethnic, gender, and performance studies to examine the commodification of Irishness in postmodern America.*

### **Pushing Back: Jayne Cortez and Unesco's War on War**

Presenter: Renee M. Kingan  
 Advisor: Hermine Pinson  
 College of William & Mary,  
 American Studies



In the November, 1982 issue of the Unesco Courier commemorating its War on War poetry conference, Jean-Jacques Lebel wrote: "The idea was simple and inspiring: that the vision and language of the poet as such should be presented without constraint or censorship on the stage of Unesco, which is by definition supranational." Black American poet Jayne Cortez was the embodiment of a "supranational" genre-smashing public intellectual dedicated to coalition-building and writing scathing critiques of hegemonic power structures. This paper presents two poems Cortez wrote specifically for War on War: "Stockpiling" and "Push Back the Catastrophes." This paper will add to the growing body of critical scholarship on Cortez's poetry by first providing a contextual framework for Unesco's War on War, then analyzing both poems in their printed and recorded forms. The analyses will highlight ways in which Cortez's musical collaborators imbued her words with more energy through their dynamic interactions as they worked together. The essay will also include material from event programs and Cortez's unpublished handwritten notes from Unesco's War on War that are preserved in (still unprocessed) archival boxes at the New York Public Library's Schomburg Center for Research in Black Culture.

*Renee M. Kingan is a Ph.D. candidate in American Studies at the College of William & Mary. She is writing her dissertation on Jayne Cortez's jazz poetry collaborations with the Firestarters.*

### **Gentry Magazine's Post-Consumer Vision in the Age of Conformity**

*Presenter:* John Barrington Matthews  
*Advisor:* Alan Braddock  
 College of William & Mary,  
 American Studies

At first glance, publisher William C. Segal's *Gentry* magazine seems to paint a glowing image of post-war consumerism and excess. Published quarterly between 1951 and 1957, the pages of *Gentry* (printed in an over-sized format with high quality paper and ink, and priced at an exceptional two dollars per issue) overflow with images of the post-war high life. Once the reader moves beyond the several dozen pages of advertisements and product endorsements that open each issue however, they find a publication grappling with a more complicated relationship to consumer goods than might be expected. Editorials on philosophy and religion, the arts, and the cultivation of new skills all privileged experiences not sold in stores. Ostensibly a celebration of high-class consumerism, *Gentry* followed in footsteps of *Esquire* and other early men's magazines, presenting a masculinized version of consumption that recast shopping, entertaining, and fashion as manly pursuits. At the same time, the magazine's editorial staff appeared to struggle with a realization that the accumulation of wealth and the enjoyment of consumer goods did not on its own lead to a satisfying life. This paper will explore *Gentry's* paradoxical relationship to consumer capitalism, its position as both an advocate for and an editorial voice against the unquestioned acquisition of material goods, and how its popularity among a class of elite consumers suggests cracks in an "Age of Conformity."

*John Matthews is a graduate student in the American Studies Program at the College of William & Mary. He studies American art and visual culture from the late nineteenth to the mid twentieth century. His research explores depictions of the American landscape, tourism, and the construction of natural spaces.*

### **The Biopolitics of Disaster**

*Presenter:* Jennifer Ross  
*Advisor:* Elizabeth Losh  
 College of William & Mary,  
 American Studies

The two states of exception which defined the first decade of the new millennium acted upon two sets of bodies in very different ways. Combining biopolitics and race history/theory, this paper will examine the displacement of negative affect onto Arab- and Muslim-Americans and Middle Easterners following 9/11 and onto black New Orleanians during and after Hurricane Katrina. Racialization of these two groups as what Michel Foucault terms a "mythical adversary" based on cultural and nation-based racism. By constructing these groups as adversaries, the State posited Arabs/Muslims/Middle Easterners as a threat to the sanctity of the (white) American race and way of life while reinvigorating narratives of blacks as a degraded and criminal element dragging on national resources. Under both the 9/11 and Hurricane Katrina states of exception, this largely unchallenged racism relegated Arabs/Muslims/Middle Easterners and black Americans to the realm of *homo sacer*, the realm of bare life and precarity. As *homines sacri*, people were reclassified as disposable populations whose deaths, whether from war, hate crimes, or social and economic disfranchisement, could be justified in the name of protecting national values, the integrity of the nation-state, the purity and goodness of the American race, and civilization itself.

*Jennifer Ross is a Ph.D. student in American Studies at the College of William & Mary. Her work focuses on the intersections of literature, biopolitics, and neoliberalism.*

### **The Limits of Homosexual Citizenship: News Media and Identity Politics in the 1960s**

*Presenter:* Helis Sikk  
*Advisor:* Leisa Meyer  
 College of William & Mary,  
 American Studies

LGBTQ experiences have been famously under- or misrepresented within national mainstream narratives. Much of the pre-1980s America press ignored this important segment of society or only covered homosexuality in negative light. LGBT activists realized early on that media coverage made a huge difference in national perception of the community and played a major part in creating safe environment in the streets and workplace. In the mid-1960s, activists started to organize in order to monitor national media coverage of the homosexual community and publicly protest and criticize unfair press. This era also saw a “gay” publishing boom and the birth of the longest published national LGBTQ magazine to date, *The Advocate*. The *Advocate* became the “*New York Times*” of gay press that provided a mainstream site of reference what counts as “gay” in national culture. As such, the magazine is an exceptional example of mainstreaming LGBTQ politics and culture with very particular kind of identity in mind: affluent white urban gay male. Yet this image of the ideal homosexual citizen excluded the majority of LGBTQ identifying people. This essay argues that the making of the homosexual citizen since the late 1960s has resulted in homonormativity at home and homonationalism abroad and is ultimately a manifestation of state-authorized formations of racism, misogyny, and classism.

*Helis is a Ph.D. candidate at William & Mary. She received her master's in American studies from the University of Wyoming, and her bachelor's in English Language and Literature from the University of Tartu, Estonia. She prefers a feral interdisciplinary approach to the relationships between queerness, built environment, media and visual cultures. Currently she is getting ready to defend her dissertation on the affective economies of LGBTQ activism in the United States.*

### **Dysfunctional Families and Defective Communication in Flannery O'Connor's Fiction**

*Presenter:* Istvan Szokonya  
*Advisor:* John Matthews  
 Boston University,  
 English

Flannery O'Connor's fiction is abundant in its depiction of complex family relationships, unresolved family conflicts, and personal life crises. Truncated families and their ineffective functioning often bring about important turns in the narratives, and in many cases the dysfunctions are related to the defective communication of the family members. The conference paper focuses on the relationship between family issues and unsuccessful communication between family members. In my research I wish to investigate whether the conflicts are caused entirely by the lack of effective communication. To conceptualize psychological relationships and communicative situations, the paper will utilize intersubjective theory. I will mostly focus on aspects of the theory of intersubjectivity which try to understand and analyze communications between subjects. Much emphasis is put on Donald Davidson's “triangle principle,” which allows new understanding and interpretations of certain communicative situations. The paper focuses on short stories which fit into the “single mother, only daughter” pattern described by Louise Westling. I plan to discuss “The Life You Save May Be Your Own,” “Good Country People,” and “A Circle in the Fire.”

*Istvan Szokonya is a Ph.D. candidate at Eotvos Lorand University, Budapest, Hungary, pursuing his degree in the American Studies Graduate Program. In the 2015/2016 academic year he is a Fulbright Fellow at the English Department of Boston University. Istvan's main academic focus is Southern literature; his dissertation focuses on truncated families of Flannery O'Connor's fiction.*



**"Build, Buy, or Modernize":  
Mechanization and Designs of American  
Kitchens, 1900-1959**

*Presenter:* Khanh V. Vo  
*Advisor:* Charles McGovern  
College of William & Mary,  
American Studies

The 20th century ushered in a concept of the "modern" kitchen through the mechanical gadgets and tools designed to foster a domestic model of efficiency. Literature of eugenics subjected housework to the time-motion studies that rationalized assembly line work aimed at increasing productivity and limiting the drudgery of housework. Culminating in the 1959 Kitchen Debate between Nixon and Khrushchev at the American National Exhibition in Moscow, where the men quipped on political ideologies and questions of progress, affordability, and efficiency, this paper engages in the discourse of the kitchen and its role in defining public and private life, traditional and modern practices in an increasingly urbanized and industrialized society. If efficiency is inextricably tied to progress and modernity then the push towards the modern, I argue, embodied, perpetuated, and transformed the idea of efficiency and gave it a fundamentally material form. Kitchen tools and technology and the layout of the modern kitchen were designed to cultivate an imagined ideal of efficiency, an ideal manufactured and sold through popular culture, corporate marketing, and government endorsement. Simultaneously, labor saving devices and design masked the labor women perform. This hidden labor challenges whatever might be considered "efficient" and highlights the problematic association of the modern with efficient and the traditional with inefficient. I examine the ways an ideal efficiency have transformed our cooking practices, influenced our consumption of technology, and offer alternative visions of the kitchen as an infrastructural support for women's involvement in paid labor and public life.

*Khanh Vo is a graduate student in the American Studies Program at the College of William & Mary. Her research interests include 19th and 20th century American history, material culture, history of technology, labor and gender, and foodways.*

### **Salt at the Crossroads: Cayo Sal, Los Roques Archipelago, within the 18th-Century Southern Caribbean**

*Presenter:* Konrad Andrzej Antczak  
*Advisor:* Frederick Smith  
College of William & Mary,  
Anthropology

The island of Cayo Sal (Los Roques Archipelago, Venezuela) has a series of saltpans running across more than two kilometers at its western end. The historical archaeological investigations at the site of Uespen de la Salina on Cayo Sal open a window onto the lives of 18th-century seafarers. Throughout the 18th century, the island was visited by Curaçaoans who would leave their enslaved mariners here to rake salt. It is also probable that occasional visits were made to the saltpans by Anglo-Americans, French smugglers and privateers and the inhabitants of the Province of Venezuela. During the 18th century, Curaçao was also heavily involved in the contraband of cacao on Venezuela's central coast. Cayo Sal was an uninhabited transshipment point for illegal cacao, located at a safe distance from Spanish Tierra Firme. Venezuelan cacao planters would meet Curaçaoan traders here to exchange much needed manufactured goods and information and also establish future commercial networks. The large ceramic collection excavated at the site of Uespen de la Salina can be separated into five categories according to origin: British, Spanish, French, Mexican and/or Greater Antillean, and Curaçaoan and/or Venezuelan. The heterogeneous material remains at Cayo Sal are reflective of the medley of interactions and mobility in the 18th-century Southern Caribbean where Cayo Sal was a saltpan at the crossroads.

*Konrad Antczak is a Ph.D. candidate in Anthropology at the College of William & Mary. His research interests focus on the historical archaeology of 17th to 19th-century salt exploitation in the Venezuelan Caribbean and aim to trace the salt's various impacts on local, regional and Atlantic world spatial scales. Using the Caribbean salt trade as a window onto the past, he is specifically interested in reconstructing the entanglements of seafarers and things from this time period to understand what role these played in the shaping and development of capitalism, consumerism and modernity.*

### **Railroads, America, and the Formative Period of Historical Archaeology: A Documentary and Photographic Investigation into the Historic Preservation Movement**

*Presenter:* Lauren Alston Bridges  
*Advisor:* Kathleen Bragdon  
College of William & Mary,  
Anthropology

The twentieth century, the formative period of historical archaeology, is marked by an ideological shift from the fervent consumerism and industrialism of the nineteenth century, towards a growing institutional concern for the nation's finite natural and historical resources. A focused case study of twentieth century railroad stations highlights various themes pertinent to the discussion of the role of historical archaeology in the Historic Preservation Movement, which focuses on preservation and interpretation of resources. Each railroad station provides a unique view into the past and present local, state, and federal legislation and ideologies that directed the station's construction, destruction or renovation, and adaptive reuse or preservation. This study of mostly extant railroad stations further provides an opportunity for dialogue between federal/state agencies, local communities, and historic practitioners, which facilitates the formation of legislation and ideologies that will shape the next 50 years of historic interpretation and preservation in the United States.

*Lauren Bridges is a Ph.D. student in Historical Archaeology at the College of William and Mary. She has worked throughout the United States on a transportation project for the past two years with a cultural resources management firm.*

### **"a very excellent race of animals": George Washington and the American Mule**

*Presenter:* Jenna Kay Carlson Dietmeier  
*Advisor:* Neil Norman  
College of William & Mary,  
Anthropology

Best known as the first President of the United States, George Washington's other famous moniker is "Father of the American Mule." However, mules had been used in North American agriculture for decades before Washington's tenure as mule breeder and promoter extraordinaire. This research explores the history of the mule in North America, George Washington's role in bringing the mule to pre-eminence in American agriculture, and the mule's lasting legacy on the Plantation South. Through an examination of Washington's personal writings and the farm accounts of his Mount Vernon estate, this paper examines why Washington specifically is credited with being the Father of the American Mule. Using an animal landscape approach, this paper also explores the natural behaviors and biology of the mule and how those factors contributed to Washington's admiration of the hybrid and to the mule's lasting impact on agriculture in the Plantation South. This paper represents an anthropological approach to the documentary record, exploring the social, economic, and natural history of the United States' premier working animal: the American Mule.

*Jenna Carlson Dietmeier is a Ph.D. candidate in Anthropology at the College of William and Mary. Her dissertation research explores the working lives of animals on eighteenth-century plantations in the Chesapeake and the South Carolina Lowcountry and how those working animals were incorporated into the human social realm.*

### **"Maybe Jesus Knows Sign": The Formation of a Deaf Christian Identity**

*Presenter:* Timothy Y. Loh  
*Advisor:* Sara Singha  
Georgetown University,  
Anthropology



Deaf Christians are in the unique position of belonging to both Deaf and Christian identity groups, whose beliefs may conflict with one another. The former group believes that Deafness is a cultural, even ethnic, identity centered around American Sign Language, and many, given the choice, would rather stay Deaf than become hearing, while the latter group views disability as one consequence of a fallen world that God will eventually restore, and the Bible records a number of instances where disabled people are miraculously healed. This anthropological research project aims to understand: how do Deaf Christians negotiate their identity as members of two distinct groups who may not have the same perspective on what constitutes disability? Using ethnographic evidence, I argue that Deaf Christians do not necessarily see a conflict between these two identities and perceive the label of "Deaf Christian" as a single identity, indexed through conversion narratives, a discourse of "God's purpose," and a desire for better inclusion. This project ultimately hopes to inform churches seeking to set up ministries to the Deaf or existing churches with Deaf ministries on how to better serve this particular demographic and to provide insight into the broader conversation on culture and religion and the issues that arise when opposing identities come into conflict.

*Timothy Loh is a M.A. Candidate in Arab Studies at Georgetown University. His research focuses on deafness and disability in the Arab world.*

### **"Fond of Fine Linnen Cloth": Cloth Fragments from a 19th-Century Hawaiian Community on Kaua'i Island, Hawai'i**

*Presenter:* Summer Moore  
*Advisor:* Jennifer Kahn  
College of William & Mary,  
Anthropology



Many Polynesian societies consider cloth as a prestige item with social significance. Historical accounts of early explorers show that, along with metal, European cloth was an item particularly sought by islanders in Hawai'i and elsewhere. Because historical references are limited, we know little about how cloth traded to Hawaiians was actually used and valued in communities, and how this may have changed over time. This paper presents preliminary results of an analysis of European cloth from an early 19th-century occupation at Nu'alolo Kai, Kaua'i Island (Hawaiian Islands). Exceptional conditions at this protected site preserved many organic items, including a diverse collection of cloth fragments. Results suggest that European cloth was among the first foreign materials used by residents of the site. Moreover, it was continuously used throughout the occupation of the site, together with traditional *kapa* or barkcloth. Analysis of the context of these finds suggests that at least some of the European cloth pieces were valued as prestige goods. Others appear to have had more mundane uses, as several fragments of cloth were modified by cutting or tying for household usage.

*Summer Moore is a Ph.D. candidate in the Anthropology Department at the College of William & Mary. Her dissertation research focuses on the archaeology of 19th-century households in rural Hawai'i. Summer received an M.A. in Anthropology in 2006 from the University of Denver.*

### **Understanding Northeastern North American Riverine Trail Systems through Network Analysis**

*Presenter:* Mallory L. Moran  
*Advisor:* Kathleen Bragdon  
College of William & Mary,  
Anthropology

The indigenous people of northeastern North America utilized the river systems of the continent to form an extensive network of travel and communication. While the riverine system offered the opportunity for local and long-distance connections between communities, the environmental dynamics of the system presented challenges for travelers who passed throughout the network. Directional patterns of water flow, coupled with seasonal variations in flow magnitude and water temperature, meant that the difficulty of travel varied across space and changed continuously throughout the year. This constantly-changing system presents methodological challenges for archaeologists, who have heretofore focused primarily on the analysis of static overland trail systems. New applications of formal network analysis and modeling, however, coupled with GIS technologies, hold potential for the spatial analysis of riverine systems. Approaching systems of riverine travel from a perspective of network theory offers opportunities to explore how they were organized in terms of closeness, regularity of travel, and overall spatial connectivity. This paper applies these analytical techniques to the riverine trail networks identified in the 1899 work of William Ganong, *A Monograph of Historic Sites in the Province of New Brunswick*, and explores how these forms of analysis can inform archaeological investigations of trail networks.

*Mallory Moran is a Ph.D. candidate in Anthropology at the College of William & Mary. Her research focuses on issues of scale and embodiment in understanding riverine networks of travel in New Brunswick, Canada and developing new methodologies for investigating past human relationships with landscapes.*

### **The Power of Ceramics: An Analysis of Ceramics and Military Order at Fort Stanwix**

**Presenter:** Elizabeth Scholz  
**Advisor:** Neil Norman  
College of William & Mary,  
Anthropology



Historically, there has been significant interest in examining military sites and recent archaeological excavations have contributed to scholars understanding of battles, sieges, and encampments. Since 1965, archaeological excavations at Fort Stanwix in Rome, New York have uncovered a rich assemblage that has facilitated the reconstruction of the fort and allowed historians and archaeologists to study the British and Continental occupation of the fort. Integrating archaeological, historical, and documentary evidence, this paper analyzes the spatial and typological distribution of ceramics at Fort Stanwix. It seeks to examine the way the officers and rank-and-file soldiers negotiated relations of power as well as the ways that material culture is imbricated in the maintenance of "military order" at this isolated fort. This paper's approach will provide a much-needed focus on military structure and status on isolated forts in order to examine the ways in which armies maintained discipline in forts and encampments during the 18th century.

*Elizabeth Scholz is a second year M.A. student in Anthropology at the College of William & Mary. Her research focus is in historical archaeology and she is particularly interested in the study of conflict, trade, ceramics, and human osteology. Elizabeth is the 2016 recipient of the S. Laurie Sanderson Award for Excellence in Undergraduate Mentoring.*

### **This Old Virginia House: An Anthropological Analysis of Architecture at Buffalo Forge's Mount Pleasant**

**Presenter:** Erin Stock Schwartz  
**Advisor:** Michelle Lelievre  
College of William & Mary,  
Anthropology

Situated on (and built partially into) a hill in the mountains of southwest Virginia, the "Mount Pleasant" mansion (ca. 1819) at the Buffalo Forge iron complex in Glasgow, Virginia, is distinguished not only by its striking architectural form, but by the stories of its many occupants. Its unusual room configuration, several additions and alterations, and unique combination of regional and ethnic influences tell a story of constant change and cultural contrasts throughout 19th century Virginia. This poster lays out the complex material world of the forge's many residents, dissecting the home's exterior and interior features and examining what particular stylistic or architectural choices reveal about the occupants' values, ambitions, identities, and ideas. Both traditional field techniques and historical research are used to connect and contextualize the many features in Mount Pleasant. This preliminary research also hopes to provide a basis for future archaeological and historical research of the surrounding forge landscape.

*Erin Schwartz is a Ph.D. student in Anthropology at the College of William & Mary. Her interests in historical archaeology, gender, and 17th-19th century Virginia have led her back to southwest Virginia, where she hopes to conduct her dissertation research at the iron forge complex "Buffalo Forge" in Glasgow, Virginia.*

### **Protected Peripheries and Excavated Edges: Archaeological Investigations at Two Protected Frontier Sites**

*Presenter:* Megan Rhodes Victor

*Advisor:* Neil Norman

College of William & Mary,  
Anthropology

Frontier spaces are dynamic zones of meeting, interaction, innovation, and change; however, often in the realm of research and preservation, these locales are given peripheral attention in favor of more well-established settlements. Recently, there have been increased efforts to preserve the sites upon which bustling and boisterous frontier settlements stand. As case studies, I examine two sites: Smuttynose Island, Isles of Shoals, Maine and Highland City, Montana. Thanks to the efforts of the Smuttynose Island Steward Program and the United States Forest Service (especially the Passport in Time Program), these two frontier resource-extraction communities have been preserved and protected. Through them, I have been able to undertake archaeological excavations to examine the actions of frontier inhabitants and their drinking spaces in particular. Without preservation efforts such as these, much of the understanding of the complex network of informal economy, trade, and social negotiation, which is so prominent in frontier towns, would be lost. The artifacts recovered from these two sites have begun to reveal, when examined comparatively, that the processes at work within frontier communities driven by natural resources are very much the same, whether the site is a 17th century fishing establishment or a 19th century mining town.

*Megan Victor is a Ph.D. candidate in Anthropology at the College of William & Mary. Her research focuses on informal economy and the drinking spaces at two frontier communities: the 17th and 18th century fishing settlement of Smuttynose Island, Isles of Shoals, Maine and the 19th century gold mining town of Highland City, Montana.*



### **Morphometric Properties of Dbx1+ Neurons that Contribute to Respiratory Rhythm and Pattern Generation in Mice**

**Presenter:** Victoria Akins  
**Advisor:** Christopher Del Negro  
 College of William & Mary,  
 Applied Science



Breathing is essential behavior for mammalian life, yet its underlying neural circuits are not completely understood. The respiratory rhythm and pattern are generated by a network of neurons that form the respiratory neural circuit. Respiratory rhythmogenesis occurs in the pre-Bötzinger complex (preBötC), a bilaterally distributed site in the ventral medulla. Putatively rhythmogenic neurons in the preBötC are derived from a single genetic line, whose precursors express homeodomain transcription factor Dbx1 (i.e., Dbx1 neurons). Respiratory modulated Dbx1 neurons are found throughout the ventral respiratory column. We examine morphological properties of respiratory Dbx1 neurons to elucidate their function within the network. Respiratory Dbx1 preBötC neurons have largely commissural axon projections that synchronize the neuron population while respiratory Dbx1 reticular formation neurons, located just dorsal to the preBötC, have disparate axon projections. Some Dbx1 reticular formation neurons have ipsilateral axon projections to the hypoglossal motor nucleus to facilitate respiratory motor output while others have commissural projections that may coordinate breathing with behaviors such as whisking or licking. Dbx1 neurons, previously thought to be the core of respiratory rhythm generation, encompass a heterogeneous population of respiratory rhythmogenic neurons, respiratory premotor neurons, and premotor neurons that may coordinate breathing with orofacial behaviors.

*Victoria Akins is a Ph.D. Candidate in Applied Science at the College of William & Mary.*

### **Intervention Strategies for Epidemics: Does Ignoring Time Delay Lead to Incorrect Predictions?**

**Presenter:** Adrienna Nicole Bingham  
**Advisor:** Leah Shaw  
 College of William & Mary,  
 Applied Science

Modeling the spread of epidemics has been a useful tool in predicting the outcome of an infectious disease. Our focus is how to model the distributions of exposed and infectious time periods. While ordinary differential equations are widely used for their simplicity, they allow high probability of unrealistically short time periods. We propose that extra care must be taken when applying intervention methods such as quarantine, hospitalization, or vaccination to basic models in order to avoid inaccurate predictions. Delay differential equations, which use fixed exposed and infectious periods, can provide more accuracy but are more difficult to use and analyze. Our project investigates how more realistic time delays affect the dynamics of the system when an intervention method is also included. This project will provide guidelines for when simpler infectious disease models can be used or more realistic time periods must be incorporated.

*Adrienna Bingham is a Ph.D. candidate in Applied Science at the College of William & Mary. She is currently researching epidemic modeling, focusing on how different intervention methods affect the dynamics of a system.*



### Additive Manufacturing of Multifunctional Components Using High Density Carbon Nanotube Yarn Filaments

*Presenter:* John Michael Gardner  
*Advisor:* Hannes Schniepp  
 College of William & Mary,  
 Applied Science

Additive manufacturing allows for design freedom and part complexity not currently attainable using traditional manufacturing technologies. Fused Filament Fabrication (FFF), for example, can yield novel component geometries and functionalities because the method provides a high level of control over material placement and processing conditions. This is achievable by extrusion of a preprocessed filament feedstock material along a predetermined path. However if fabrication of a multifunctional part relies only on conventional filament materials, it will require a different material for each unique functionality printed into the part. Carbon nanotubes (CNTs) are an attractive material for many applications due to their high specific strength as well as good electrical and thermal conductivity. The presence of this set of properties in a single material presents an opportunity to use one material to achieve multifunctionality in an additively manufactured part. This presentation describes a recently developed method for processing continuous CNT yarn filaments into three-dimensional articles, and summarizes the mechanical, electrical, and sensing performance of the components fabricated in this way.

*John Gardner is a Ph.D. candidate in Applied Science at the College of William & Mary and a Materials Research Engineer at NASA Langley Research Center. His research interests include additive manufacturing, nanocomposites, materials characterization, and scanning probe microscopy techniques. John's current focus is on additive manufacturing hardware and process development for multifunctional materials.*

### Axon Initial Segment Loss in Chronic Experimental Autoimmune Encephalomyelitis is Reversible

*Presenter:* Nicholas Matthew George  
*Co-Authors:* K. Clark, S. Benusa, M. Joslyn, B. Sword  
*Advisor:* Jeffrey Dupree  
 Virginia Commonwealth University,  
 Anatomy



Experimental autoimmune encephalomyelitis (EAE) is an inflammatory mouse model of multiple sclerosis (MS). Axonal domains, which are required for proper neuron function, are unstable and degenerate in both EAE and MS. One domain that is significantly disrupted in the cerebral cortex of mice with EAE is the axon initial segment (AIS). The AIS is located on the axon immediately distal to the neuronal cell body and is responsible for initiating and modulating action potentials. In a previous study from our lab, we have shown that the maintenance of the AIS is independent of myelin, but that AIS disruption corresponds with the inflammation in EAE. In early stages of EAE, we observe a shortening of AISs while in later stages of the disease the number of AISs is significantly reduced. When mice are treated with didox, an anti-inflammatory drug, at an early stage of EAE, AIS length is restored and the loss of initial segments is inhibited. Based on these findings, we propose that didox will restore the lost AISs observed in later stages of EAE. Preliminary immunocytochemistry results show that AIS structure is restored in didox treated mice, indicating a recovery from this inflammatory model of MS. These findings provide the first evidence that AIS degeneration, an axonal pathology observed in MS, is reversible.

*Nicholas George is an M.A. candidate in Anatomy and Neurobiology at Virginia Commonwealth University. His research interests in neuroscience involve glial cells and neurodegenerative diseases.*



### Toughness-Enhancing Structure of Recluse Spider Webs

*Presenter:* Sean Koebley  
*Advisor:* Hannes Schniepp  
 College of William & Mary,  
 Applied Science

Spider silk is the toughest known biomaterial, and its energy absorption capacity is known to be further enhanced if the silk is arranged into an orb-web structure. The webs of non-orbweaving spider species, which are often more disorganized, have been less studied. But these alternatives offer potentially intriguing designs that are just as superbly adapted to their respective evolutionary niches. The recluse genus of spiders (*Loxosceles*) is one such non-orbweaving species that spins an especially curious silk: instead of a cylindrical strand like that of most other species, it produces a flat ribbon 6–8  $\mu\text{m}$  wide and only 40–80 nm thick. We show that *Loxosceles* spins these flat ribbons into a web structure that enhances toughness. Modeling of ideal elastic and strain-hardening plastic fibers arranged into this structure confirmed that the advantage is generally applicable, and key design parameters were identified. In addition to enhancing toughness, the *Loxosceles* web design was also found to contribute to the unique prey capture capacity of a ribbon-like silk. These advantages make the recluse silk-web system an ideal candidate for biomimicry in future synthetic materials.

*Sean Koebley is Ph.D. candidate in Applied Science at the College of William & Mary. His research focuses on silk structure and assembly.*

### Understanding the Genetic Origins of Breathing Behavior in Mammals

*Presenter:* Andrew Kottick  
*Advisor:* Christopher Del Negro  
 College of William and Mary,  
 Applied Science



Breathing behavior in mammals relies on periodic inspiratory movements of the diaphragm and airways that produce ventilation in support of respiration. Understanding the neural origins of inspiratory breathing movements is a basic challenge for neuroscience with considerable physiological significance. We seek to discover which neurons comprise the core inspiratory central pattern generator by taking a genetic approach. Interneurons derived from progenitors that express the transcription factor Dbx1 (Dbx1 neurons) may play a key role because they are necessary for breathing at birth, and they contain markers previously associated with rhythmogenic function. Using intersectional mouse genetics to visually identify and optically manipulate Dbx1 neurons, we have described their role in respiratory rhythmogenesis and pattern formation. Our results suggest that Dbx1 neurons form the core inspiratory oscillator, as well as a significant portion of the premotor population. These results contribute to the understanding of the genetic origin of the breathing network, which may have ramifications for the loss of respiratory function in neurological disease states.

*Andrew Kottick is a Ph.D. candidate in Applied Science at the College of William & Mary. He investigates the properties of biological motor pattern generating networks in the mammalian central nervous system.*

## Calcium Activity in Embryonic Neural Development

**Presenter:** Sudip Paudel  
**Advisor:** Margaret Saha  
 College of William & Mary,  
 Applied Science

Calcium is an ancient and ubiquitous signaling molecule in living organisms. It plays a major role in virtually every physiological system by allosteric regulation of various proteins and enzymes. In particular fluxes in calcium form the basis of neurotransmission in the adult nervous system. While a great deal is known about the molecular-cellular details of calcium activity in the adult brain, far less is known about the significant amount of calcium activity in the embryonic nervous system. Previous published reports as well as preliminary data from the lab has demonstrated ongoing calcium activity at gastrula and neurula stages of development as calcium waves and spikes. However we know little about the patterning, regularity or molecular-cellular basis of this activity. Our goal in this project is to identify the role of calcium activity in early neural development. We will monitor calcium activity using genetically encoded calcium markers and identify phenotype of the cells that are showing these activity employing various approaches. First we will use memRFP to label membranes and identify cells following in situ hybridization to identify which cells display calcium activity. Second we will use caged compounds and in situ hybridization to identify the phenotype of the cells. Taken together these experiments will reveal whether there is stereotypical calcium activity in early neural development and will begin to uncover the molecular mechanisms governing this process.

*Sudip Paudel is a graduate student in Applied Science at the College of William & Mary. He is interested in developmental molecular neuroscience.*

## Minkowski Product of Convex Sets and Product Numerical Range

**Presenter:** Diane Christine Pelejo  
**Co-Authors:** Y. Poon, K. Wang  
**Advisor:** Chi-Kwon Li  
 College of William and Mary,  
 Applied Science

Let  $A$  and  $B$  be two compact convex sets in the complex plane. The Minkowski product of  $A$  and  $B$  is the subset  $AB = \{ab : a \text{ is in } A, b \text{ is in } B\}$  of the complex plane. The product numerical range of a matrix  $m \times n$ -by- $m \times n$  matrix  $X$  is defined and denoted by  $W(X) = \{(z \otimes y)^* X (z \otimes y) : z^* z = 1, y^* y = 1\}$ . If  $X$  and  $Y$  are matrices with numerical range  $W(X)$  and  $W(Y)$ , respectively, then the product numerical range of  $X \otimes Y$  is exactly the Minkowski product of  $W(X)$  and  $W(Y)$ . The set  $AB$  may not be convex even when  $A$  and  $B$  both are. It was conjectured by Puchala et. al that the Minkowski product of two convex sets is star-shaped. We show that this conjecture is not true by giving examples for  $A$  and  $B$  so that  $A$  and  $B$  are triangles (including interior) and  $AB$  is not star-shaped. We also prove that the set  $AB$  is star-shaped if  $A$  is a line segment or a circular disk.

Diane Pelejo is a Ph.D. candidate in Applied Science at the College of William & Mary. She studies matrices and its properties that have applications in quantum information science.

## Modeling preBötC Dbx1 Neurons

*Presenter:* Hanbing Song  
*Advisor:* Christopher Del Negro  
*Co-Authors:* J. Hayes, M. LaMar  
 College of William & Mary,  
 Applied Science

The mammalian breathing rhythm originates from the pre-Bötzinger complex (preBötC) of the ventral medulla. The preBötC core consists of interneurons derived from progenitors that express transcription factor Dbx1. These autorhythmic putative “pacemaker” neurons possess several characteristic physiological mechanisms to ensure proper functionality, including ICAN (Calcium-activated non-specific cation current), INa-P (persistent Sodium current), synaptic depression, etc. In this modeling and computational project, we will improve the Rubin-Hayes model to a more realistic level. Other than the Rubin-Hayes model, so far there are two other models aiming to replicate the rhythmogenic neuronal behavior, each having its own advantages and disadvantages. Jasinski’s model in 2013 adopted a realistic method in Calcium dynamic that a Calcium current equation and an IP3 gating variable were included that influenced Calcium concentration. Guerrier’s model in 2015 succeeded in replicating the synaptic depression simply by using a basic H-H type model combined with a model of synapses, taking the place of the hypothesized contributing physiological factors of rhythmogenesis. Our goal, however, is to synthesize the three models on the basis of the well-established Rubin-Hayes model in order to maintain the merits of each model while making the model computationally stable in numerical simulations. This computational model could be tested with the cumulative deletion experiment that when a total of ~18% neurons is deleted, the network-wide rhythmicity would be precluded.

*Hanbing Song is a Ph.D. candidate in Applied Science at the College of William & Mary. His research mainly focuses on mathematical modeling on respiratory circuit as well as preBötC Dbx1 neurons.*

## Silencing Dbx1 pre-Bötzinger Neurons Disrupts Breathing in Mice

*Presenter:* Nikolas C. Vann  
*Advisor:* Christopher Del Negro  
 College of William & Mary,  
 Applied Science

Central pattern generator networks produce neural rhythms that underlie rhythmic motor behaviors such as walking, swimming, chewing, and breathing. The central pattern generator for inspiratory breathing movements resides in the pre-Bötzinger Complex of the ventral medulla, but its cellular composition in adult mammals remains incompletely understood. Experiments using knock-out mice and perinatal in vitro preparations suggest that brainstem interneurons derived from Dbx1-expressing precursors generate inspiratory rhythm. Here we test the Dbx1 core hypothesis using a cre-lox system to express the proton pump archaeorhodopsin-3 in Dbx1 preBötC interneurons. Light-mediated inhibition of Dbx1 neurons reduced the frequency and amplitude of breathing movements up to and including a complete cessation of ventilation. These results suggest that Dbx1-derived hindbrain interneurons form the cellular core for inspiratory breathing rhythm and may also influence motor output.

*Nikolas Vann is a Ph.D. candidate in Applied Science at the College of William & Mary. His interests focus on central pattern generators, specifically the respiratory oscillator.*

## Revealing the Structure of *Loxosceles* Silk at the Molecular Scale

*Presenter:* Qijue Wang  
*Advisor:* Hannes Schniepp  
 College of William & Mary,  
 Applied Science

Due to its extraordinary mechanical properties, spider silk is one of the most important biomaterials in nature. The combination of high tensile strength and extensibility makes it unrivaled by synthetic materials. It has many potential applications in biomedicine, biointegrated electronics and polymer industries. However, current artificial silk has inferior properties to natural spun spider silk, largely caused by the insufficient understanding of silk fiber structures. With its distinctive thin film morphology and nanometer-scale thickness, *Loxosceles* silk provides an ideal research model for structural investigation. Here, we show our investigation of the *Loxosceles* silk ribbon morphology using atomic force microscopy. Our work reveals its structural constituents with molecular resolution and thus provides a better understanding of how silks achieve their superior performance.

*Qijue Wang is currently a second year Ph.D. student in Applied Science at the College of William & Mary. He works in the Nanomaterials and Imaging lab. His research investigates the mechanical properties, internal structures and their relationships of recluse spider silk.*

## Dynamical Behavior in a Coupled Two-Cell Brusselator Model

*Presenter:* Yan Wang  
*Advisor:* Junping Shi  
 College of William & Mary,  
 Applied Science

Many dynamical problems in physics, chemistry, biology and other fields involve modeling spatial movement of cells/particles between coupled discrete cells or reactors. The reactors are coupled through a permeable wall through which all chemical species can diffuse. We consider a coupled two-cell Brusselator chemical reaction model, which is a minimal mathematical model possess nonlinear oscillation. Through mathematical analysis and numerical simulation, it is shown that the coupled system possesses rich bifurcation structure including multiple steady states and oscillatory states, and many of these states are not symmetric so the dynamics in two cells are not synchronized. We also consider the effect of asymmetric movement between two cells.

*Yan Wang is a graduate student in Applied Science at the College of William & Mary. Her research focuses on modeling spatial movement of cells/particles between coupled discrete cells or reactors and working on the dynamical behavior of the global system.*

**Modeling Pattern Formation in the York River Tidal Marshes through the Interaction of Salt Marsh Cordgrass, Mussels and Sediment**

*Presenter:* Sofya Zaytseva

*Co-Authors:* J. Shi, R. Lipcius

*Advisor:* Leah Shaw

College of William & Mary,  
Applied Science

Spatial patterning in multi-species communities can be critical to ensuring their proper function and survival. Therefore, studying the formation of self-organized patterns in ecology is crucial for understanding the underlying interactions in the community and its ability to adapt to various environmental changes. A pattern of finger-like projections has recently been observed on the shore of the York River for salt marsh cordgrass, mussels and sediment. We propose a system of reaction-diffusion equations with nonlocal effects to explain the formation of this pattern through interactions between grass, mussels and sediment. We numerically simulate the full model in MATLAB and see that it produces stable patterns reminiscent of those observed in the field. To achieve a better understanding of the underlying dynamics, we analyze the corresponding system without spatial dependence. The analysis leads to some interesting conclusions regarding the stability of steady states and the bifurcations they undergo.

*Sofya Zaytseva is a graduate student in Applied Science at the College of William & Mary. Her research is focused on mathematical biology and in particular, questions regarding spatial patterning in nature.*

## **The Nutrition Education for Children Attending Preschool Program, The NECAP Program**

*Presenter:* Ibtehal Alsallaiy  
*Advisor:* Paul Dawson  
 Clemson University,  
 Biology

There is a need to educate children as young as 3-5 years old about nutrition. It is at this age when children start to develop their preferences for certain foods. The purpose of this research study was to; explore the perceptions, preferences, and dietary intake of the main food groups in preschool children, explore the availability, choices, and preparation of the main food groups by the care providers, design and present a nutrition education program to the children and their care providers. The average consumption of fruits during breakfast and lunch prior to the program was 51.6 %, 59.3 % respectively, after the program 74.6%, 74.9% respectively and after the wait period 77.6%, 88.2% respectively. The average consumption of grains during breakfast, lunch and snack time prior to the program was 59.2 %, 85.8%, 51.8 % respectively and after the program 79%, 71.4%, 93% respectively and after the wait period 71.1%, 85.3%, 96.4% respectively. The average consumption of milk during breakfast, lunch and snack time prior to the program was 76.3 %, 78.9 %, 89.1 % respectively and after the program 98.2%, 81.6%, 91.2% respectively and after the wait period 92.2%, 80.4%, 92.9% respectively. The average consumption of proteins during lunch prior to the program was 54.1 %, after the program 60.9% and after the wait period 65.3%. The average consumption of vegetables during lunch prior to the program was 27.7 %, after the program 63.7% and after the wait period 66.2%. The results described above suggest that there was an effect from the program and that the program was successful in delivering the nutrition education that encouraged this increased consumption.

*Ibtehal Alsallaiy is a graduate student at Clemson University. She studies nutrition education in general with an emphasis in nutrition education for children.*

## **Variance in Oxidative Stress Levels of Zebra Finch, When Exposed to Mercury at Different Stages in Development**

*Presenter:* Juan Mateo Botero  
*Advisor:* Dan Cristol  
 College of William & Mary,  
 Biology

Methylmercury exposure is known to suppress fitness parameters in songbirds including fecundity, immune response, and endocrine function. Oxidative stress (OXS) has been proposed as one of the mechanisms through which mercury causes its many deleterious effects. The high concentrations of free radicals experienced during OXS can damage proteins, lipids and DNA. Damage to these macromolecules can render vital cell pathways useless, and eventually manifest as the fitness defects commonly associated with mercury toxicity. The extent of OXS-inflicted damage throughout the different stages of life is poorly understood, however, it is clear that stressors during development have drastic effects on fitness later in life. The focus of this study is to compare mercury induced OXS at different stages of development in zebra finches. By following individuals from birth through 250 days of life, we can confidently show at what stage of development, mercury is having its biggest impact on OXS. We will assay OXS biomarkers through two different blood parameters. One assay assesses antioxidant capacity (GSH/GSSG) and the other assesses oxidative damage to proteins (protein carbonyls). This study adds an important element to mercury toxicity research by quantifying a mechanism through which mercury inflicts its damage during development.

*Juan Botero is an M.S. student in Biology at the College of William & Mary. He spent a year doing field work with Brown-headed Nuthatch, Eastern Hellbenders and Snapping Turtles post-graduation. He conducts research at the Institute for Integrative Bird Behavior Studies (iibbs) lab at William and Mary. His research interests include conservation and toxicology .*

## Competition Affects Functional Trait Responses of Dune Grasses to Abiotic Stressors

**Presenter:** Joseph Karl Brown  
**Advisor:** Julie Zinnert  
 Virginia Commonwealth University,  
 Biology

Stability of coastal systems are threatened by sea-level rise compounded with increased frequency and intensity of storms. This emphasizes a need for protection of inner island systems by dune formations. Dune building processes are affected by interactions between growth of ecosystem engineering dune grasses and environmental factors associated with disturbance such as sand burial and salt spray. Climate change may also cause latitudinal expansion of some species, resulting in emergence of competitive interactions that were previously absent. Topographic structure of coastlines, traditionally influenced by sand burial, could change as a result of competition emergence. Our goal was to use functional trait responses to determine plant performance in the presence of common abiotic factors and competition. We performed a greenhouse experiment by planting three common dune grasses (*Ammophila breviligulata*, *Uniola paniculata*, and *Spartina patens*) in different competition mixtures, using sand burial and salt spray as abiotic stressors. Plants treated with burial and salt spray showed significant increase in leaf elongation throughout the experiment, while maximum root length decreased with burial. This indicates changes in energy allocation in response to environmental factors. We found a significant interaction between environmental treatment and competition level. Our research shows that functional trait responses (biomass, height, and maximum root length) to environmental filters change as competition increases. These factors will influence dune topography and island formation causality.

*Joseph Brown is an M.S. student in Biology at Virginia Commonwealth University. He is currently conducting research on functional trait responses of ecosystem engineering dune grasses common to east coast barrier islands. His research is part of a collaborative effort to understand plant mechanisms behind dune construction and morphology.*

## Can Lizard Embryos Survive Climate Warming? Thermal Constraints on the Physiology of Developing Eastern Fence Lizards

**Presenter:** Michael Anthony Carlo  
**Co-Author:** E. Riddell  
**Advisor:** Michael Sears  
 Clemson University,  
 Biology



As rapid climate change affects ecological systems across the globe, organismal responses to such change rely heavily on the plasticity of physiology and behavior. For instance, mobile animals can alter behavior in response to changes in the thermal environment to buffer effects of climate warming. However, animals in immobile life stages lack that capacity and must therefore rely on physiology. For instance, when a female Eastern fence lizard chooses a nest site, she determines the conditions experienced by her embryos. The developing embryos are exposed to recurrent thermal stress in shallow underground nests with fluctuating temperatures. In Summer 2014, we conducted a laboratory experiment to evaluate the effects of warming nest temperatures on the physiology and survival of developing fence lizards. We reared embryos under three daily temperature cycles: a contemporary regime with a maximum daily temperature ( $T_{max}$ ) of 32.1°C, and two regimes to simulate warming scenarios in which  $T_{max}$  was raised by 3.5°C and 7.0°C. Results showed embryos from warmer nests had lower survivorship and grew more slowly post-hatching. This is significant because increased nest mortality and thermal constraints on the physiology of developing lizards may limit the persistence of the species under climate change. Future studies will examine whether female fence lizards can adjust nesting behavior to choose nest sites that will buffer offspring to a rapidly warming environment.

*Michael Carlo is a Ph.D. candidate in Biology at Clemson University studying thermal biology and physiological ecology. Using the Eastern fence lizard as a model organism, he is currently conducting research to incorporate thermal traits during early ontogeny into predictions of organismal responses to climate change.*

## Differences in Sockeye Salmon Antibody and Pathogen Infection Patterns During the Spawning Journey

**Presenter:** Maxwell Elliott Chappell  
**Advisor:** Patty Zwollo  
 College of William & Mary,  
 Biology

Anadromous fish such as sockeye salmon return to their natal streams to spawn, during which they undergo significant physiological changes including the release of cortisol, a known immunosuppressive hormone. Our lab has proposed the Immunological Imprinting Hypothesis, which suggests that juvenile anadromous fish respond to pathogens specific to their natal site by producing protective long lived plasma cells (LLPCs) that constitutively produce antibodies against those pathogens. These LLPCs are among the few immune cell types resistant to downregulation associated with cortisol. Thus, fish returning to their natal streams have protection from pathogens found at that specific location. I have been investigating the Immunological Imprinting Hypothesis through the analysis of antibody composition and usage from different locations. Since 2009 samples of Sockeye Salmon spleen and anterior kidney have been harvested from two separate salmon runs in Alaska. Using quantitative PCR (qPCR) I am examining the relative usage levels of specific VH gene families between fish at different locations. To further investigate the “pathogen fingerprint” of given spawning sites, I am using qPCR to study the pathogen load of different common fish pathogens at different sites. As I gather more data, I will test whether specific antibody compositions are associated with specific geographic sites, as well as with pathogen infection. Greater understanding of spawning fish immune functioning could potentially suggest a method of natural immunization against common fish pathogens and thus protect both farmed and wild populations.

*Maxwell Chappell is an M.A. student in Biology at the College of William & Mary studying immunology.*

## Potential Threats to Diamondback Terrapin Nesting Success Caused by the Invasive Reed *Phragmites australis*

**Presenter:** Cassandra Cook  
**Advisor:** Randy Chambers  
 College of William & Mary,  
 Biology



The diamondback terrapin (*Malaclemys terrapin*) is a specialized species of turtle that is only found in brackish water habitats along the Atlantic Coast and Gulf of Mexico of the United States. They are currently facing population threats including bycatch in crab pots, predation, and habitat loss. The expansion of the exotic, invasive reed *Phragmites australis* is causing widespread structural and functional changes to coastal habitats throughout North America, which could negatively impact the nesting success of female terrapins by invading preferred nesting habitats. I propose to determine the extent to which *Phragmites* may affect nesting of a breeding population of diamondback terrapins at Fisherman Island National Wildlife Refuge on the eastern shore of Virginia, where *Phragmites* has recently expanded into known areas of terrapin nesting. With data collected from the 2015 nesting season I will quantify the impacts of this expansion on terrapin nesting by: determining the extent to which nest incubation temperature is impacted by *Phragmites* shading and how *Phragmites* density impacts the degree of rhizome invasion into nests. With crab pots and roadways contributing to high adult mortality every year, nesting success will be highly important to maintaining and propagating this charismatic species. I hope my findings will aid local land managers in understanding the relationship between these two species thereby supporting conservation efforts, as well as applying these findings to other species that face similar threats associated with vegetation invasion and expansion.

*Cassie Cook is an M.A. student in Biology at the College of William & Mary. She is interested in conservation ecology and herpetology, and is extremely excited to be studying diamondback terrapins on the coast of Virginia. Cassie is the 2016 recipient of the S. Laurie Sanderson Award for Excellence in Undergraduate Mentoring.*



### The Influence of MED1 on Thyroid Hormone Receptor Nuclear Localization

*Presenter:* Matthew Robert Femia  
*Advisor:* Lizabeth Allison  
College of William & Mary,  
Biology

Intracellular trafficking of transcription factors is an essential cellular function that has implications in regulating gene expression. For thyroid hormone receptor (TR), proper localization is fundamental to its regulatory function of mediating gene expression in response to binding thyroid hormone (T3). Dysfunction in TR's role in transcription may lead to negative consequences in health regarding growth, development, and metabolism. MED1, a subunit of the Mediator complex that coregulates the transcription of many genes, has been shown to interact directly with TR. This interaction allows the Mediator to act as a transcriptional coactivator of TR. In addition, phosphorylation of MED1 by mitogen-activated protein kinase (MAPK)-extracellular signal-regulated kinase (ERK) enhances TR-dependent transcription. These previous studies have expanded on the transcriptional activity of TR in the presence and absence of MED1, but how these parameters affect nuclear retention and intranuclear mobility of TR has not been studied. Experiments are in progress to determine the impact of knockdown and overexpression of MED1 on TR localization. Emphasis is placed on utilizing RNA interference (RNAi), fluorescence recovery after photobleaching (FRAP), and in situ retention assays to reveal the effects of MED1 on TR under these conditions. We hypothesize that if knockdown of MED1 promotes nuclear export, a greater cytoplasmic distribution of TR will be observed. Whereas, if MED1 overexpression promotes nuclear import, we will observe a definitive nuclear distribution of TR. Together, our findings will contribute to a comprehensive network of variables affecting localization of TR and ultimately provide insight into TR and T3-related pathogenesis.

*Matthew Femia is an M.S. student in Biology at the College of William & Mary. His research focuses on revealing factors affecting the nuclear localization of thyroid hormone receptor.*

### Non-Vertebrate Model to Screen Pathogenicity of Isolated Salmonella from Animal Feed Ingredients

*Presenter:* Matthew Garrett  
*Advisor:* Annel Greene  
Clemson University,  
Animal and Veterinary Science

*Salmonella enterica* is a pathogenic, Gram negative bacterium which causes gastrointestinal infections in animals and humans resulting in diarrhea, abdominal cramps, vomiting and, in severe cases, even death. Recently, a low population of extremely heat resistant bacteria identified as *Salmonella* were repeatedly isolated from rendered animal product samples. Rendered animal products are derived by thermally treating residual, inedible products of animal slaughter. Since these products are used as pet food and animal feed ingredients, it is important to understand if the isolated *Salmonella* strains have the potential for causing disease. These *Salmonella* isolates will be screened for pathogenicity using *Caenorhabditis elegans*, a well-studied nematode, as a model. There is evidence that bacterial pathogens which cause infection in animals can also infect and reduce the lifespan of *C. elegans* significantly. Using known pathogenic *Salmonella* strains and the recently isolated *Salmonella* strains, *C. elegans* (N2 wildtype) will be tested for survival as compared to non-pathogenic bacterial controls using *Escherichia coli* OP50. If the known pathogenic strains and the isolated strains from rendered animal products reduce the lifespan of the *C. elegans*, this information will indicate the isolated strains may be pathogenic. The results will be used to determine if future tests are needed to confirm the potential dose-dependent risk for *Salmonella* disease via feed ingredients.

*Matthew Garrett is an M.S. candidate in Animal and Veterinary Science at Clemson University.*

### **The Effect of Mercury Exposure on Mate Choice in Birds**

*Presenter:* Virginia Greene  
*Advisor:* Dan Cristol  
College of William & Mary,  
Biology

Mate choice is the first step of reproduction for many sexually-reproducing species. Courtship behaviors, such as songs or displays, play an especially large role in mate choice for birds. However, stressors such as toxins can lead to abnormal courtship, potentially decreasing an animal's attractiveness as a mate. Environmental mercury, an increasing anthropogenic pollutant recently discovered to be widespread in terrestrial bird communities, presents a novel potential disruption to the process of mate choice. Mercury exposure has already been shown to reduce reproductive success in many avian species, but its potential effects on mate choice itself have remained unclear. My research examines the potential effects of mercury on the process of mate choice using the zebra finch as a model system. I examined female preferences for males on either control or mercury diets in three ways: songs only, caged choice trials, and outdoor pairing trials. While females did not appear to differentiate between males of different treatments in any of these contexts, preliminary results indicate that the social behavior of males may have differed between treatments. The potential for negative effects of mercury has important implications for the reproductive success of wild bird populations.

*Virginia Greene is an M.S. candidate in Biology at the College of William & Mary. She is interested in animal cognition, behavior, and physiology, and the interactions between all three. Her past research involvement includes developmental embryology and avian endocrinology, and she is currently working as part of Professor Dan Cristol's lab on the effects of mercury on zebra finch behavior. She is a professional scientific illustrator and has had her illustrations published in several journals, magazines, and textbooks.*

### **Integrative Genomic Analysis of Long Non-coding RNAs Associated with Autism Spectrum Disorders**

*Presenter:* Brian Lee Gudenas  
*Advisor:* Liangjiang Wang  
Clemson University,  
Genetics

Autism spectrum disorders (ASD) are a group of neurodevelopmental conditions characterized by diminished social and cognitive functions, with a prevalence of 1 out of 68 births in 2010. There is known evidence for a strong genetic component of ASD, however in the majority of cases causal factors are unknown. Long non-coding RNAs (lncRNAs) represent a large class of non-coding genes with emerging regulatory functions and have been shown to be involved in brain development. In addition, lncRNAs have been observed to be differentially expressed in the ASD brain. Disruptive genetic variants in lncRNAs functioning in development could affect their regulatory targets, thereby disrupting normal brain development. To identify if lncRNAs are associated with ASD, we analyzed RNA-sequencing data from the brains of ASD patients compared to controls to identify differentially expressed lncRNAs. Next, we asked if these lncRNAs are associated to known ASD risk genes. We constructed a weighted gene co-expression network from RNA-sequencing data during human brain development, using our previously identified lncRNAs and a curated list of known ASD risk genes. Weighted gene co-expression network analysis facilitates the discovery of associations between uncharacterized lncRNAs with ASD risk genes, affected biological pathways and at-risk developmental periods. We find groups of genes within our gene network, showing enrichment of lncRNAs, ASD risk genes and ASD associated biological functions. Thus, supporting the idea that the lncRNAs we have identified are associated with ASD and possible candidate ASD risk genes with implications of expanding upon the causes of ASD.

*Brian Gudenas is a graduate student in genetics at Clemson University studying bioinformatics. He works in Dr. Liangjiang Wang's lab researching the functional annotation of long non-coding RNAs including their association to human diseases.*

## Differential Reactivity of Microglia in Mouse Models of Multiple Sclerosis

*Presenter:* Rebecca K. Hartley  
*Co-Authors:* K. Clark, S. Benusa, B. Fuss, G. Devries  
*Advisor:* Jeffrey Dupree  
 Virginia Commonwealth University  
 Molecular Biology and Genetics

Multiple sclerosis (MS) is a neurodegenerative disorder characterized by CNS inflammation and axonal demyelination. Axonal pathology has also been reported in MS and may be responsible for the functional deficits associated with this disease. Based on preliminary data from our laboratory, we propose that a specific domain of the neuron, the axon initial segment (AIS), is targeted in MS. We have observed disruption of AIS integrity in a murine CNS inflammatory model and observations strongly implicate reactive microglia as mediators of AIS disruption. In contrast, a murine model of demyelination did not exhibit AIS pathology but reactive microglia were prevalent. We propose that reactive microglia drive AIS disruption in our inflammatory model, but observe no AIS pathology following demyelination in the presence of reactive microglia. Therefore, we propose that reactive microglia in these models exhibit different interactions and molecular profiles. To test this hypothesis, we employed immunofluorescence labeling combined with confocal microscopy to quantify microglia-AIS interaction. Additionally, we conducted a microarray using RNA isolated from microglia in both models. Our findings show that microglia are reactive prior to pathology in both models and that the extent of AIS-microglial contact is similar between the models but significantly increased as compared to naive mice. Finally, our microarray data reveal a substantial difference in gene expression indicating functional differences between the microglia in the inflammatory and demyelinating models.

*Becca Hartley is an M.S. student in Molecular Biology and Genetics at Virginia Commonwealth University. Her research focuses on the mechanisms of pathology in Multiple Sclerosis.*

## Predicting the Impact of Sea Level Rise on the Distribution of *Phragmites australis* and *Spartina alterniflora* in Tidal Freshwater Marshes of James City County, Virginia

*Presenter:* Abbey Humphreys  
*Advisor:* Randy Chambers  
 College of William & Mary,  
 Biology

With ongoing sea level rise (SLR), tidal freshwater marshes (TFMs) eventually will be flooded with more brackish water. The impact of more water and salt on the plant community of TFMs, however, is unknown. With SLR, both the invasive reed *Phragmites australis* and the native salt marsh grass *Spartina alterniflora* could become dominant species in TFMs. I propose to determine how increases in salinity and inundation caused by sea level rise will impact the relative distribution of *Phragmites* and *Spartina* in tidal freshwater marshes in Southeastern Virginia. Using GIS, I will summarize past expansion patterns by mapping the current and historical distribution of *Phragmites*. Because seed germination rates may vary in TFMs converting to more brackish conditions with SLR, I will complete a greenhouse experiment to determine germination rates of *Phragmites* and *Spartina* in response to rising salinity and inundation. From three TFMs in James City County showing greater than 50% *Phragmites* cover and three non-adjacent TFMs with less than 50% *Phragmites* cover, soil samples will be collected and exposed to different combinations of salinity and inundation. I hypothesize that more *Phragmites* seeds will germinate in soils from dense stands with less flooding and lower salinity, relative to *Spartina* seeds that will germinate more in soils from with more flooding and higher salinity. Based on germination rates and historical patterns, SLR-caused range shifts can be predicted for *Phragmites* and *Spartina* and provide crucial information for wetland management as tidal freshwater marshes convert to more brackish marshes with sea level rise.

*Abbey Humphreys is an M.S. student in Biology at the College of William & Mary. Her research interests are conservation and mitigating the impacts of climate change and invasive species.*

## Epigenetics of an Interploidy Hybridization Event in *Mimulus*

**Presenter:** Taliesin J. Kinser  
**Advisor:** Joshua Puzey  
 College of William & Mary,  
 Biology

Hybridization is a common occurrence between diverged species in flowering plants, bringing together two genomes of separate evolutionary trajectories into intimate contact. This contact first occurs during fertilization both of the egg and a second fertilization event of the endosperm, the seed's nutritive tissue. Outcrossing, where a maternal plant receives pollen from separate pollen donors, offers benefits of genetic diversity and heterozygosity, but introduces sexual conflict of different mating strategies in the developing endosperm. The mitigation of this conflict is largely driven by the ratio of parental genomes in the endosperm, yet polyploidy (ploidy above diploid) can alter these ratios, thus affecting sexual conflict. Interploidy hybridization occurs when two species of different ploidy (i.e., a diploid and a tetraploid) hybridize. Altering the balance of parental ratios can lead to seed lethality, with successful seeds typically only developing when the maternal plant is of higher ploidy. The mechanisms that drive this success or failure are not well understood. We use a recent hybrid system in *Mimulus* that has a unique opposite direction in interploidy hybrid seed viability to study the mechanistic underpinnings of seed development and its genomic interactions. Here we trace the morphological features of seed development in the parental and hybrid seeds to test for abnormal endosperm development in reciprocal interploidy hybrids. Next, we determine patterns of genomic interactions and conflict in the hybrids. We expect to better understand how genomic interactions drive endosperm development and how they either prevent or allow this speciation event to occur.

*Taliesin Kinser is an M.S. student in Biology at the College of William & Mary. His research interests include evolution, epigenetics, and molecular ecology. He is currently studying the epigenetic processes that drive speciation through interploidy hybridization of plants (*Mimulus* sp.).*

## A Different Way to Make a Hermaphrodite: Investigating a Wild Nematode Species' Cell Differentiation and Cell Cycle Progression in Germline Development

**Presenter:** Caitlin Marie McCaig  
**Advisor:** Diane Shakes  
 College of William & Mary,  
 Biology

Most organisms pass on genes in sperm or oocytes produced in two different sexes: males and females. However, in some species, self-fertile hermaphrodites produce both sperm and oocytes. In the well-studied nematode model *C. elegans*, hermaphrodites first produce sperm then switch to oogenesis. In contrast, *Rhabditis* sp. SB347 hermaphrodites produce sperm and oocytes continuously and at the same time. Immunocytology experiments characterized developing spermatocytes and their presumed progenitor cells. Using antibodies against tubulin and a sperm-specific motility protein MSP, we found meiotic spermatocytes present in the germline alongside the oocytes. The spermatocytes develop from progenitor cells that we hypothesize are transit amplifying by mitosis. The progenitors increase in number as they progress and have tubulin spindles indicating division. Thus, it appears *R. sp. SB347* evolved a distinct hermaphroditism mechanism: extending mitotic proliferation and delaying spermatocyte differentiation in these progenitor cells, enabling the germline to produce sperm at the same time as oocytes. This spermatogenesis mechanism is highly dissimilar from *C. elegans*, but may be analogous to spermatogonia cells in flies or humans. These data enlighten our evolutionary understanding of gametogenesis strategies and coordination of cellular pathways within developing gametes.

*Caitlin McCaig is an M.S. student in Biology at the College of William & Mary. She studies the cell biology of spermatogenesis in the nematode model organism *C. elegans* as well as distantly-related "wild worms."*

## Behavioral Responses and Sublethal Impacts of PAHs on Juvenile Sablefish, *Anoplopoma fimbria*

**Presenter:** Megan Marie McConville  
**Advisor:** Susanne Brander  
 University of North Carolina-Wilmington,  
 Biology

Deepwater Horizon Oil Spill (DWH) reinforced the lack of research on deepwater oil spills, and to the best of our knowledge, no research was conducted on deepwater fishes. The scientific literature is currently lacking studies focused on cold deepwater species and their responses to dispersed oil and PAHs. Sablefish, *Anoplopoma fimbria*, are a cold deepwater fish species that have been important for foreign and domestic fisheries since the end of the 18<sup>th</sup> century. Sablefish utilize the whole water column and are more susceptible to stressors as juveniles because they have not fully developed coping mechanisms. With proposed increases in deepwater offshore drilling, it is important to understand deepwater species' sensitivity to whole and dispersed oil. Crude oil is made up of a complex mixture of chemicals, consisting of polycyclic aromatic hydrocarbons (PAHs), which determine oil's toxicity. Previous studies have found juvenile fishes are highly susceptible to dispersed oil and PAH toxicity and exhibit poorer performance. Assessment of behavioral and stress response in exposed juvenile fish can help detect indicators of neurotoxicity and physiological disruption. In order to gain a better understanding of PAH toxicity on sablefish, preliminary experiments were conducted to determine behavioral responses to specific PAHs. The proposed project aims to explore the sublethal impacts of whole and dispersed oil on juvenile sablefish survival by analyzing their physiological, biochemical, and behavioral responses.

*Megan McConville is a graduate student in Biology at the University of North Carolina-Wilmington. Her research looks at the physical and behavioral impacts of whole and dispersed oil on Sablefish juveniles.*

## The Effect of Developmental Mercury Exposure on the Reproductive Success of Dosed Zebra Finches

**Presenter:** Ohad Jonathan Paris  
**Advisor:** Dan Cristol  
 College of William & Mary,  
 Biology



Exposure to mercury during development can have long-lasting consequences on critical physiological and behavioral functions. Songbirds, a taxon of immense cultural significance, public interest, and conservation importance, have been shown in field and dosing studies to suffer profound mercury-related reductions in reproductive success and overall fitness. Yet, the effects of mercury exposure during development on bird physiology and behavior in adulthood remain largely unstudied. Mirroring songbird exposures in the wild, this lab study compares reproductive success of breeding zebra finches (*Taeniopygia guttata*) exposed to methylmercury at different stages of development. Birds will be placed in one of four exposure treatments: (1) conception through 50 days of life, (2) 50-114 days of life, (3) conception through 114 days of life, and (4) non-exposed controls. In order to reveal potential reproductive disruption, data collection will begin at the time of subjects' pairing and end at offspring sexual maturity. Between these two points in time, a variety of parameters associated with reproductive success, that have been shown in earlier mercury dosing studies to be affected by methylmercury ingestion, will be monitored. This would be the most comprehensive and critical test to date of the early stress hypothesis. Its applications to conservation are also important. Results will refine our understanding of the relationship between developmental stress, increasing environmental mercury contamination, and reproductive success, and could potentially provide useful data for regulating the exposure of millions of songbirds to this pervasive pollutant.

*Ohad Paris is an M.S. student in Biology at the College of William & Mary. His research focuses on wildlife conservation and toxicology. Ohad is the 2016 recipient of the Carl J. Strikwerda Award for Excellence in the Natural and Computational Sciences.*

## Characterization and Functional Analysis of Chinmo (Chronologically Inappropriate Morphogenesis), A Presumed Transcriptional Regulator of Cell Fate and Behavior in *Drosophila*

**Presenter:** Leanna Rinehart

**Advisors:** Matthew Wawersik, Oliver Kerscher  
College of William & Mary,  
Biology

Assignment of cells' sex is essential for a species to retain the ability to reproduce sexually. In many organisms, sex must also be maintained throughout an organism's lifetime. Chinmo (chronologically inappropriate morphogenesis) is a transcription factor found in the fruit fly *Drosophila melanogaster* that regulates cell fate and behavior, and is essential for maintenance of male stem cell sex in the testis (Ma et al., 2014). Previous research indicates that Chinmo prevents feminization of stem cells and is therefore associated with masculine characteristics in fruit flies. The Chinmo protein contains several sites for potential modification by the SUMO modifier protein that could regulate its function. Previous research has also shown that Chinmo is expressed within the developing *Drosophila* brain. Goals of this research are to better understand how Chinmo is regulated and how Chinmo controls cell fate and behavior in the fruit fly. To understand how Chinmo is regulated, we will determine what controls subcellular localization of Chinmo. We will also assess whether Chinmo interacts with SUMO and other common modifier proteins using a yeast two-hybrid screen. Finally, the impact Chinmo has on neural development in vivo will be tested by assessing whether Chinmo controls sex-specific behaviors. We hypothesize that key modifiers of Chinmo modulate Chinmo localization and function. We also predict that Chinmo is required in flies to promote male-specific behavior. This research should elucidate the function of the *Drosophila* protein Chinmo and shed light on how stem cell sex is properly regulated throughout an organism's lifetime.

*Leanna Rinehart is a graduate student in Biology at the College of William & Mary. She is currently working in the labs of Dr. Wawersik and Dr. Kerscher where she studies the form and function of the sex-regulating Drosophila protein Chinmo.*

## Antibody Responses to Marine Bacterial Pathogens in Loggerhead, *Caretta caretta*, and Kemp's ridley, *Lepidochelys kempii*, Sea Turtles from the Southeastern United States

**Presenter:** Maria L. Rodgers

**Co-Authors:** M. Arendt, J. Schwenter,  
D. Owens, C. Toline  
**Advisor:** Charles Rice  
Clemson University,  
Biology

Sea turtles are a unique group of marine reptiles inhabiting tropical and temperate waters globally. In the wild, they are subjected to many environmental stressors, but how these stressors impact their health and immunological fitness is not well understood. This research explores several aspects of sea turtle immunology to answer the question: what can we learn about sea turtle health from studying their immune systems? One obstacle in understanding sea turtle immunology is the lack of reagents that recognize their specific immunoglobulins (antibodies). Immunoglobulin Y (IgY) is the main class of immunoglobulins responsible for long-term immunological memory in sea turtles, and serves as a marker of exposure and magnitude of response to pathogens that sea turtles have been exposed to previously. For this project, a novel technique was used to purify IgY, which was then used to immunize mice for antisera production. 60 loggerhead and 30 Kemp's ridley serum samples were probed for IgY antibody responses to determine which marine bacterial species these turtles had previously encountered. There were some differences in recognition between the two sea turtle species as well as between genders and sampling years. Further analysis is underway to determine if these responses also differ between sampling sites to better understand which turtles are most at-risk for bacterial infections.

*Maria Rodgers is a Ph.D. candidate in Biology Clemson University. Her research investigates the immune systems of two sea turtle species to establish critical reagents for immunological assays, and to determine organismal health via serum analyses.*

## Antimicrobial Activity of Novel Amphiphiles

*Presenter:* Elizabeth Anne Rogers  
*Co-Author:* K. Oberg  
*Advisor:* Kyle Seifert  
James Madison University,  
Biology

Approximately 2 million people in the United States alone acquire some illness that is caused by bacteria resistant to major antibiotics, and 23,000 people die each year as a direct result of these infections. Organisms such as *Clostridium difficile* and methicillin-resistant *Staphylococcus aureus* (MRSA) continue to affect vulnerable populations, and nosocomial infections put patients at risk for secondary bloodstream infections and pneumonia. Amphiphiles are a diverse class of compounds that have well-documented antimicrobial effects. The diversity in amphiphile geometry, coupled with an improved understanding of its effects on antimicrobial activity, allows for a wide range of potential novel antimicrobial compounds with applications including more efficient surface disinfection. Several novel series of amphiphiles have been synthesized, and their antimicrobial activity tested on seven different bacteria, including *Pseudomonas aeruginosa* and *S. aureus*. This research has revealed a strong correlation between the length of the hydrophobic carbon tails and the antimicrobial activity of these compounds, with a twelve-carbon tail length being the most effective for the double-tailed series. Additionally, substituting new counter ions such as chloride and iodide has been shown to increase antibacterial activity as well. Continued research of novel antibacterial compounds is essential to combat the growing problem of antibiotic resistance. The development of new and more effective disinfecting agents could help prevent the spread of nosocomial infection and reduce hospital-associated mortality.

*Elizabeth Rogers is an M.S. candidate in Biology at James Madison University. She is currently part of a continuing research project investigating the effects of variation of geometry and counter ion exchange on the antimicrobial activity of novel amphiphiles.*

## Clonal Integration in *Asclepias syriaca*

*Presenter:* Mary D. Seward  
*Advisor:* Harmony Dalglish  
College of William & Mary,  
Biology

Clonal plants are those which reproduce by producing genetically identical copies of themselves on their vegetative structures. These clones have the potential to remain connected to each other and to share resources. In some plant species, there is an age gradient to this sharing, with different levels of sharing between the parent plant and the offspring, which is often unidirectional in favor of the offspring. *Asclepias syriaca*, or common milkweed, is a clonal plant found across North America. This plant is capable of asexual reproduction through root buds and the clones stay physically connected. The purpose of my experiment was to determine if common milkweed clones show signs of integration and to determine if this occurs along an age gradient. Clones of common milkweed were grown in pairs, either with their roots still connected or severed. One plant per pair was then experimentally damaged to simulate herbivory, with chemical data taken via spectroradiometry. These data allow a model to be used to determine the change in defense chemicals over time. One plant per pair was then shaded to illicit stress responses in growth habit. Height and diameter of both plants was measured over the course of a month. We expect integration with an age effect such that older plants will send resources to younger plants, but not vice versa.

*Mary Seward is an M.S. candidate in Biology at the College of William & Mary. She studies milkweed in the Plant Ecology Lab with Dr. Harmony Dalglish.*

## Feeding Behaviors of the Invasive Kudzu Bug, *Megacopta cribraria*, on Soybean

**Presenter:** Francesca Stubbins  
**Advisor:** Francis Reay-Jones  
 Clemson University,  
 Entomology

The invasive kudzu bug, *Megacopta cribraria*, was first discovered in North America in 2009 and has subsequently spread through most of the southeastern United States, causing yield loss in soybean. Since discovery, research has focused mainly on managing this newly established pest, and many important characteristics of the pest's feeding behavior remain unknown. All phytophagous hemipterans use piercing-sucking mouthparts to feed. When the mouthparts are inserted into the plant, they become invisible to researchers and behaviors cannot be monitored. The electrical penetration graph (EPG) technique is a tool that allows researchers to overcome this difficulty so insect feeding behavior experiments can be performed. Feeding activities performed by an insect wired into an electrical circuit, are converted into identifiable waveforms which can be quantified and analyzed. The objectives of this study were to provide the first documentation and characterization of *M. cribraria* waveforms and to determine the biological meaning of these waveforms through histological means. Adult females probed soybean stems  $1.3 \pm 0.8$  times in nine hours with an average probe time of  $2.27 \pm 1.30$  hours. Mouthparts were shown to terminate in the phloem of soybean stems. Results can be used in conjunction with the development of soybean varieties resistant to *M. cribraria* damage to identify potential mechanisms of resistance as well as providing a baseline for further research on the feeding behaviors of the kudzu bug and other soybean feeding hemipterans.

*Francesca Stubbins is a Ph.D. candidate in Entomology at Clemson University. She is studying the ecology and management of the invasive kudzu bug, Megacopta cribraria on soybean.*

## Morphology of the Caudal Fin Skeleton of Toadfishes and Its Impact on Their Systematics Relationships (Percomorphacea: Batrachoidiformes)

**Presenter:** Diego Francisco Vaz  
**Advisor:** Eric Hilton  
 Virginia Institute of Marine Science,  
 Fisheries

The caudal fin skeleton has been a primary source of information on the systematics of fishes and characters of the caudal skeleton shared by different taxa of fishes have been proposed as synapomorphies at many different levels of organization. Although Batrachoidiformes "the Toadfishes" are widely recognized as a monophyletic group, the interrelationships among their genera and species are not entirely clear. Likewise, the relationships of this order to other fishes are not clearly established either, as Batrachoidiformes are unresolved within the division Percomorphaceae. As part of a new study on the systematics of Batrachodiformes, the skeleton of the caudal fin of representatives of the order have been studied through dissection of cleared and stained specimens. This has allowed new descriptions and interpretations of the diversity of the caudal skeleton within the order, including an analysis of intraspecific variation and recognition of morphological characters with putative phylogenetic significance. Preliminary results indicate a high level of intraspecific variation, primarily in the number of neural spines on preural centrum 2 and on the shape of ventral margin of parhypural. However, the parhypural articulates with the haemal spine of preural centrum 2 in two distinct patterns: 1) the parhypural tightly articulates with the haemal spine by a wide and flat surface (e.g., *Opsanus tau*, *Thalassophryne maculosa* and *Allenbatrachus reticulatus*), and 2) the parhypural articulates loosely with the haemal spine by an acute stay (e.g., *Aphos porosus* and *Porichthys porosissimus*). This and other characters may be informative regarding genus-level relationships across the Batrachoidiformes.

*Diego Vaz is a Ph.D. student at the Virginia Institute of Marine Science, whose research focuses on the morphology and systematics of Toadfishes, the order Batrachoidiformes.*



**Using Auditory Brainstem Response  
Testing to Investigate the Potential  
Effects of Methylmercury Exposure on  
Hearing in the Zebra Finch**

*Presenter:* Sarah Elizabeth Wolf

*Co-Author:* W. Buscher

*Advisor:* Dan Cristol

College of William & Mary,  
Biology

Songbird vocal communication is essential for fitness because it conveys information about resources, threats, and reproduction. Unfortunately, when methylmercury (MeHg) is introduced as a contaminant from anthropogenic sources, it bioaccumulates in songbird food items and can impact avian songs. Specifically, MeHg can negatively impact song quality by decreasing the song complexity and pitch of male song. However, this trend has only been found in species which learn their songs, suggesting that MeHg is specifically impacting cognitive processes that heavily rely on hearing-dependent vocal learning. We are investigating whether MeHg-induced change in song is caused by an impaired hearing ability. We will test hearing ability in control and lifetime MeHg-exposed zebra finches using a sedated auditory brainstem response test (ABR), which estimates the minimum volume required at a specific frequency for the bird to hear that pitch. Using this test, we expect MeHg-exposed birds to exhibit higher ABR thresholds than control birds across all frequencies (i.e. worse hearing). While preliminary data on a random sample of 80 zebra finches reveals no difference in ABR response between treatments and a high variation in response, we are now testing only young male finches to determine if a difference is apparent when variance is artificially reduced. In the future, it would be interesting to investigate whether the timing of MeHg exposure determines the severity of impact of mercury on the hearing ability in oscine songbirds.

*Sarah Wolf is an M.S. student in Biology at the College of William & Mary. Her research interests include exploring the mechanisms of complex vertebrate behavior by integrating hormonal, neurological, and physiological assays.*

### Synthesis, Structure, and Optical Memory Properties of Copper (I) Thiocyanate-Amine Networks

**Presenter:** Gerardo Ayala  
**Co-Authors:** H. Patterson,  
 J. Ahern, A. Nicolas  
**Advisor:** Robert Pike  
 College of William & Mary,  
 Chemistry



(CuSCN)<sub>2</sub>(pyrazine) displays novel luminescent behavior in response to laser stimulation and thermal cycling from low to high temperatures. Given an excitation wavelength of 375 nm, it emits at 588 nm, its visible color. The intensity of this emission can be lowered and red-shifted by exposure to high-intensity laser light at low temperatures. Warming the sample to room temperature and recooling it returns the emission spectra to pre-laser-treatment intensities. This sequence can be thought of as a “write/read/erase” process. Inspired by this phenomenon, numerous metal-organic networks containing CuSCN and substituted pyrazines (Pyz) or pyridines (Py) were synthesized. X-ray crystal structures for these compounds were studied or obtained in order to determine possible structural dependencies of this optical memory behavior. A variety of (CuSCN)<sub>x</sub>L network arrangements were found, including sheets (where L=Pyz, 2,5-dimethylPyz (2:1 Cu:L), 3-chloroPy, 3-bromoPy, quinazoline, or phthalazine), bridged ladders (methylPyz, quinoxaline), bridged chains (2,5-dimethylPyz (1:1 Cu:L)) and bridged dimer chains (2,3-dimethylPyz). All were subjected to the same laser treatment, measurement of emission, and thermal cycling as the Pyz compound. Benchmarks for optical memory material included significant emission intensity changes upon laser treatment, near complete recovery upon thermal cycling, and stability over multiple cycles. Of the four network types, only sheets showed significant promise as optical memory material, namely (CuSCN)<sub>2</sub>Pyz and (CuSCN)(3-BrPy). Ongoing studies attempt to address the underlying mechanism of this optical memory behavior.

*Gerardo Ayala is an M.S. candidate in Chemistry at the College of William & Mary. His research focuses on x-ray crystallography and inorganic synthesis. Gerardo is the 2016 recipient of the Carl J. Strikwerda Award for Excellence in the Natural and Computational Sciences.*

### Probing Conformational Propensities of Histidine in Different Protonation States of the Unblocked GlycylHistidylglycine Peptide by Vibrational and NMR Spectroscopy

**Presenter:** David M. DiGuseppi  
**Advisor:** Reinhard Schweitzer-Stenner  
 Drexel University,  
 Chemistry

Histidine has been shown to play a major role in a number of biological systems. Being able to understand unconstrained conformational distributions of histidine and their dependence on the environment can shed light on the structure-function relation with regard to its multiple roles in biochemical processes. We utilized polarized Raman, FTIR, vibrational circular dichroism (VCD) and <sup>1</sup>H NMR spectroscopy to probe the conformational distribution of the central histidine in the unblocked tripeptide H-Gly-His-Gly-OH in D<sub>2</sub>O. Our results show that in the double protonated state (GHG<sup>++</sup>), 94% of the histidine residue resides in the upper left quadrant of the Ramachandran plot with an equal partition between pII and β-strand conformations. In this protonation state enthalpic and entropic differences between the two conformations are practically eliminated which indicates reduced backbone and/or side chain hydration. On the contrary, the single protonated state (GHG<sup>+</sup>), while only marginally different with regard to the pII/β partition at room temperature (β-strand is now slightly favored), shows an enthalpic stabilization of pII which is being compensated by an entropic stabilization of β-strand. This indicates a much stronger coupling between peptide and water. At neutral pH, GHG in D<sub>2</sub>O forms a hydrogel above a peptide concentration of ca. 25 mM. Some experimental evidence suggests that the preceding peptide aggregation involves hydrogen bonding between the C-terminal groups and the imidazole NH-group.

*David DiGuseppi is a Ph.D. candidate in Chemistry at Drexel University. His research is focused on biophysical spectroscopy.*

**TonB Binding Produces Allosteric Changes in the Outer Loops and Substrate Binding Site of the TBDT BtuB**

*Presenter:* Arthur Sikora  
*Advisor:* David Cafiso  
 University of Virginia,  
 Chemistry

Outer-membrane TonB-dependent transporters function in the uptake of essential nutrients, and are important for the success of many pathogenic bacteria. During transport, these proteins undergo a cycle of binding and unbinding to the inner membrane protein TonB, through an interaction that is mediated by the Ton box, an energy-coupling segment near the transporter N-terminus. Over 50 high-resolution crystal structures have been obtained for 12 different TonB-dependent transporters, however the mechanisms of substrate transport remain unclear. Determination of membrane protein structure or dynamics with high resolution using highly heterogeneous native systems is an attractive way to solve transport mechanisms. In this work, the cobalamin transporter BtuB was overexpressed and spin labelled in outer membranes, interspin distances were measured to a spin labelled cobalamin and between outer loop positions using pulse EPR. A comparative analysis of the data reveals a similar interspin distance distribution between outer membranes and synthetic vesicles. We then take advantage of these native lipid environments to study the effects of TonB binding. There is evidence of TonB mediated allosteric loop modulation; the binding of TonB to the Ton box on the periplasmic surface of BtuB alters the configuration of these extracellular loops. CW EPR measurements using a spin labeled substrate show TonB binding lowers the affinity of the transporter for the substrate. Taken together these data indicate a clear TonB effect transduced from the periplasmic Ton Box to the substrate binding pocket and loops on the outer surface of the transporter.

*Arthur Sikora is a Ph.D. candidate in Biophysics at the University of Virginia. His research interests focus on membrane proteins, especially their motions and dynamics.*

**Iron-Polypyridyl Sensitized TiO<sub>2</sub> for Photocatalytic Hydrogen Generation**

*Presenter:* Wanji Zhang  
*Advisor:* William McNamara  
 College of William & Mary,  
 Chemistry

Artificial Photosynthesis (AP) focuses on finding a way to harness solar energy to generate a chemical fuel. TiO<sub>2</sub> semiconductors are of interest to AP research due to its relatively low cost and widespread use as an efficient charge-separating support. This research focuses on the development of a device for photocatalytic hydrogen generation. Our approach utilizes the immobilization of iron polypyridyl catalysts and ruthenium chromophores on TiO<sub>2</sub> through stable phosphonic acid anchoring groups.

*Wanji Zhang is an M.S. student in Chemistry at the College of William and Mary. Her primary research focus is on the immobilization of proton reduction catalysts on TiO<sub>2</sub> semiconductor.*

## Highway Infrastructure Development for Alternative Fuel Stations

*Presenter:* Menuka Ban  
*Advisor:* Rex Kincaid  
 College of William & Mary,  
 Computational Operations Research

Overdependence on fossil fuels in the transportation sector has caused significant damage to the environment. While policy makers and logistics companies are considering the options of alternative fuels such as hydrogen, ethanol, biodiesel, natural gas, and electricity on heavy duty vehicles like freight trucks, the lack of infrastructure for refueling stations has been one of the major challenges. Due to the high capital costs of building and maintaining these stations, it is essential to know the number and optimal locations of alternative fuel stations, so that the cost of locating these facilities can be minimized. For the last two decades, researchers have proposed different variants of the network location model for solving these problems. Although these proposed models are NP-hard, they do provide optimal solutions for a smaller network, and in other cases, heuristics are recommended to solve the large problems from real world examples. The first part of this paper includes a literature review to understand the progress made to date. The paper then implements the flow capturing location problem (FCLP) model to obtain an optimal solution for locating alternative fuel stations in the Virginia interstate system. Finally, the paper modifies the FCLP model by including the budget constraints to obtain the optimal number of stations when the candidate facilities involve different costs.

*Menuka Ban is an M.A. student in Public Policy and an M.S. student in Computational Operations and Research (COR) at the College of William & Mary. Her major policy focus has been international development, economic policy, and foreign aid effectiveness. policy.*

## The Information Market: Employing Mutual Information Distance in Model Evaluation and Portfolio Selection

*Presenter:* Anthony John Finch  
*Advisor:* Rex Kincaid  
 College of William & Mary,  
 Computational Operations Research

We analyze a mutual-information-based distance metric on market networks and observe unexpected stability in relative distances between securities. Under typical market assumptions, this stability should not be observed in range in which it consistently appears. We consider the implications of this new approach on both portfolio selection and on model evaluation. Preliminary results indicate strong evaluative potential, which we apply to several common market theories.

*Anthony Finch is an M.S. student in Computational Operations Research (COR) at the College of William & Mary. His research interests are in Financial Modeling, Simulation, and Valuation.*

## Two-Stage BRDF Fitting

*Presenter:* James Bieron  
*Advisor:* Pieter Peers  
 College of William & Mary,  
 Computer Science

Bidirectional reflectance distribution function (BRDF) models are mathematical models that describe the interaction between light and an opaque surface. A common criteria for evaluating the effectiveness of a BRDF model is how closely it can simulate the appearance of real surfaces whose reflective properties have been precisely recorded. In this paper we present a new process for fitting -BRDF models to measured material data. Existing fitting methods are single stage processes, using a single fixed error metric in a numerical optimization procedure. We propose breaking the fitting process into two stages. First generate numerous candidate fits using a variable error metric. Second, select a single fit from those candidate fits by comparing scenes rendered using the fitted BRDF model to the same scenes rendered using collected BRDF measurements directly. We compare our fitting approach to previous fitting results over a set of 38 materials.

*James Bieron is an M.S. student in Computer Science at the College of William & Mary. His research is on computer graphics.*

## Mining and Analysis of Public Information for Insight into Personal Fitness Tracker Reliability, Operations and User Performance

*Presenter:* Nancy Carter  
*Advisor:* Qun Li  
 College of William & Mary,  
 Computer Science

Personal fitness tracking devices are newly popular with "Quantified Selfers," persons interested in measuring their own fitness activities, nutrition and sleep behavior. The widespread adoption of personal fitness tracking devices has provided users with the benefits of insight into personal health activities and motivation to reach higher fitness goals. There is currently no way to understand the daily activity level of the general population of users. The data from each user's device is held within the user's mobile phone or personal computer. Users may opt to forward data to the device manufacturer database which is proprietary and shielded from public access. We propose to characterize the motivations and daily activity level of the general population and develop a list of product reliability concerns and operational practices through publicly available user postings on forums such as online retailers, device manufacturers, Facebook, Tumblr, Instagram and images from Yahoo, Google and Flickr. We analyze various types of comment forums to understand user perspectives on actual fitness device performance. Online retailers and device manufacturers have an inherent goal of promoting device sales which may bias comments allowed to appear within user reviews. Social forums may provide a more positive picture of fitness device usage. To date, our work reveals an average daily average of 11,336 steps per day. Through comparison of user-posted information on a variety of public forums a realistic picture is developed of personal fitness device performance and effectiveness.

*Nancy Carter is a Ph.D. candidate in Computer Science at the College of William & Mary. Her areas of interest are in human-computer interactions, sensors and computing for the over-age-60 user.*

**Analysis of Data-Driven BRDF Model**

*Presenter:* Victoria Cooper  
*Advisor:* Pieter Peers  
 College of William & Mary,  
 Computer Science

We propose an analysis of a data-driven BRDF model under natural lighting. A BRDF, or Bidirectional Reflectance Distribution Function, is defined as a four-dimensional function that describes how light is reflected off the surface of a material. Determining an accurate BRDF is crucial for precisely recovering the appearance of an object. Our analysis concentrates on recovering the appearance of a material under natural lighting. Specifically, we are determining the dimensionality of homogeneous materials under natural lighting to ascertain whether we can recover the full BRDF or not. We also investigate the inverse problem of determining the material properties of an object when both the shape and lighting are known. Thus, this creates a mapping from appearance space to appearance space under natural lighting.

*Victoria Cooper is a Ph.D. candidate in Computer Science at the College of William & Mary. She studies Computer Graphics and conducts research on appearance modeling and BRDFs.*

**PmDroid: Permission Supervision for Android Advertising**

*Presenter:* Xing Gao  
*Advisor:* Haining Wang  
*Co-Authors:* D. Liu, K. Sun  
 College of William & Mary,  
 Computer Science

It is well-known that Android mobile advertising networks may abuse their host applications' permission to collect private information. Since the advertising library and host app are running in the same process, the current Android permission mechanism cannot prevent an ad network from collecting private data that is out of an ad network's permission range. In this paper, we propose PmDroid to protect the data that is not under the scope of the ad network's permission set. PmDroid can block the data from being sent to advertising servers at the occurrence of permission violation in ad networks. Moreover, we utilize PmDroid to assess how serious the permission violation problem is in the ad networks. We first implement 53 sample apps using a single ad network library. We grant all permissions of Android 4.3 to these apps and record the data sent to the Internet. Then, we further analyze 430 published market apps. In total, there are 76 ad networks identified in our experiments. We compare the permission of data received by these ad networks with their official documents. Our experimental results indicate that the permission violation is a real problem in existing ad network markets.

*Xing Gao is a Ph.D. candidate in Computer Science at the College of William & Mary. His research focuses on security, cloud computing and mobile computing.*

## Mixed-Weight OLD-sets in Wireless Sensor Networks

*Presenter:* Robin Givens  
*Co-Authors:* G. Yu, R. Kincaid  
*Advisor:* Weizhen Mao  
College of William & Mary,  
Computer Science

A wireless sensor network (WSN) is a system of distributed devices that monitors environmental conditions and transfers collected data through radio frequency. These networks are used by environmental scientists to study climate change and the human influence on natural habitats. WSNs are constrained by cost, computational power, and battery life. We focus on reducing the costs of these networks by using open locating-dominating sets (OLD-sets) to determine the minimum number of sensors required. An OLD-set is a set of vertices in a graph that can detect and locate issues within a system. We introduce a modified version of the OLD-set problem, mixed weight OLD-sets, which model a WSN that contains sensors of different strengths. Given that many WSN are designed using sensors with different strengths, this is an important addition to the field.

*Robin Givens is a Ph.D. candidate in Computer Science at the College of William & Mary. Her research areas include graph theory and optimization.*

## A Platform across Smart Mobile Device and Cloud

*Presenter:* Zijiang Hao  
*Advisor:* Qun Li  
College of William & Mary,  
Computer Science

We propose a novel and practical mobile-cloud platform for smart devices. Our system allows users to run the entire smart device operating system (OS) and arbitrary applications on a cloud-based virtual machine. Our platform has two design fundamentals. First, applications can freely migrate between the user's mobile device, and a backend cloud server. Second, to protect user data on the local mobile device, we leverage hardware virtualization, which isolates the data from the local smart device operating system. We have implemented a prototype of our system using off-the-shelf hardware, and performed an extensive evaluate of it. We show that our system is efficient, practical, and secure.

*Zijiang Hao is a Ph.D. student in Computer Science at the College of William & Mary. His research interests include mobile computing and cloud computing.*

**Your Switch is Mine: Man-in-the-Middle Attack Threat in SDN***Presenter:* Cheng Li*Advisor:* Qun LiCollege of William & Mary,  
Computer Science

Software-defined Networking (SDN) has become a hot topic among researchers and network administrators due to its flexibility, scalability and programmability. Though many have been studied in the area of SDN, some security issues still require further investigation. For instance, the security of the communication channel between controllers and switches is one of the most important and serious ones. In this work, we point out that there is a potential man-in-the-middle attack in the controller-switch channel. In such attack, a malicious machine (attacker) may take full control of the switches without the awareness of both the switch and the controller, resulting in severe consequence. The attacker can stealthily collect sensitive packets flowing through switches under its control. Furthermore, the attacker may intentionally change the forwarding table of the switch to redirect certain flows. For example, the attacker may either block its opponent's website or redirect its opponent's clients to some phishing websites to collect client's information. We have implemented a prototype of such attack using small python scripts and evaluated it using Mininet simulator and Floodlight controller, showing that the proposed attack can indeed exist in current SDN. Finally, we have designed several countermeasures to detect and defend against such attack.

*Cheng Li is a Ph.D. candidate in Computer Science at the College of William & Mary. His research interests include software-defined networking and network security.*

**A Large-Scale Study of the Impact of Temperature on Soft-Errors on GPUs in the Field***Presenter:* Bin Nie*Advisor:* Evgenia SmirniCollege of William & Mary,  
Computer Science

Parallelism provided by the GPU architecture has enabled domain scientists to simulate physical phenomena at a much faster rate and finer granularity than what was previously possible by CPU-based large-scale clusters. Architecture researchers have been investigating reliability characteristics of GPUs and innovating techniques to increase the reliability of these emerging computing devices. Such efforts are often guided by technology projections and simplistic scientific kernels, and performed using architectural simulators and modeling tools. Lack of large-scale field data impedes the effectiveness of such efforts. This study attempts to bridge this gap by presenting a large-scale field data analysis of GPU reliability. We characterize and quantify different kinds of soft-errors on the Titan supercomputer's GPU nodes. Our study uncovers several interesting and previously unknown insights about the characteristics and impact of soft-errors.

*Bin Nie is a Ph.D. candidate in Computer Science at College of William and Mary, Her research interests reside in GPU reliability at large-scale, workload characterization and performance evaluation*



## Private Proximity Detection for Content Access Control

**Presenter:** Edmund Novak  
**Advisor:** Qun Li  
 College of William & Mary,  
 Computer Science



Online social networking, along with smart mobile devices, have been growing in popularity in the past several years leading to the advent of a new phenomenon of social, location based services such as Tinder and Yik-Yak. These applications allow users to interact based on their current location. Unfortunately, location information is highly sensitive, and these current, widely popular services make little to no effort to protect it. Location information can be used by attackers to cause physical harm, to stalk the user, and it can even be used to extrapolate other sensitive information like the user's home address. In this work, we propose a novel and practical private proximity detection protocol which utilizes bloom filters and oblivious transfer, allowing users to pose the question to each other "are you near me?" Our protocol guarantees that if they are not within a certain distance threshold of one another, the locations of both users are protected. Our system is designed to be secure, private, fast and practical. In our evaluation, we present two different applications which use private proximity detection for access control to some other data, and we show that private proximity detection queries can be performed in five seconds, in the best case.

*Edmund Novak is a Ph.D. candidate in Computer Science at the College of William & Mary. His research interests include cybersecurity and privacy on smart mobile devices. Edmund is the 2016 recipient of the S. Laurie Sanderson Award for Excellence in Undergraduate Mentoring.*

## EasyPass: How to Generate Strong and Easy-to-Memorize Passwords?

**Presenter:** Zhengrui Qin  
**Advisor:** Qun Li  
 College of William & Mary,  
 Computer Science

Nowadays, internet users are confronted to create and memorize passwords for accounts in various fields, such as banking/credit, email, social network, utility, and so on. And there is always a tradeoff between convenience and security. For instance, if a unique password is used across all accounts, it is convenient but not secure; if different passwords are used for different accounts, it may be secure but not convenient. In this work, we strive to design schemes that generate strong and easy-to-memorize passwords for different accounts. We assume that nothing is trusted, such as a personal computer, a commercial server and even a piece of note, except the user's own brain. In our schemes, the user only needs to memorize some password-generation rules and some secrets that only he himself knows, and then he can access all his accounts easily and securely. We have presented many possible rules and shown that strong and easy-to-memorize passwords can be generated without any assistance except user's brain.

*Zhengrui Qin is a Ph.D candidate in Computer Science at the College of William & Mary. His research interests focus on security of Cyber-Physical System and communication networks.*

### Corpus Linguistics and Computer Code: Connections Across the Disciplines

*Presenter:* Lindsay Michelle Stinson  
*Advisor:* Frank Napolitano  
Radford University,  
English

With the continued rise of Digital Humanities, there is a greater need to understand the connections between technology and communication. I am currently researching the connections between computer code and the linguistics of natural language. Both computer code and natural language works within hierarchical structures. Computer coding, or programming, works in small processes beginning first with numbers to create programming language. In the same manner, human or natural languages are also the result of complex particles working with regular changes and adaptations. Language defines how a person conveys a message; this is true both in communication studies and how a person conveys messages to a machine. As I continue to research this complex field of studies that dabbles in Computer Science, Linguistics, Technical Writing, and perhaps some Sociology, I hope to better understand the interactions in language both on and off-line. How does online writing fit in discourse across the curriculum? How does Corpus Linguistics work with search engines and the semantics of natural language? In researching, I hope to find more connections between the fields of Computer Science and the Humanities in order to learn from each other, as well as continue to expand the knowledge of the fields and how they work together.

*Lindsay Stinson is a Scholar and Graduate Teaching Fellow at Radford University in American Literature.*

### Micro Sleep Detecting Wearables

*Presenter:* Annette Watson  
*Advisor:* Gang Zhou  
College of William and Mary,  
Computer Science

As wearable technology continues to advance, the applications for the wearable technology also need to advance. Micro sleep is a temporary episode of sleep which may last for a fraction of a second or up to thirty seconds where an individual fails to respond to some arbitrary sensory input and becomes unconscious. Because of the lapsed time, micro sleep can create dangerous situations, for example when a user is driving a car, any micro sleep can result in unsafe situations or even death. Because of the repercussions of even a short episode of micro sleep, it is necessary that we learn to track it and alert the user to an occurrence or the probability of a near future occurrence. To prevent micro sleep in unsafe conditions, it is necessary to detect when a user is micro sleeping and watch for patterns that can predict micro sleep. The EKG data will be collected using a polar H7 heart rate monitor. Then, predictive analytics will be run in real time to determine if the user of the device will experience trends that are not as obvious to humans. After detection or a high probability prediction, the system should alert the user to shorten the micro sleep event or even prevent it all together.

*Annette Watson is an M.S./Ph.D. student in Computer Science at the College of William & Mary. Her research interests include wearable technology for healthcare and athletics.*

## **Improving Thick-Restarting Lanczos Method by Subspace Optimization For Large Sparse Eigenvalue Problems**

*Presenter:* Lingfei Wu  
*Advisor:* Andreas Stathopoulos  
College of William & Mary,  
Computer Science

The Thick-Restart Lanczos method is an effective method for large sparse eigenvalue problems. In this work, we propose and study a subspace optimization technique to accelerate this method. The proposed method augments the Krylov subspace with a certain number of vectors from the previous restart cycle and then apply the Rayleigh-Ritz procedure in the new subspace. Numerical experiments show that our method can converges two or three times faster than the Lanczos method.

*Lingfei Wu is a Ph.D. candidate in Computer Science at College of William & Mary. His research interests are in the areas of numerical linear algebra, scientific computing, mathematical software, large-scale machine learning and big data mining, parallel and high performance computing.*

## **Managing Datacenter Tickets: Prediction and Active Sizing**

*Presenter:* Ji Xue  
*Advisor:* Evgenia Smirni  
College of William & Mary,  
Computer Science

As wearable technology continues to advance, the applications for the wearable technology also need to advance. Micro sleep is a temporary episode of sleep which may last for a fraction of a second or up to thirty seconds where an individual fails to respond to some arbitrary sensory input and becomes unconscious. Because of the lapsed time, micro sleep can create dangerous situations, for example when a user is driving a car, any micro sleep can result in unsafe situations or even death. Because of the repercussions of even a short episode of micro sleep, it is necessary that we learn to track it and alert the user to an occurrence or the probability of a near future occurrence. To prevent micro sleep in unsafe conditions, it is necessary to detect when a user is micro sleeping and watch for patterns that can predict micro sleep. The EKG data will be collected using a polar H7 heart rate monitor. Then, predictive analytics will be run in real time to determine if the user of the device will experience trends that are not as obvious to humans. After detection or a high probability prediction, the system should alert the user to shorten the micro sleep event or even prevent it all together.

*Ji Xue is an M.S./Ph.D. student in Computer Science at the College of William & Mary. His research interests include performance evaluation/diagnosis, modeling, and resource management in large-scaled systems and data centers.*

### Performance Modeling and Scalability Optimization of Distributed Deep Learning Systems

*Presenter:* Feng Yan  
*Advisor:* Evgenia Smirni  
College of William & Mary,  
Computer Science

Big deep neural network (DNN) models trained on large amounts of data have recently achieved the best accuracy on hard tasks, such as image and speech recognition. Training these DNNs using a cluster of commodity machines is a promising approach since training is time consuming and compute-intensive. To enable training of extremely large DNNs, models are partitioned across machines. To expedite training on very large data sets, multiple model replicas are trained in parallel on different subsets of the training examples with a global parameter server maintaining shared weights across these replicas. The correct choice for model and data partitioning and overall system provisioning is highly dependent on the DNN and distributed system hardware characteristics. These decisions currently require significant domain expertise and time consuming empirical state space exploration. This work develops performance models that quantify the impact of these partitioning and provisioning decisions on overall distributed system performance and scalability. Also, we use these performance models to build a scalability optimizer that efficiently determines the optimal system configuration that minimizes DNN training time. We evaluate our performance models and scalability optimizer using a state-of-the-art distributed DNN training framework on two benchmark applications. The results show our performance models estimate DNN training time with high estimation accuracy and our scalability optimizer correctly chooses the best configurations, minimizing the training time of distributed DNNs.

*Feng Yan is currently a Ph.D. student in Computer Science at the College of William and Mary. His current research interest includes distributed systems, performance tools, deep learning, MapReduce, priority scheduling, cloud computing, and storage systems.*

### HISE: Head Gesture Interface for Smart Eyewears

*Presenter:* Shanhe Yi  
*Co-Authors:* Z. Qin, E. Novak  
*Advisor:* Qun Li  
College of William & Mary,  
Computer Science



We are seeing an emerging trend towards wearables nowadays. In this paper, we focus on smart eyewears, whose current interfaces are difficult to use, error-prone and disable unfriendly. We thus present HISE, a system that improves smart eyewears (Google Glass, in this paper) through a gesture-based user interface, which provides efficient and robust gesture recognition. Our system increases the input space of the smart eyewear by enabling small, easy-to-perform head gestures. We utilize activity context information to adaptively set thresholds for gesture detection, which leads to robust gesture recognition in different user activities. We improve the performance of gesture template matching by a novel scheme that down samples the input and leverages the similarity between templates to prune branches on the comparison path, which can reduce the time cost by at least 55%. We implement HISE and present extensive evaluations. HISE achieves a gesture recognition accuracy near 96% in various applications.

*Shanhe Yi is a Ph.D. student in Computer Science at the College of William & Mary. His research interests are mobile/wearable computing, security and privacy. He has also conducted research on cognitive radio network and fog computing.*

**Matching Learning Method for Estimating  
Heterogeneous Causal Effects of the  
World Bank Projects**

*Presenter:* Jianing Zhao

*Advisor:* Peter Kemper

College of William & Mary,  
Computer Science

The world bank funds aid projects in third world countries all over the world each year. There is a natural interest in better understanding what makes a project succeed and what not. In technical terms, we are interested in estimating heterogeneity in causal effects and conduct inference about the magnitude of the differences in project effects across subsets of world bank projects. To do so, we analyze a data set with data on world bank projects from 1982 to 2014 that contains project characteristics such as temperature and precipitation as well as spatial and spatially related information. The key challenge for this analysis is that the observational data does not allow us to directly measure the difference between the result of performing a project and of not performing a project as reality only gives us the choice to do one of the two. Following recent research results by Athey and Imbens, we employ a combination of machine learning techniques such as regression trees with techniques from causal inference to measure the average treatment effect, i.e. the average effect of a project, for subsets of geographic locations.

*Jianing Zhao is a Ph.D. candidate in Computer Science at the College of William & Mary. His research interest is on causal inference, machine learning and data mining.*



## **What Every Child Ought to Know: Sex Education in the Self and Sex Series**

*Presenter:* Laura M. Ansley  
*Advisor:* Leisa Meyer  
College of William & Mary,  
History

In 1897, Protestant minister Sylvanus Stall began to publish the Self and Sex Series, eight books that offered advice about sexual and physical health to Americans. Of the eight, four volumes were meant for youths: *What Every Boy Ought to Know*, *What Every Girl Ought to Know*, *What Every Young Man Ought to Know*, and *What Every Young Woman Ought to Know*. Stall himself authored the texts for boys, while he hired Dr. Mary Wood-Allen to write for the girls. This book series would go on to become best-selling advice literature and would be translated into many languages, with new editions being released into the 1930s. First published in 1897 and 1898, these four books were some of the earliest in the newly popular publishing field of sex education for children and adolescents. An analysis of these four books illustrates the mixture of moral and scientific information that would become the standard format for educating young people about puberty, sexuality, and reproduction. These books show how authors could combine a scientific approach to “the birds and the bees” (quite literally relating human reproduction to flowers and birds) with a Christian understanding of human morality, along with a healthy dose of nineteenth-century gender ideology. In a period when many parents were unable to discuss such topics with their children (whether from ignorance or unwillingness) such books aimed to shore up ideals of moral Christianity among the youngest generations of white, Protestant Americans, while providing a modern medical understanding of sexuality.

*Laura M. Ansley is a Ph.D. candidate in History at the College of William & Mary. Her dissertation is titled “Life Problems: Sex Education in the United States, 1890-1930” and argues that sex education at the turn of the twentieth century created a new “Progressive youth” and transformed American sexuality.*

## **"A Spirit of Insubordination": Arson as a Means of Protest at Heckingham Workhouse, 1836**

*Presenter:* Kristin Victoria Brig  
*Advisor:* Jacob Steere-Williams  
College of Charleston,  
History

In nineteenth-century English workhouses, paupers struggled to voice their complaints concerning workhouse life. While the majority of historical attention has been paid to the reaction of English society to the New Poor Law and its deterrent workhouse system, little research has considered workhouse disorder as a form of protest. The 1836 arson attempt at Heckingham Workhouse in Norfolk serves as a case study in understanding how this disorderly protest worked and the official reaction to it. In my study, the inmate voices “from below” emerge from rarely used manuscript material and poor law correspondence from the Loddon and Clavering poor law union. I demonstrate from this evidence that the Heckingham Workhouse fire was an informal protest against the new regulations and buildings constructed in the workhouse, in order to transform Heckingham Workhouse into a deterrent institution. Through this evidence, I argue that the misconduct of these workhouse inmates allows for a unique critique of the nineteenth-century deterrent workhouse by using perceptions of the deterrent workhouse system and New Poor Law from those who actually lived there instead of drawing on outside narratives from such factions as the riotous anti-poor law movement. Although there are few written documents of inmate experiences in workhouses, the records of their actions persist, thus permitting a more historically comprehensive depiction of the deterrent workhouse and its conditions.

*Kristin Brig is an M.A. student in History at the College of Charleston. She focuses on nineteenth-century British labor history, with an emphasis on the British poor laws.*

## **Prior Knowledge: The Treaty of Utrecht of 1713 and How a Few Maps, Books, and Globes Gave Men in London the Confidence to Claim and Divide the World**

*Presenter:* Phillip Louis Emmanuel  
*Advisor:* Christopher Grasso  
College of William & Mary,  
History

The Treaty of Utrecht which ended the War of Spanish Succession in 1713 gave Britain considerable gains in North America, but left unresolved colonial borders which were to be at issue until the American Revolution. It also opened the Pacific to British and French imperial competition. Most importantly, the treaty granted Britain the Asiento contract to supply slaves to all of Spain's American colonies, a contract which would see Britain become the world's largest slave trading nation. The negotiations which would become the treaty actually happened in a private house in London in 1711, that of Matthew Prior (1664-1721), poet, diplomat and one of the negotiators. It is possible to reconstruct the books, maps, and information available to these men thanks to an inventory of Prior's property, including his library. My talk will examine what knowledge of the world the negotiators could draw on and how they presented themselves as knowledgeable about places and peoples they had never seen. As they projected their power into the world it mattered greatly what they knew (or pretended to know). An examination of this helps us to understand the ways in which empire and territorial boundaries, many of which are still with us, were imposed upon the world from an imperial centre and how the lives of millions of people were changed by partially informed decisions made in a house in London.

*Phillip Emmanuel is an M.A./Ph.D. student in History at the College of William & Mary. His research interests are in art and material culture.*

## **Illustrated Ladies: The Body, Class, and the Exotic**

*Presenter:* Kelley Hogan Kinard  
*Advisor:* William Poole  
College of Charleston,  
History

I am conducting a gender study of the white tattooed lady performer in the late 19th century. The tattooed lady is a unique and contrasting image to the Victorian era's proscribed standards and norms. Motivated by images of tattooed men in freak shows and dime museums, such as Captain Costentenus (one of the original, and arguably most popular, tattooed male performers of the 19th century) these ladies chose to tattoo their bodies from the chest down, and capitalize on their "otherness." Quickly over shadowing tattooed men in popularity within the developing entertainment industry, tattooed ladies donned risqué costumes, which would have been considered pornographic in any other context during this period. Tattooed women capitalized on the popular literature of the period by including falsified captivity narratives in their biographical booklets and cards as an explanation for their tattoos. These narratives served to reassure middle class audiences that these women were forced to mark their bodies, while adding sexual connotations to their tattoos through language such as "violation," "outrage," and "indignity." By displaying their tattooed bodies for profit, tattooed ladies were able to successfully manipulate and challenge proscribed gender roles, and achieve financial and social independence during a period that offered few avenues for work, and often subjugated women to the domestic/private sphere.

*Kelly Kinard is a M.A. student in History at the College of Charleston. Her thesis explores the tattoo as a means of agency when decorating the bodies of upper and lower class women in nineteenth-century America and Britain.*

**Feminized Farmers:  
Native American Views of English  
Colonists in the Virginia Chesapeake  
1607-1623**

*Presenter:* Morgan McCullough  
*Advisor:* Karin Wulf  
College of William & Mary,  
History

This paper argues that Native Americans in the Chesapeake viewed the English men as feminine because of English male agriculture labor. The written records of the Jamestown settlers reveal what English colonists thought of the Native Americans. But the Native Americans left no written record of their views of the English. This paper seeks to uncover the Native American view of the English colonists who established Jamestown from 1607-1623. By using the English written accounts to track the actions of the English, we can understand what the local Native Americans saw the English doing. For example, the writings of John Smith or William Strachey reveal not only English opinions, but a record of English actions—actions local Native people observed and used to draw conclusions about their new English neighbors. Of particular importance was English men's agricultural labor. In many Native societies, including those around Jamestown, women performed agriculture labor. This labor and the food it produced was closely associated with women and femininity. Similarities in Native and English farming practices allowed Native Americans to draw direct parallels between Native women's and English men's labor. By examining how feminized the English colonists appeared and how Native Americans responded to the feminized Englishmen, this paper seeks to uncover a Native view of the first permanent English North American colony and its inhabitants.

*Morgan McCullough is a graduate student in History at the College of William & Mary. Her research interests focus on women, gender, and Native Americans in Early America.*

**French "Idolators," British "Heretics":  
The Seven Years' War in North America  
as a Religious Conflict**

*Presenter:* Nicole Marie Penn  
*Advisor:* Christopher Grasso  
College of William & Mary,  
History



With France and Great Britain as its primary belligerents, the Seven Years' War was an international conflict with a decidedly religious dimension, one based on the longstanding rivalry between Catholicism and Protestantism. In North America, the conflict galvanized clergymen in both the British and French colonies to frame the war as a religious struggle with potentially apocalyptic consequences. This discourse remains largely understudied by historians, and any efforts to address religion's role in America during the Seven Years' War has usually been one-sided, focusing exclusively on either the French or British experience. This paper aims to fill this historiographic gap, by analyzing both sermons produced by Protestant ministers from across the American colonies, such as Samuel Davies and Gilbert Tennent, and pastoral letters issued by Henri-Marie Dubreil de Pontbriand, the Catholic Bishop of Quebec, between 1755 and 1763. In particular, this paper argues that both French and British religious leaders viewed the Seven Years' War as a natural extension of the Catholic-Protestant European religious wars of the previous century, and believed that the conflict's outcome would permanently determine the survival of their respective religions in North America. This paper also describes how Native Americans figured in this discourse, and although it does not attempt to represent the Native American religious experience during the war, it does employ a combination of captivity narratives written by Protestant ministers and the reports of Jesuit missionaries to further illustrate the war's perceived apocalyptic significance, as well as offer suggestions for future research.

*Nicole Penn is an M.A. student in History at the College of William & Mary. She studies the intersection of religion and war in American history from the colonial to Civil War era.*



## **"The Worst Citizens in the World": Merchants and the Struggle for Social Success in Colonial Virginia**

*Presenter:* Kasey Marie Sease  
*Advisor:* Robert Trent Vinson  
College of William & Mary,  
History

In 1810, Governor John Tyler, Sr. delivered a message to the Virginia legislature that targeted a particularly bothersome group of individuals. He argued that merchants, "what [are] called citizens of the world" were "the worst citizens in the world" because they had "no attachment to any country." If economic or political hardships befell a nation or a state, they would "make themselves wings to fly away from impending dangers." Tyler's words were not new to the ears of Virginian politicians in 1810. Long before the colonies gained independence, elite Virginians harbored distaste for their merchant neighbors and labored to divest them of economic power and social standing. Yet, this widespread revulsion exists in tandem with another social reality of the colony: a number of merchants were able to establish themselves and their families as elites in their own right. Several merchants served as judges, members of the colonial assembly, and trustees of major towns, including Norfolk and Yorktown. Many achieved favorable reputations worthy of publication in local and state-wide newspapers. This study will seek to reconcile the pervasive hate of merchants with the social success that many achieved in the colony before the American Revolution. By combining these two narratives, and making sense of their coexistence, readers will gain a more complete understanding of the social place that merchants had within the colony that several called home.

*Kasey Sease is a Ph.D. student in History at the College of William & Mary. Her research focuses on of early American history, and he political and intellectual history of Virginia from colony to statehood.*

## **More Than Words Alone: The Altarpiece and Affective Piety in Medieval Prayer**

*Presenter:* Rory Ellis Sullivan  
*Advisor:* Elizabeth Fowler  
University of Virginia,  
English

At times literary analysis can become too focused on the text itself, ignoring the surrounding material world that makes up its environment. This is a particular problem when one analyzes a prayer, for these texts are but one part of the devotional landscape that surrounds the supplicant. Within this paper, I will explore the approaches medieval prayer takes towards the altarpiece, a centerpiece of the built environment. Through a reading of prayers collected in "The Preaching Book of John Grimestone, a late-14th century Franciscan, I will show there is a focus on utilizing the visual power of the altarpiece to augment the process of affective piety in the medieval period. The prayer's and the altarpiece's spiritual powers are yoked together to bring about greater meaning for the supplicant, driving her or him onwards to the divine. By analyzing the poetry of prayer in this way, I will help to open up a dialogue between literary critics (Wilson), historians (Duffy), religious scholars (McNamer, Despres), and art historians (Virris, Cheetham) allowing fresh perspectives for viewing these rewarding texts, and presenting new understandings of the medieval past.

*Rory Sullivan is an M.A. student at the University of Virginia, specializing in Medieval and Early Modern Literature.*

## In Search of Askia Mohammed

*Presenter:* Joseph Daniel Wilson  
*Advisor:* T. J. Fitzgerald  
James Madison University,  
History

Askia Mohammed is best known as the Songhay king that ruled the largest Islamic state in West Africa. He is remembered as a pious ruler and a brilliant administrator. Yet most of what historians know about Askia Mohammed is based on texts recorded by friendly Islamic clerics. Their biases obscure our view of an important figure. The oral history of the Songhay griot Nouhou Malio, as recorded by Thomas Hale, tells a far different tale of Askia Mohammed. Titled *The Epic of Askia Mohammed*, it is an account of popular history that reveals just how he was remembered by the Songhay for generations, deep into the 20th century. By placing the popular history in historical context and consolidating the written account with the oral account, I hope to find a more accurate image of Askia Mohammed.

*Joseph Wilson is a graduate student specializing in World History at James Madison University. His main areas of research concern Ancient Mediterranean civilizations, tribal European societies, and Islamic histories, especially rihla literature.*

## "I before the altar stood": Marriage Ties Among Antebellum Petersburg's Prosperous Free African Americans

*Presenter:* Elizabeth Wood  
*Advisor:* Melvin Ely  
The College of William & Mary,  
English

In her book, *The Free Women of Petersburg: Status and Culture in a Southern Town*, Suzanne Lebsock discerns antebellum marriage patterns among free African Americans very different from those among whites, with women heading slightly over half of free African American households. Lebsock highlights the ways racial oppression negated many of the advantages of marriage that white women gained in exchange for surrendering legal agency. She and others examining free blacks in Petersburg, however, have failed to interrogate what marriage meant for both the men and women who did choose it. Examining the family papers of one prominent free African-American family in antebellum Petersburg, the Colson family, suggests that one way to navigate racial restrictions and enhance freedom was to build and consolidate economic and social capital through marriage. Through advantageous marriages, prosperous free African Americans not only closed ranks to protect the property and wealth they accumulated but also gained "respectability" to help them build ties to whites, important for economic success as well as support in times of racial tension or heightened law enforcement. Further, while women may have gained some advantages in these marriages, this evidence demonstrates that men gained far more, as women brought money, connections, and skills that allowed men to assert masculine prerogatives denied to many of their race. Understanding how these families saw marriage is a step toward revealing the complex ways African American men and women protected and enhanced their freedom by embracing or rejecting dominant ideas about marriage.

*Elizabeth Wood is a Ph.D. candidate in History at the College of William & Mary. She is currently writing her dissertation, "The Family Politic: Race, Gender, and Respectability in Old Virginia." Her research examines the ways in which ideas and practices surrounding gender, sexuality, and family formation shaped free black experience in pre-Civil War Virginia.*

## **Study on the Stereotype of American Imperialism in China from the View of Peking Review (1965-1970)**

*Presenter:* Shaofan Zhang

*Advisor:* Alex Cummings  
Georgia State University,  
History

Peking Review was a significant magazine of Communist Party of China. It was also the internal and external official propaganda. During the early period of China's Cultural Revolution (1965-1970), Peking Review published a number of Chairman Mao's thoughts, talks and articles on American Imperialism. These articles, editorials and speeches reflected different aspects of China's perception of the United States. This paper focuses on Peking Review and uses it as a lens to explore the establishment of the stereotype of American Imperialism and to analyze how China conceptually engaged with the United States of this period.

*Shaofan Zhang is a Ph.D. student in the History Department at Georgia State University. His research interest focuses on the American public policy and social transition in the 1960s.*

### Understanding Nuclear Structure with Beam-Normal Single-Spin Asymmetries

*Presenter:* Kurtis D. Bartlett  
*Advisor:* Wouter Deconinck  
College of William & Mary,  
Physics

In experimental nuclear physics there has been a long standing disagreement between the Rosenbluth Separation and Polarization Transfer methods for determining the electric and magnetic structure of the proton when struck by an electron. During the collision the electron interacts with the proton through the exchange of a virtual photon. The disagreement between the two methods could be partially explained by the absence of multi-photon exchange corrections. Just as the name implies these corrections describe interactions that occur when multiple photons are exchanged between the electron and the proton. Using a transversely polarized electron beam to scatter from a hydrogen or nuclei target allows for measurements of beam-normal single-spin asymmetries (BNSSA). Measurements of BNSSAs give experimental access to the imaginary part of the multi-photon exchange amplitude. Knowledge of these imaginary exchange amplitudes can be used to constrain theories explaining the electric and magnetic structure disagreement. In addition to being helpful for understanding this disagreement, recent measurements of BNSSAs for nuclei such as Pb have shown a disagreement with theory. This is believed to be a result of unconsidered Coulomb distortions. This talk will be geared to a general audience with emphasis on the reason for making future measurements of beam-normal single-spin asymmetries and their implication on our understanding of nuclear structure. This work was supported in part by the National Science Foundation under Grant No. PHY-1405857.

*Kurtis D. Bartlett is a Ph.D. student in Physics at the William & Mary.*

### Ultrafast Pump-Probe Studies of the Light-Induced MIT and Recovery of Niobium Dioxide Thin Films

*Presenter:* Melissa R. Beebe  
*Advisor:* R. Alejandra Lukaszew  
College of William & Mary,  
Physics

Niobium dioxide ( $\text{NbO}_2$ ) is a highly correlated binary oxide that, like vanadium dioxide ( $\text{VO}_2$ ), exhibits a first-order insulator-to-metal transition (IMT) at a material-dependent critical temperature, accompanied by a structural transformation from monoclinic to rutile. The nature of the IMT in  $\text{VO}_2$  has been discussed at length, while fewer studies have been carried out on  $\text{NbO}_2$ . Previous studies show that the IMT can also be optically induced in  $\text{VO}_2$  on a sub-picosecond timescale; here, we present the first ultrafast pump-probe studies showing this optically-induced transition in  $\text{NbO}_2$ .

*Melissa Beebe is a Ph.D. candidate in Physics at the College of William & Mary. Her research is focused on thin films.*

## **Pulsed Energetic Condensation of Nb Thin Films on Cu Cavities**

*Presenter:* Matthew Burton  
*Co-Authors:* L. Phillips, C. Reece  
*Advisor:* R. Alejandra Lukaszew  
College of William & Mary,  
Physics

Bulk Niobium (Nb) SRF cavities are currently the preferred method for acceleration of charged particles at accelerator facilities around the world. However, bulk Nb cavities can be costly, have poor thermal conductance and impose material and design restrictions on other components of a particle accelerator. A proposed solution to this problem has been to take advantage of the shallow,  $\sim 1\mu\text{m}$ , depth of the SRF phenomena by creating cavities of a suitable metal (Cu or Al) and coating the interior with a Nb film. While this approach has been attempted in the past using DC magnetron sputtering (DCMS), cavity performance has never met the bulk Nb level. However, new energetic condensation techniques offer the opportunity to create suitably thick Nb films with improved density and microstructure when compared to traditional DCMS. One such technique recently developed is High Power Impulse Magnetron Sputtering (HiPIMS). Here we present preliminary results from 1.3GHz Cu cavities coated at Jefferson Lab using HiPIMS and calibration sample results. Also, due to the unique capabilities of the Jefferson Lab system, we will show results from a Nb/Cu cavity before and after exposure to air.

*Matthew Burton is a Ph.D. candidate in Physics at the College of William & Mary. His dissertation is entitled, "Superconducting Thin Films for the Enhancement of Superconducting Radio Frequency Accelerator Cavities."*

## **Detector Calibration for the NOvA Neutrino Oscillation Experiment at Fermilab**

*Presenter:* Marco Colo  
*Advisor:* Jeffrey Nelson  
College of William & Mary,  
Physics

NOvA (the NuMI off-axis neutrino experiment) is an experiment that uses the Fermilab NuMI neutrino/antineutrino beam (used in the past by other experiments such as MINOS, and recently upgraded) to measure important physical parameters such as neutrino mixing angles and neutrino CP (Charge-Parity) violation. The experiment has been collecting data for almost two years and presented its first results during the past summer.

*Marco Colo is a Ph.D. candidate in Physics at the College of William & Mary. He is an experimental physicist and is collaborating with the NOvA neutrino oscillation experiment in Fermilab, one of the major national labs in the U.S.*

### **Using Atomic Force Spectroscopy to Investigate the Effects of High Pressure and High Temperature on Crude Oil/Rock Interactions**

*Presenter:* William Winsor Dickinson  
*Co-Authors:* S. Higgins, J. Sasidharan  
*Advisor:* Hannes Schniepp  
College of William & Mary,  
Physics

Extraction of crude oil from reservoirs is a relatively inefficient process, where often a majority of the oil remains unrecovered. A major limiting factor is the adhesion of the crude oil to the porous reservoir rocks. Our research aims to understand oil-mineral interactions, so that we can systematically reduce adhesion and thus improve recovery efficiency. We developed a specialized sensor which allows us to characterize the forces between microscopic oil droplets and individual rock micrograins with nanometer spatial and piconewton force resolutions. Using this approach, we can systematically vary the chemical environment of the rocks and test its influence on the adhesion. We then aimed to employ this approach at the extreme conditions present at depth in an oil well. Therefore, we have designed and built a specialized AFM that can operate at temperatures of up to 100 °C (12 °F) and pressures of up to 100 atmospheres (1450 psi). For the first time we carried out force spectroscopy between oil and minerals at such extreme conditions. Our results show that these high temperatures and pressures have significant impact on the oil/mineral interactions. Application of this new methodology to the different minerals present in a reservoir will provide an understanding of these systems in unprecedented detail and thus inspire the next generation of oil recovery enhancements.

*William Dickinson is a Ph.D. student in Physics at the College of William & Mary. His research focuses on studying interactions at a liquid/solid interface using an atomic force microscope.*

### **Laser Amplifier System for Ultracold Potassium Experiments**

*Presenter:* Shuangli Du  
*Co-Authors:* A. Rotunno, C. Fancher, A. Pyle  
*Advisor:* Seth Aubin  
College of William & Mary,  
Physics

Ultracold atomic potassium is an excellent candidate for studies of the AC Zeeman force, as well as for research on quantum many-body physics and atom interferometry. We present progress on the implementation of a laser amplifier system for improved laser cooling and trapping of potassium isotopes. We are constructing a tapered amplifier for producing up to 0.5 W of laser cooling light at 767 nm, which can be used to produce large quantities of cold potassium, upwards of 10 million atoms, at a temperature in the range of 100 microkelvin. The full amplifier system consists of two daisy-chained tapered amplifiers to maximize the output power and gain. Both amplifiers are driven by their own lab-assembled current and temperature controller. The available potassium isotopes includes bosonic 39K and 41K and fermionic 40K, which are good atomic systems for the proposed research. Potassium has a small hyperfine splitting, leading to low drive frequencies for the AC Zeeman force. Potassium also has numerous Feshbach resonances for studies of novel many-body systems and interaction-free atom interferometry.

*Shuangli Du is a Ph.D. student in Physics at the College of William & Mary.*

## Experimental Observation of the AC Zeeman Effect

*Presenter:* Charles T. Fancher  
*Co-Authors:* A.J. Pyle, A. Rotunno, S. Du  
*Advisor:* Seth Aubin  
College of William & Mary,  
Physics



We present experiment results using microwave AC Zeeman potentials produced from an atom chip to manipulate ultracold atoms. We have observed a predicted bipolar and resonant force from the microwave gradient that is dependent on the frequency of the microwaves from a sloshing-based and a free-fall-based experiment. The AC Zeeman force is inherently spin-dependent and is typically stronger than gravity in our system.

*Charles Fancher is a Ph.D. candidate in Physics at the College of William & Mary.*

## Twisted Van der Waals Systems

*Presenter:* Yohanes Satrio Gani  
*Advisor:* Enrico Rossi  
College of William & Mary,  
Physics

Van der Waals systems formed by two-dimensional (2D) crystals and nanostructures possess electronic properties that make them extremely interesting for basic science and for possible technological applications. By tuning the relative angle (the twist angle) between the layers, or nanostructures, forming the Van der Waals systems experimentalists have been able to control the stacking configuration of such systems. We study the dependence on the twist angle of the electronic properties of two classes of Van der Waals systems: double layers formed by two, one-atom thick, layers of a metal dichalcogenide such as molybdenum disulfide (MoS<sub>2</sub>), and graphene nanoribbons on a hexagonal boron nitride substrate. We present results that show how, for both classes of systems, the electronic properties can be strongly tuned via the twist angle.

*Yohanes Gani is a graduate student in Physics at the College of William & Mary. His research focus is study of the electronic properties of low dimensional system. He studies twisted bilayer system such as MoS<sub>2</sub>, hBN, and graphene nanostructures. He also studies spin transport in 2D system where this can be promising future in spintronic application.*

## Optical Spectroscopy of the M2 and T Phases of Vanadium Dioxide

**Presenter:** Tyler J. Huffman  
**Advisor:** Mumtaz Qazilbash  
 College of William & Mary,  
 Physics

The salient feature of the familiar structural transition that accompanies the metal-insulator transition in bulk  $\text{VO}_2$  is a pairing of all of the vanadium ions in the M 1 insulating phase. This pairing has long been thought critical to the emergence of insulating behavior. However, there exist two less familiar insulating states, M2 and T. These phases are noteworthy in that they exhibit distinctly different V-V pairing. In the M2 phase, only half of the vanadium ions exhibit pairing while the other half carry local spin 1/2 magnetic moments and are equally spaced in quasi-one dimensional chains. The T phase has two types of inequivalent vanadium chains, each consisting of V-V pairs but with different spacing between vanadium ions in the pairs. The M1 phase has been studied extensively with optical spectroscopy. By studying the two less familiar insulating phases, M2 and T, one can investigate how changes in V-V pairing affect the properties of the  $\text{VO}_2$  insulating state. We performed infrared and optical spectroscopy on the M2 and T phases in the same sample. Despite a clear change in the lattice structure, the inter-band transitions are insensitive to changes in the V-V pairing. This result conclusively establishes that intra-atomic Coulomb repulsion between electrons provides the dominant contribution to the energy gap in all insulating phases of  $\text{VO}_2$ . Our work highlights the necessity of considering the M2 and T phases of  $\text{VO}_2$  in future experimental and theoretical research.

*Tyler Huffman is a Ph.D. candidate in Physics at the College of William & Mary. His research interests include strongly correlated phase transitions, optical spectroscopy, and near-field micro-spectroscopy.*

## Investigation of Cation Ordering in Dielectric Oxides Microwave Ceramics Using $^7\text{Li}$ and $^{93}\text{Nb}$ Solid-State NMR and First Principle Calculation

**Presenter:** Rony Gustam Kalfarisi  
**Advisor:** Gina Hoatson  
 College of William & Mary,  
 Physics



The local structure and cation ordering in dielectric oxides microwave ceramics are studied using  $^7\text{Li}$  and  $^{93}\text{Nb}$  solid-state NMR as well as first principle calculation in the framework of density functional theory (DFT). NMR spectroscopy provides an excellent probe as local structure, as it is very sensitive to the atomic scale environment. The NMR measurements on the  $^7\text{Li}$  nuclei of the samples show spectra with only one very sharp and narrow resonance peak at the central transition, except for  $\text{Ca}(\text{Li}_{1/4}\text{Nb}_{3/4})\text{O}_3$  (CLN) which showed one sharp peak and one broad peak with very low intensity indicating two distinct local environments. As for  $^{93}\text{Nb}$  NMR measurements, it is observed that the spectra show resonance with very broad peak at the central transition and lack the feature of quadrupolar pattern indicating many slight variations in local environment which give rise to distribution of chemical shift and quadrupolar interactions. NMR parameters are also extracted from these spectra and these values are compared to those obtained from first principle projector augmented wave (PAW) calculation performed on geometry optimized crystal structure where relatively good agreements are observed.

*Rony Kalfarisi is a Ph.D. candidate in Physics at the College of William & Mary. His research focuses on dielectric oxide for microwave ceramics application until now.*



### Optical Constants of Niobium Dioxide Thin Films

*Presenter:* David Lahneman  
*Co-Authors:* G. Schwiete, J. Sinova  
*Advisor:* Mumtaz Qazilbash  
College of William & Mary,  
Physics

Niobium dioxide exhibits a metal-insulator transition at a temperature of  $\sim 1080\text{K}$ . We have obtained the optical constants of  $\text{NbO}_2$  films at room temperature in the insulating state. The films studied had thicknesses of about 100nm and 200nm, and were grown either on a sapphire substrate or on a layer of gold and titanium on sapphire substrate. Fourier transform infrared spectroscopy and spectroscopic ellipsometry were performed to obtain the optical constants of  $\text{NbO}_2$  from  $\sim 100\text{cm}^{-1}$  to  $\sim 50,000\text{cm}^{-1}$ . Modeling of the infrared-active phonons and optical interband features were performed using software that allowed the  $\text{NbO}_2$  optical constants to be determined independently of the other layers in the multilayered structures. This study will help further our understanding of this metal oxide, which has potential for ultrafast switching applications in novel optoelectronic devices. Specifically, the metal-insulator transition may be triggered by ultrafast optical pulses, and our research will allow the determination of the best pump frequencies for ultrafast optical techniques to excite the films through the metal-insulator transition.

*David Lahneman is a Ph.D. student in Physics at the College of William & Mary.*

### Experimental Apparatus to Observe Dynamical Manifestations of Hamiltonian Monodromy

*Presenter:* M. Perry Nerem  
*Advisor:* John Delos  
College of William & Mary,  
Physics

An experiment to observing a topological change in a classical system with nontrivial monodromy is presented. Monodromy is the study of the topological behavior of a system as it evolves along a closed path. If the system does not return to the initial topological state at the end of the circuit, that system exhibits nontrivial monodromy. Such a topological change has been predicted in certain mechanical systems, but has not yet been observed experimentally. One such system is a family of paths in a cylindrically symmetric champagne-bottle potential, with a classically forbidden region centered at the origin. We constructed this system with a long spherically symmetric pendulum and a permanent magnet attached at the end. Magnetic fields from coils are used to create the potential barrier and the external forces to drive the pendulum about a monodromy circuit. A loop of initial conditions, that is initially on one side of the forbidden region, is driven smoothly about this circuit such that it continuously evolves into a loop that surrounds the forbidden region. We will display this phenomena through numerical simulations and hopefully experimental measurement.

*Perry Nerem is a Ph.D. candidate in Physics. His research is focused on nonlinear dynamics and topological phenomena.*

## Scattering of Ultracold Atoms from an Oscillating Barrier

*Presenter:* Andrew James Pyle  
*Co-Authors:* C. Fancher, J. Delos  
*Advisor:* Seth Aubin  
 College of William & Mary,  
 Physics

We present progress on an experiment to study 1D quantum mechanical scattering by an amplitude-modulated barrier. The oscillating barrier imparts or subtracts kinetic energy in discrete amounts from the scattered atoms. In this manner, the energy spectrum of the scattered atoms resembles a comb with a tooth spacing of  $\hbar\omega$  where  $\omega$  is the oscillation frequency of the barrier. Numerical simulations of the scattering process confirm this basic scattering picture. We present an atom chip-based experimental system to study the scattering dynamics with Bose-Einstein condensates (BEC) of  $^{87}\text{Rb}$ . The proposed experiment operates by releasing a BEC from an optical dipole trap, while a magnetic field gradient is used to control the vertical motion of the BEC as it is directed downward towards a tightly focused laser beam that serves as an oscillating barrier. Detection is carried out with a time of flight technique used to resolve discrete atomic packet sidebands. Dark-ground imaging can be used to detect small atom number BECs, which benefit from weak interactions. This experiment represents a first step toward implementing a quantum pump for ultracold atoms based on two such barriers modulated out of phase with one another. Quantum pumping was originally proposed in the context of electron transport in nanowires, but has proven difficult to implement. The ultracold atom approach represents a possible route around the current experimental bottleneck.

*A.J. Pyle is a Ph.D. candidate in Physics at the College of William & Mary.*

## Ultrafast Dynamics of $\text{VO}_2$ Thin Films Measured in Pump-Probe Configuration

*Presenter:* Elizabeth Radue  
*Co-Authors:* R. Lukaszew, Z. Fu, M. Yamaguchi, S. Wolf  
*Advisor:* Irina Novikova  
 College of William & Mary,  
 Physics

$\text{VO}_2$  is a paradigm of a highly correlated material that undergoes a phase transition, changing from an insulator phase to a metallic one upon increasing its temperature while its lattice structure changes dramatically.  $\text{VO}_2$  has drawn interest because the insulator-metal transition (MIT) occurs just above room temperature at  $154^\circ\text{F}$  ( $68^\circ\text{C}$ ) enabling technological applications. It has been shown that  $\text{VO}_2$  thin films can also undergo such phase transition when stimulated by an ultrafast optical pulse, leading to interesting applications, such as ultrafast optical switches and novel electronic devices. Thin films often exhibit different properties than bulk materials due to microstructure defects, strain, etc. Thus, we have been studying the metal insulator transition of  $\text{VO}_2$  thin films grown on different substrates using a strong 100 fs pulse to induce the transition, while changing the arrival time of a weaker pulse to probe the changes of the film over time. By studying films grown on different substrates and observing differences in the dynamics of the MIT we aim to better understand the mechanisms of the light-induced transition. We have been exploring the effects of polarization of the pump in relation to the probe affects the sub-picosecond response of  $\text{VO}_2$  thin films, which will be important in designing ultrafast switches. We have also been looking at pumping our  $\text{VO}_2$  films with a THz source that directly pumps the lattice, and have found the film responds optically on a slower scale than when pumped with 800 nm, suggesting that there is an electronic response from disturbing the lattice.

*Elizabeth Radue is Ph.D. candidate in Physics at the College of William & Mary.*

### **Inverse Spin-Galvanic Effect in Topological-insulator Graphene Heterostructures**

*Presenter:* Martin Rodriguez-Vega  
*Advisor:* Enrico Rossi  
College of William & Mary,  
Physics

We study theoretically the inverse spin-galvanic effect in heterostructures formed by a layer of a three dimensional strong topological insulator (TI) and a graphenic layer (single layer graphene, and bilayer graphene). We also consider trilayer structures in which a ferromagnetic thin film is added on top of the graphenic layer. We consider the cases of coherent, and random tunneling between states in the TI and the graphenic layer. We obtain the strength of the inverse spin-galvanic effect, taking into account both intraband and interband contributions, as a function of the system's parameters both for the case in which the disorder is short-range and for the case in which the disorder is long-range as when charge impurities are the dominant source of disorder. We find that for a large range of system's parameters the presence of the graphenic layer enhances the strength of the inverse spin-galvanic effect. Finally, we discuss the relevance of our results for recent experiments.

*Martin Rodriguez-Vega is a Ph.D. student in Physics at the College of William & Mary. His research involves condensed matter theory with Dr. Enrico Rossi.*

### **Four-Wave Mixing Reduction for Electromagnetically Induced Transparency Based Quantum Memory**

*Presenter:* Gleb Romanov  
*Co-Authors:* S. Du, A.J. Pyle, C.T. Fancher, H. Cantor-Cooke  
*Advisor:* Irina Novikova  
College of William & Mary,  
Physics

Quantum memory is an important component of quantum repeaters. Quantum memory can be based on the effect of Electromagnetically Induced Transparency (EIT), where a strong classical field called Control determines the group velocity of the Signal field. Unfortunately under certain conditions, EIT-based quantum memory experiences the Four-Wave Mixing effect, which is detrimental to memory fidelity. Four-Wave Mixing manifests itself in the two following effects: Signal field being amplified and an additional Idler field being generated. We are exploring the possibility to reduce this effect by introducing an absorption resonance for the Idler field.

*Gleb Romanov is a Ph.D. student in Physics at the College of William & Mary.*

### **Spin-Orbit Coupling in the Strongly Interacting Fermi Gas: An Exact Quantum Monte Carlo Study**

*Presenter:* Peter Rosenberg  
*Co-Authors:* H. Shi, S. Chiesa  
*Advisor:* Shiwei Zhang  
College of William & Mary,  
Physics

Spin-orbit coupling (SOC) plays an essential role in a variety of intriguing condensed matter phenomena, including the quantum Hall effect, and topological insulators and superconductors. The recent experimental realization of spin-orbit coupled Fermi gases provides a unique opportunity to study the effects of SOC in a tunable, disorder-free system. Motivated by this experimental progress, we present here the first exact numerical results on the two-dimensional, unpolarized, uniform Fermi gas with attractive interactions and Rashba SOC. Using auxiliary-field quantum Monte Carlo and incorporating recent algorithmic advances, we carry out exact calculations on sufficiently large system sizes to provide accurate results systematically as a function of experimental parameters. We obtain the equation of state, study the spin behavior and momentum distribution, and examine the interplay of SOC and pairing in real and momentum space. Our results help illuminate the rich pairing structure induced by SOC, and provide important guidance to future experimental efforts.

*Peter Rosenberg is a Ph.D. candidate in Physics at the College of William & Mary. He works in the group of Prof. Shiwei Zhang, studying condensed matter physics using cutting-edge computational techniques.*

### **Agile Radio Frequency Generation for Manipulation of Ultracold Atoms**

*Presenter:* Andrew Rotunno  
*Co-Authors:* S. Du, A. Pyle, C. Fancher, H. Cantor-Cooke  
*Advisor:* Seth Aubin  
College of William & Mary,  
Physics

A critical tool for the study and manipulation of ultracold atoms is an agile, precise, and low-noise frequency source which can drive transitions between atomic hyperfine states with resonant frequencies in the MHz to GHz range. We present here a lab-built direct digital synthesizer (DDS) which can be addressed via an ethernet-connected Arduino to produce a signal from 1 to 400MHz with a noise level below -60dBc, and the ability to rapidly change frequencies in a phase-continuous manner at increments of  $\sim \frac{1}{4}$  Hz every 4 ns. This DDS can be used as a tunable reference clock to synthesize higher frequencies, allowing for fine frequency control extending through Rubidium-87's hyperfine separation near 6.8GHz. Particular interest is given to the quality of an input clock, the generation of fast frequency ramps, and the performance of this apparatus versus similar commercial products. Immediate applications include demonstrating the AC Zeeman force, driving resonant state transitions in rubidium and potassium, and radiofrequency spectroscopy of cold atoms. This work is supported by the Air Force Office of Scientific Research and the College of William and Mary.

*Andrew Rotunno is a Ph.D. candidate in Physics at the College of William & Mary.*

## **Experimental Apparatus for the Observation of the Topological Change Associated with Dynamical Monodromy**

*Presenter:* Daniel Salmon  
*Co-Author:* M. Nerem  
*Advisor:* John Delos  
College of William & Mary,  
Physics

Monodromy means “once around a path,” therefore systems that have non-trivial monodromy are systems such that, when taken around a closed circuit in some space, the system has changed state in some way. Classical systems that exhibit non-trivial Hamiltonian monodromy have action and angle variables that are multivalued functions. A family, or loop, of trajectories of this system has a topological change upon traversing a monodromy circuit. We present an experimental apparatus for observing this topological change. A family of particles moving in a cylindrically symmetric champagne-bottle potential exhibits non-trivial Hamiltonian monodromy. At the center of this system is a classically forbidden region. By following a monodromy circuit, a loop of initial conditions on one side of the forbidden region can be made to evolve continuously into a loop that surrounds the forbidden region. We realize this system using a spherical pendulum, having at its end a permanent magnet. Magnetic fields generated by coils can then be used to create the champagne-bottle potential, as well as drive the pendulum through the monodromy circuit.

*Daniel Salmon is a graduate student in Physics at the College of William & Mary. His research has primarily focused on systems with nontrivial monodromy, as well as some experimental applications of such systems.*

## **Bayesian Analysis and Modeling of Gravitational Microlensing Events with Implications for the Wide-Field Infrared Survey Telescope**

*Presenter:* Sean K. Terry  
*Co-Authors:* J. Baker, R. Barry  
*Advisor:* Steven Kraemer  
The Catholic University of America,  
Physics

We present a new C++ toolkit for the analysis of gravitational microlensing events. The Gravitational Lens Event Analysis Machine (GLEAM) is a set of codes that work together to build accurate models of microlensing light curves and produce posterior probability maps based on a Bayesian statistical approach. GLEAM includes several minimization routines such as parallel-tempered Markov Chain Monte Carlo and nested sampling to permit the adaptation to and efficient exploration of various types of parameter space. GLEAM's highly parallelized, fast central routines are designed with the necessary software interfaces to permit inclusion of user-developed Python modules to facilitate experimentation with various lens geometries and higher order astrophysical effects. GLEAM will be open source to encourage participation in algorithm and lens geometry development by the broadest possible community of astronomers, programmers and citizen scientists. The development of GLEAM is in response to the immanent Phase-A start of NASA's Wide-Field Infrared Survey Telescope (WFIRST). WFIRST will have a significant portion of its six-year mission dedicated to the conduct of a microlensing survey to complete the census of all possible planets in the Milky Way Galaxy. The large quantity of data generated by the mission must be quickly and efficiently analyzed to achieve the mission's science objectives. We are developing GLEAM to permit characterization of multi-planet and multi-star planetary systems and higher order astrophysical effects in the presence of anticipated WFIRST observatory systematics.

*Sean Terry is a graduate student in Physics at The Catholic University of America. He is a Research Assistant at NASA Goddard Space Flight Center, working on preliminary research for the Wide-Field Infrared Survey Telescope (WFIRST).*

## Role of Turbulence and Shear Flow in Determining Plasma Density Profiles in Tokamaks

**Presenter:** Xin Wang  
**Advisor:** Saskia Mordijck  
 College of William & Mary,  
 Physics



For decades people have been trying to use magnetic confinement devices – for example, tokamaks – to harness fusion energy. To trigger fusion reactions, high-temperature, high-density plasmas are needed. However, in plasmas, turbulent transport can cause large heat and particle loss. One of the mechanisms to reduce this turbulent transport is by introducing a stable shear flow. Shear flow tears apart turbulence eddies into smaller sizes and thus effectively reduce its transport. In DIII-D, experiments were performed to alter the shear flow's shearing rates by varying the input torque from co- to counter- direction. We compare the shearing rates with the growth-rates of the most unstable turbulence mode, and show that, for co- and counter- torque discharges, the shearing rate becomes comparable or even larger than the growth-rate at plasma edge. This results in the highest density profile and improved confinement. However, in the balanced torque injection discharge, the growth-rate is always larger than the shearing rate, so that particle transport is not effectively suppressed, and thus the particle confinement is reduced.

*Xin Wang is a Ph.D. candidate in Physics at the College of William and Mary. His research interests include plasma physics, specially in turbulent particle transport within high temperature, magnetic confined plasmas.*

## Optical Spectroscopy of Superconducting Pt-doped BaFe<sub>2</sub>As<sub>2</sub>

**Presenter:** Zhen Xing  
**Advisor:** Mumtaz Qazilbash  
 College of William & Mary,  
 Physics

Substitution of iron with platinum in BaFe<sub>2</sub>As<sub>2</sub> leads to suppression of the antiferromagnetic and structural transitions, and the occurrence of bulk superconductivity with superconducting transition temperature (T<sub>c</sub>) around 20 K. In this work, we perform optical spectroscopy study of a BaFe<sub>1.9</sub>Pt<sub>0.1</sub>As<sub>2</sub> single crystal. The ab-plane optical conductivity has been obtained by performing cryogenic infrared reflectance spectroscopy and spectroscopic ellipsometry both above and below T<sub>c</sub>. Below T<sub>c</sub>, bulk superconductivity is directly observed as perfect reflectance in the far infrared data. We model the optical conductivity in the superconducting state using Mattis-Bardeen formalism and find that the data is best fit with two energy gaps. We also analyze the optical conductivity in the normal state and discuss the nature of charge transport.

*Zhen Xing is a Ph.D. candidate in Physics at the College of William & Mary. His research is on iron-based superconductors.*

## Temperature-Dependent Near-Field Infrared Microscopy of $\text{La}_{0.67}\text{Sr}_{0.33}\text{MnO}_3$ Thin Films

*Presenter:* Peng Xu

*Co-Authors:* T. Huffman, I. Kwak, A. Biswas

*Advisor:* Mumtaz Qazilbash

College of William & Mary,

Physics

$\text{La}_{0.67}\text{Sr}_{0.33}\text{MnO}_3$  thin films are studied with apertureless, scattering-type near field microscopy at mid-infrared wavelength and varied temperatures. Spatial resolution of about 20 nm is achieved with our technique. The temperature-dependent resistivity shows a continuous second order phase transition between insulating and metallic phases. At most temperatures, near-field infrared microscopy reveals local persistent phase separation that is independent of temperature. It is possible that the local persistent phase separation is induced by strain inhomogeneity in the thin films. Remarkably, we also observe global time-dependent changes in the infrared near-field signal upon repeated scanning of the same microscopic area at a fixed temperature. This observation is consistent with time-dependent, fluctuating conductivity in the vicinity of a second order phase transition.

*Peng Xu is a graduate student in Physics at the College of William & Mary.*

## Generation of a Squeezed Vacuum Field in a Multi-Pass Setup

*Presenter:* Mi Zhang

*Co-Authors:* R. Lanning, Z. Xiao, J. Dowling, I. Novikova

*Advisor:* Eugeniy E. Mikhailov

College of William & Mary,

Physics

We use interaction of laser light with dense vapor of Rb atoms to modify quantum statistics of the optical field and to produce a so-called "squeezed" vacuum field of light, in which amplitude and phase fluctuation is altered compared to a regular laser field (known as a "coherent" optical field). By propagating the strong laser beam through a vapor cell once, we were able to achieve a noise suppression ("squeezing") of 2 dB below shot noise, which is the noise limit one can achieve with a coherent field used for measurement. Our previous experiments showed that the amount of observed squeezing may be limited by the contamination of the squeezed vacuum output with higher-order spatial modes, also generated inside the cell. Here, we investigate whether or not the squeezing can be improved by making the light interact several times with a less dense atomic ensemble. We carry out a comparison of various conditions, e.g. injection power, atomic density, passing numbers etc., and studied their effect on squeezing level and the spatial structure of the output squeezed vacuum field. We show optimization of the conditions can lead to higher achievable squeezing which would be very useful for precision metrology and quantum memory applications.

*Mi Zhang is a Ph.D. candidate in Physics at the College of William & Mary. Her research focuses on the squeezed quantum states, especially the squeezed vacuum state and the properties of it.*

## **Social Cognitive Affective Processes that Promote Vulnerability to Posttraumatic Stress: The Roles of Anxious Attachment, Negative Worldview Fulfillment, and Coping Self-Efficacy**

*Presenter:* Gabriel T. Anderson  
*Advisor:* Andrew Smith  
Virginia Tech,  
Psychology

Following exposure to interpersonal trauma (e.g., violence, assaults), insecure attachment is theorized and empirically supported in the promotion of vulnerability to worse posttraumatic stress (PTS) reactions. However, mechanisms that link attachment-related vulnerabilities to posttraumatic mental health remain unclear, inhibiting understanding of facets that can be targeted in interventions. The current study tests the hypothesis that assault survivors with more severe insecure anxious attachment would experience higher PTS symptoms, and that this effect would be conferred through fulfillment of negative posttraumatic cognitions about others and reduction of coping self-efficacy beliefs. Methods. Participants included a cross-sectional sample ( $N = 73$ ) of physical and sexual assault survivors who answered online questionnaires. Path analysis using MPLUS 7.2 tested direct and indirect effects, estimating via bootstrapping re-sampling. Results. Results demonstrated a good fitting model ( $SRMR = .013$ ;  $CFI = 1.0$ ) that predicted 42% of the variance in PTS symptom severity. Higher PTS symptom severity was directly predicted by lower coping self-efficacy ( $B = -.59$ , 95% CI  $[-.922, -.232]$ ) and higher negative posttraumatic cognitions ( $B = .55$ , 95% CI  $[.229, .878]$ ). Whereas more severe insecure anxious attachment did not directly predict PTS symptoms, indirect effects were significant (i.e., predicting more severe PTS symptoms through increasing negative posttraumatic cognitions and reducing coping self-efficacy). Discussion. Implications for theory, future research, and interventions are discussed, with specific emphasis on leveraging these findings when incorporating cognitive restructuring techniques.

## **Inspired Writers Produce Imagery-Laden Texts through an Efficient Process of Expression**

*Presenter:* Will Belzak  
*Advisor:* Todd Thrash  
College of William & Mary,  
Psychology

Inspiration has long been associated with vision metaphors, such as “illumination” and “seeing” new possibilities. We hypothesized that writers who are more inspired produce texts that evoke more imagery. In Study 1, 188 students wrote poems and reported their inspiration, effort, positive affect, and awe while writing. Research assistants coded poems for imagery using the referential activity system. As hypothesized, writer inspiration uniquely predicted poem imagery. In Study 2, 162 students wrote stories and reported their inspiration and other states while writing. During story writing, the number of words generated and the number of words deleted were assessed independently using screen capture. Inspiration again uniquely predicted imagery. This effect was fully mediated by word generation, with word deletion (revision) playing no role. Imagery may explain why inspired writing seems effortless; the inspired individual has the enviable task of merely describing what he or she “sees” clearly in the mind’s eye.

*Will Belzak is a graduate student in Psychology at the College of William & Mary.*



### **The Effects of Entitativity on the Neural Processing of Homosexual Couples**

*Presenter:* JoEllen Joy Blass  
*Advisor:* Cheryl Dickter  
College of William & Mary,  
Psychology

Previous research has suggested that early differential attention toward a social group may lead to differences in person perception. Other research has suggested that perceiving homosexuals as entitative is associated with antigay prejudice. Therefore the goal of this study was to investigate whether manipulating entitativity, the degree to which people share common goals, affects the affective and attentional processing of sexual minorities, as measured with event-related potentials (ERPs). Participants read statements suggesting that homosexual couples were either high ( $N = 25$ ) or low ( $N = 25$ ) in entitativity. Participants then completed a series of reaction time tasks portraying pictures of heterosexual and homosexual couples to measure implicit affective and implicit attitudinal responses towards the couples. Afterwards, participants completed a series of explicit questionnaires. Data processing is currently in progress. We expect that participants in the high entitativity condition will show more implicit affective and attentional biases toward homosexuals than participants in the low entitativity condition. Additionally, we believe that this effect will be moderated by the number of participants' close friendships with homosexual individuals. These findings have implications for understanding the neural processing of groups based on sexual orientation and may suggest that implicit bias reduction can occur by decreasing the degree to which homosexuals are perceived to be a cohesive entity.

*JoEllen J. Blass is an M.A. student in Psychology at the College of William & Mary. Her current research focuses on prejudice toward sexual minorities with an emphasis on different mechanisms through which prejudice reduction may occur.*

### **Adolescent Emotion Regulation Coping: Links to Unsupportive Emotion Socialization Responses**

*Presenter:* Kara Braunstein  
*Advisor:* Janice Zeman  
College of William & Mary,  
Psychology

We examined how youth's emotion regulation (ER) coping skills are associated with their responses to their close friends' emotional disclosures, and how these associations may be moderated by gender. Participants were 182 middle-school age youth (Mage = 12.7 years; 52.5% girls; 73.6% White) who participated in same-sex best friend dyads. Youth completed the Children's Emotion Management Scales to report on their sadness, worry, and anger regulation coping and participated in a 15-minute discussion task in which they each talked about a problem to their best friend. Videos were coded for youth's unsupportive responses to their friend's emotional disclosures and were given an unsupportive response score on a 5-point Likert scale. Three models were run using Actor-Partner Interdependence Modelling to examine the interaction of ER coping and gender with unsupportive responses. There were significant gender interactions with sadness and worry regulation coping only. In the sadness and worry coping models, the actor effect  $\times$  gender interaction was significant. Simple slope analyses examining gender indicated a significant actor effect of sadness and worry coping for girls, but not boys. For girls, more adaptive sadness and worry regulation coping was associated with fewer unsupportive responses to their friend's emotional disclosures. Given that boys' friendships are based more on action- than discussion activities, it may be that ER skills do not exert as important an effect in their friendships, or it may be that girls who cannot regulate their own emotions effectively are overwhelmed by their friends' emotionality and respond unsupportively.

*Kara Braunstein is an M.A. student in Psychology at the College of William & Mary. She studies social and emotional processes and how they influence the development and maintenance of youth's internalizing behavioral outcomes.*

## **Verification and Validation Study of the InterAxon Muse EEG Headband**

*Presenter:* Andrew Ninian Burdette  
*Co-Authors:* C. Stephens, A. Pope, C. Schrader, R. deBeus  
*Advisor:* Lisa Emery  
Appalachian State University,  
Psychology

**Background:** Electroencephalography (EEG) is a method of detecting electrical brainwave activity using electrodes attached to the scalp. EEG equipment has traditionally been cumbersome and expensive, restricting most research and applications to lab and clinical settings. This study seeks to examine the InterAxon Muse™ EEG Headband and establish whether this device provides an affordable 4-channel EEG system adequate for use in research. **Methods:** The study will compare raw signals from the InterAxon Muse™ EEG Headband with raw signals recorded by the research grade BrainMaster Atlantis system. Participants will complete a series of tasks intended to provoke Beta and Alpha wave states while simultaneously wearing both devices. Recorded signals from each device will be post-processed to remove artifacts (e.g. eye blink), compared, and correlated. Higher correlations will indicate greater fidelity of the InterAxon Muse™ EEG Headband, demonstrating its capabilities as a research device. **Anticipated Results and Implications:** It is the hope of the investigators that the InterAxon Muse™ EEG Headband performs at a level adequate for research and application in real-world settings. Such applications include monitoring brain activity among specific populations such as ADHD or regulating mental states such as drowsiness among pilots and commercial drivers.

*Andrew N. Burdette is an M.A. student in General Experimental Psychology at Appalachian State University. His research interests include the novel use of off-the-shelf devices for research in naturalistic settings and embedded neurofeedback for optimal self-regulation.*

## **Being Bossy and Being Female: Identity Integration In the Workplace**

*Presenter:* Megan Jessie Buys  
*Co-Author:* M. Henderson  
*Advisor:* Constance Pilkington  
College of William & Mary,  
Psychology

This paper examines the psychological processes that underlie how people manage conflicting roles within organizational settings, specifically supervisor and friend, and how these processes affect the use of behavioral and verbal power tactics. In addition to measuring identity integration as a stable individual difference, study 1 explores the malleability of identity management within organizational situations. Both study 1 and study 2 integrate gender as a third identity, in an attempt to understand how identity integration influences behavior towards employees on the basis of gender. Study 1 and study 2 were conducted via Amazon's Mechanical Turk, replicating previous studies using undergraduate samples and providing additional results on gender interactions with identity integration. Results show that higher identity integration was associated with more integrative behavioral tactics and more polite verbal tactics. Results also suggest that the effect of identity integration differs by gender. Higher identity integration allows men to be more polite to female employees while lower identity integration appears to be related to men being less polite to these same female employees. Higher identity integration also allows for participants to use more perspective-taking tactics throughout the study. Overall, these studies demonstrate that identity integration affects how people manage role conflict, and that this process might differentially affect strategies and outcomes for both men and women.

*Megan Buys is an M.A. student in Psychology at the College of William & Mary.*

## **Bayesian Mind or Problem Solving? Making Sense of Probability-Based Decision-Making Strategies**

*Presenter:* Kunjoon Byun  
*Advisor:* Christopher Ball  
College of William & Mary,  
Psychology

Correct answers to base rate neglect problems often require complex Bayesian calculations involving probability information embedded within realistic event descriptions. The past research emphasis on base rate neglect responses for such problems has overlooked the fact that responses can actually vary widely across participants for such problems. In our first study, we found large individual differences resulted when participants were given multiple base rate neglect problems to solve. In addition, many participants also varied widely in their responses from one base rate problem to the next. We suggest that these two sources of variability (between-participant and within-participant) result from a misunderstanding of objective probability information that can also be combined with a subjective interpretation of the event description surrounding this probability information. Support for this first source of variability came in our first study when participants provided probability answers at each calculation step of an additional base rate neglect problem. The range of answers provided by participants quickly multiplied at each step, suggesting that participants have considerable trouble translating probability statements into numerical calculations. We are currently conducting a verbal (think-aloud) protocol study to investigate in more depth the underlying reasons for the probability miscalculations, the difficulties translating probability information, and the subjective story interpretations that can override objective probability information.

*Kunjoon Byun is an M.A. student in Psychology at the College of William and Mary. His core research interests are judgments and decision making, reasoning, and emotion.*

## **The Relationship between EEG & ERP Based Neurometrics and Autism Spectrum Disorder**

*Presenter:* Leigh Catherine Gayle  
*Advisor:* Paul Kieffaber  
College of William & Mary,  
Psychology

Autism spectrum disorder is a pervasive development disorder characterized by heterogeneous deficits in social communication and interaction, as well as repetitive behaviors and restricted interests. Due to the dramatic increase in prevalence, a major theme in contemporary research has been the identification of biomarkers for ASD that can shed light on etiological factors, facilitate diagnosis and serve as markers for tracking the efficacy of behavioral and pharmacological treatments. Electroencephalography (EEG) is well-suited for the measurement of such biomarkers. Due to the complexity and heterogeneity of ASD symptoms, it is important that research aiming to use EEG to identify biomarkers of autism and other neurodevelopmental disorders focus on determining the relationships between electrophysiological neurometrics and clinical presentation in order to more accurately delineate clinically relevant subgroups. The aim of the present study was to determine the relationships between clinically diagnosed ASD and a collection of EEG-based neurometrics elicited by a novel "Brief Neurometric Battery" (BNB). It is hypothesized that a subset of the BNB neurometrics will be able to be used to synthesize a transdiagnostic profile that differentiates between individuals on the autism spectrum and controls. Additionally, it is hypothesized that this profile will be able to differentiate clinically relevant subgroups of ASD. This research builds on a sub-clinical study conducted by this research team. Implications and future directions of this research are discussed.

*Leigh Gayle is an M.A. student in Psychology at the College of William & Mary. She works in the Cognitive Psychophysiology Lab with Dr. Paul Kieffaber. Her research interests include the neural correlates of autism spectrum disorder.*

### **The Interaction of Existential Thinking and Religiousness on Mental Health Concerns in an Undergraduate Sample**

**Presenter:** Derek Anthony Giannone  
**Advisor:** Daniel Kaplin  
The College of New Jersey,  
Psychology

Existential thinking is defined as a person's propensity to engage with the deeper matters of human existence. Psychological theorists have long thought these existential concerns (e.g. meaning, death, perceptions of reality) to be important to psychological well-being. The only study to date examining existential thinking in relation to mental health found a positive association to psychopathology, which was moderated by whether or not participants believed in God. This present study seeks to understand how existential thought is related to mental health factors and whether religiousness moderates this relationship as previously hypothesized. A sample of 353 undergraduate students responded to standardized measures of existential thinking, religiousness, depression, anxiety, and substance use. We expected individuals reporting higher existential thinking to report increases in depression, anxiety, and substance use. Furthermore, we expected religiousness to moderate this relationship such that this association would increase at lower levels of religiousness and decrease at higher levels of religiousness. Confirming our first hypothesis, we found existential thinking to be positively associated to the study's mental health variables. Our second hypothesis that religiousness would moderate this association was partially supported, as a moderating effect of religiousness was only found in the case of substance use. The implications of our findings are the salience of existential concerns in this population and valuable therapeutic insight into the importance of finding resolutions to the deeper matters of existence as well as the mechanisms by which religiousness affects substance use.

*Derek Giannone is an M.S. student in Psychology at Drexel University. His research interests lie broadly in clinical and existential psychology, specifically the investigation of evidence based interventions as well as the role of meaning in psychological well-being.*

### **The Affect of Calorie and Health Information on Women's Food Choices and Intake**

**Presenter:** Lisa Stephanie Goldberg  
**Co-Author:** K. Oberg  
**Advisor:** Catherine Forestell  
College of William & Mary,  
Psychology

Research has found that women select lower calorie options from a menu when caloric information is provided (Gerand, 2009). The first study examined the caloric value and healthfulness of restrained and unrestrained eaters' choices when presented with menus that either contained caloric information or not. Ninety-six undergraduate females were randomly assigned to one of two menu conditions: with or without caloric information. Participants selected and tasted two food items and one beverage from a menu of items that varied in caloric content and healthfulness. Half of the menus contained caloric information and half did not. Study one found that, on average, participants chose lower calorie items when presented with menus containing the caloric information. However, these lower calorie choices were less healthful, in that they contained fewer nutrients. To determine whether information about the healthfulness of the foods would affect choice, study two will randomly assign participants to one of three menu conditions; calorie information only (as in study one), calorie and health information, and no information (as in study one). Participants will complete the same procedures as described above. We hypothesize that participants in the calorie and health information condition will make more healthful selections than in either of the other two conditions. In combination, these studies may demonstrate that the inclusion of health information along with caloric information may help consumers to choose lower calorie options that are also more nutritious.

*Lisa Goldberg is an M.A. student in Psychology at the College of William & Mary. Her research interests are in the psychology of eating behaviors and weight.*

### Identifying Protective and Risk Factors in Aging Out Youth Outcomes

*Presenter:* Jenika C. Hardeman  
*Advisor:* Cathy Bolton  
Drexel University,  
Psychology

The study of resilience in the field of psychology has discredited many of the negative assumptions and presumptions that were held about resilience. It is now recognized that resilience is an ordinary, adaptational process that normally arises from normative human functions and capacities. It is also recognized that normal human development is threatened when protective and adaptational systems, like resilience, are compromised. These compromises occur when humans are exposed to negative life events and intensified in the absence of protective factors. The current study aims to explore these findings in a sample of children whom were placed and aged out of the foster care system in the United States. Further, the present study aims to identify risk and protective factors within this sample using a cluster analysis between the two waves of data collection. We hope to be able to profile the two waves of data to test whether the following variables are risk or protective factors: closeness to an adult, having insurance, maintained insurance, gainfully employed, and maintained gainful employment. A second analysis will explore the differences in the aforementioned factors over time with a repeated measures T-test. It is hypothesized that there will not be a significant change in these factors between waves 1 and 2.

*Jenika Hardeman is an M.S. student in Psychology with a forensic clinical concentration.*

### The Effect of Cross-Cultural Differences on Team Performance within an Educational Setting: A Mixed Methods Study

*Presenter:* Sevinj Iskandarova  
*Advisor:* Oris Griffin McCoy  
James Madison University,  
Psychology

The ongoing research will assist educational organizations with sufficient support for measuring the effect of cross cultural differences on team performance. Faculty members performance and their satisfaction on a team were used as the variables to determine benefits and challenges of cross cultural differences. The sample consisted of full and part time faculty members at James Madison University (JMU), Harrisonburg, Virginia, the United States of America. The purpose of this mixed methods sequential explanatory study (online survey & one-to-one interview) was to determine and measure the effect of cross-cultural differences on team performance, highlight advantages and disadvantages of those cross-cultural differences within the team; and, to apply the knowledge learned from this study to enhance team performance within an educational setting. The online survey was administered to assess faculty performance on a team. The results provided statistical evidence regarding the effect of multicultural team performance within an academic organization. The interview, the second step, provided more detailed information about the university's international faculty members' experiences on a multicultural team. By referencing these findings, the educational institutions may improve organizational culture and provide a future vision for increasing multicultural team performance. By highlighting the benefits and challenges of cross cultural differences, the educational setting will possess greater knowledge in understanding and promoting more productive team performance. The research concludes by suggesting appropriate directions for future research.

*Sevinj Iskandarova is a graduate student in Psychology at James Madison University.*

### **A View From The Unconscious: Testing the Unconscious Effect of the Ebbinghaus Illusion**

*Presenter:* Evan D. Jones  
*Advisor:* Peter Vishton  
College of William & Mary,  
Psychology

The purpose of this study will be to measure the magnitude of the Ebbinghaus Illusion on verbal judgments, manipulating the variable of consciousness. In order to manipulate the conscious visual experience, we will rely on a new and exciting dichoptic masking technique that will selectively veil the contextual elements of the illusion from conscious awareness. A wealth of research has shown that visually guided actions are resistant to the illusion's effects. The differences in the magnitude of the illusion for verbal judgments versus visually guided actions has traditionally been used as support for the two visual systems hypothesis (TVSH), which proposes that the visual system is functionally and anatomically separated between conscious perception and visually mediated action. However, a more recent study has complicated matters, showing that when subjects consciously think about reaching before making a verbal size judgment, a similar reduction in the magnitude of the illusion's effect occurs for conscious perception. Perhaps, the conscious thought of reaching cognitively penetrates the action-oriented visual system? Or, maybe the distinction between action and conscious perception is ill formed? Our hypothesis is that the magnitude of the illusion for the dichoptically masked stimulus will be similar the illusion's effect for subjects who consciously think about reaching. Regardless of the outcome, we will have evidence about a potential confounding variable that has not been further explored, and the results will provide us with future techniques for evaluating the TVSH.

*Evan Jones is a graduate student in Psychology at the College of William & Mary whose focus is on the interaction between perception and action as well as cognitive development.*

### **Diffusion Tensor Imaging and Neurometabolic Analysis of Normal Brain Development**

*Presenter:* Neggin Keshavarzian  
*Co-Authors:* T. Meredith-Duliba, K. Osipowicz  
*Advisor:* Michael Williams  
Drexel University,  
Psychology

To chart normal brain development trajectories using volumetric MRI measures of gray and white matter, magnetic resonance spectroscopy (MRS), and diffusion tensor imaging (DTI). These methods allow for the assessment of white matter structural maturation and a set of brain metabolites that change over the course of development. The study consisted of 452 normal children (birth to 18 years) as a part of the NIH MRI Study of Normal Brain Development (<http://pediatricmri.nih.gov>). A standard MRI protocol was administered: T1, DTI, and MR Spectroscopy of N-acetyl aspartate (NAA) choline, creatine, and unsuppressed water. Fractional Anisotropy (FA) and Mean Diffusivity (MD) derived from DTI. Analyses included curvilinear regression of structural imaging utilizing 115 ROIs from the Johns Hopkins White Matter Atlas. Developmental trends were plotted for all measures, nonlinear regression procedures were applied to determine trend lines and variance accounted for by the resulting equations. Development patterns revealed that white matter tracts have highest initial DTI FA and MRS measures with moderate development ( $R^2 \approx .31$ ). Peri-cortical white matter areas, e.g. precentral gyrus, association areas, and frontal lobes developed at a moderate rate ( $R^2 \approx .49$ ). The cerebellum and archicortex developed least ( $R^2 \approx .17$ ). A consistent acute pattern of growth was present during the first five years of brain development that tapered off across subsequent years; similar to the pattern previously established using volumetric measures.

*Neggin Keshavarzian hails from the west coast earning her B.A. from California State University Channel Islands. She is currently a graduate student at Drexel University studying psychology. Her research interests include cognitive neuroscience, fMRI and DTI.*

### **Interactions with Latinos/as as a Predictor of Explicit and Implicit Bias**

*Presenter:* Jasmine Koech  
*Advisor:* Cheryl Dickler  
College of William & Mary,  
Psychology

The positive effects of intergroup contact on prejudice reduction have been well established, with prior research demonstrating that contact with out-group members can reduce implicit racial bias (Dickter, Gagnon, Gyurovski, & Brewington, 2015). However, the majority of this literature has focused on White-Black relations, and these findings thus may not be generalizable to other intergroup interactions (e.g., Latinos with non-Latinos). Despite reports that Latinos are now the largest minority group in the United States (Gandara, 2010), there is a lack of representation examining this group within the intergroup contact literature. The current research assessed non-Latinos' (n = 78) contact experiences with Latinos to more closely examine the relationship between contact and prejudicial attitudes towards Latinos. Participants indicated their current exposure to Latinos (e.g., frequency of interactions, number of close friends who are Latino), completed multiple validated measures of explicit prejudice, and three implicit bias tasks. The three tasks all measured different constructs related to prejudice with one assessing stereotypic associations, one assessing relational affect, and the last measuring automatic attention allocation. Results indicated that the individuals with more contact with Latinos exhibited lower explicit prejudice towards Latinos. There are moderately significant relationships indicating a trend of more contact being predictive of less implicit bias across measures. In addition, individuals showed more implicit positive affect towards White faces compared to Latino faces and individuals show more early attention allocation towards Latino faces than White faces.

*Jasmine Koech is an M.A. student in Psychology at the College of William & Mary. Her research in social psychology focuses on intergroup contact, prejudice, and Latino/a identity.*

### **Allelic Variation in the Oxytocin Transporter Gene Relates to Social but Not Non-Social Risk Taking Behavior**

*Presenter:* Amrita Lamba  
*Co-Author:* G. Atreya  
*Advisor:* Joanna Schug  
College of William & Mary,  
Psychology

Previous research has shown that variations in oxytocin transporter gene OXTR rs53576 are associated with variation in psychological processes related to socio-emotional sensitivity and trusting behavior. Oxytocin, often referred to as the "love hormone" has been shown in prior studies to increase trust when administered intra-nasally and other studies have found that individuals homozygous for the G allele of OXTR display a higher degree of trusting behavior than participants who carried an A allele. In this study, we sought to examine the relation between OXTR polymorphism and risk taking in social (i.e., trust) and non-social domains. Participants took part in a behavioral economic game known as the trust game, and a similar game measuring risk taking tendency in a non-social context. The result showed that OXT related to behavior in the trust game, but not in the risk game. We discuss directions for future research on the relation between oxytocin and trust behavior.

*Amrita Lamba is an M.A. student in Psychology at the College of William & Mary. Her current research projects borrow from evolutionary game theory, behavioral economics, and applied mathematics to study social psychological topics such as intergroup trust, cooperation, altruism, and conflict, as well as the decision-making processes that guide these behaviors.*

### **Effects of Muscarinic-1 Receptor Stimulation on Attentional Deficits Induced by Loss of Cortical Cholinergic Projections**

*Presenter:* Eden Blake-Lea Maness  
*Advisor:* Joshua Burk  
College of William & Mary,  
Psychology

Corticopetal cholinergic neurons play a vital role in attentional processing, and dysregulation of this system contributes to central nervous system disorders whose main attributes include an incapacity to engage in sustained attention, including Alzheimer's disease (AD). A particular cholinergic receptor subtype, the muscarinic-1 (M1) receptor, is known to be necessary for normal attentional processing. The goal of the present experiment was to test whether M1 receptor stimulation, that potentiates the actions of endogenous acetylcholine, could be beneficial in an AD model. N-desmethylozapine (NDMC), one of two metabolites of the atypical antipsychotic clozapine, is able to enhance activity at M1 receptors. The present experiment was designed to test whether NDMC could attenuate attention deficits in a rat model of AD. We hypothesized that, compared to sham lesion groups, rats given infusions of the cholinergic neurotoxin 192 IgG-saporin into the basal forebrain will show poorer performance in an attentional operant task. In this paradigm, rats must employ sustained attention in order to differentiate between signal trials (500, 100, and 25 ms illumination of a central panel light) and non-signal trials (no light illumination). After intracerebral administration of NDMC, we speculate that the lesioned rats' decrease in signal detection accuracy will be attenuated. Significant findings could suggest that the M1 receptor is a key site for restoring attentional performance following damage to the cholinergic system.

*Eden Maness is an M.A. student in Psychology at the College of William & Mary. She is primarily interested in behavioral neuroscience research. Her work focuses on elucidating the neurological mechanisms of sustained attentional processing and their behavioral correlates in the context of age-related cognitive decline and pharmacological interventions.*

### **Trust, Cooperation, and Synchrony: A Socio-Ecological Approach**

*Presenter:* Thomas Granville McCauley  
*Advisor:* Joanna Schug  
College of William & Mary,  
Psychology

Synchronous behavior has shown to increase cooperation within groups. However, little cross-cultural work exists. We propose that the tendency for synchrony to induce cooperation within newly formed groups is limited to societies with high levels of relational mobility, where group memberships are more fluid, resulting in greater vigilance for cues that signal group membership. Using an experimental manipulation, we found that synchrony increases in-group cooperation in the United States, but not Japan, and demonstrated that the impact of synchrony on cooperative behavior is a function of relational mobility. We also replicated a previous finding that relational mobility mediates differences in trust between the United States and Japan. Taken together, these findings provide strong evidence for relational mobility's influence on cognition and behavior at the individual and group levels.

*Thomas McCauley is a graduate student in the Psychology Department at the College of William & Mary. His research has focused on cross-cultural psychology, intragroup processes, honest signaling theory, evolutionary perspectives of psychological phenomena, and social ecology as a determining factor of behavior. His research broadly aims to integrate cultural (socio-psychological) and evolutionary (bio-psychological) perspectives into a coherent framework, seeking to understand how the psychological mechanisms crafted by nature produce and interact with cultural artifacts.*



### **Assessing Temporal and Contextual Factors Affecting Preferential Attention to Faces in Individuals with High and Low Levels of Autistic Traits**

*Presenter:* Catherine I. Mitchell  
*Advisor:* Cheryl Dickter  
College of William & Mary,  
Psychology

Research suggests that typically developing individuals automatically orient their attention to social stimuli, but individuals with autism spectrum disorder (ASD) do not (Dawson et al., 2004). The results of studies examining attentional preference to faces in ASD and non-ASD individuals are mixed; some studies find a clear face-bias only for non-ASD individuals (Moore et al., 2012), but other studies find no difference between ASD and non-ASD groups (Bar-Heim et al., 2006). These discrepancies might stem from differences in how long stimuli are presented (the stimulus onset asynchrony (SOA)), and the type of distractor stimulus. To address these inconsistencies, the current study examined preferential attention to faces in a sub-clinical sample with different levels of autistic behaviors using a dot-probe paradigm with four distinct SOAs (100ms, 200ms, 500ms, 1000ms) and two distractor stimuli (cars and inverted faces). The Autism Quotient (AQ; Baron-Cohen et al., 2001), a self-report measure of autistic behaviors, was used to divide undergraduate participants (N = 105; 36 males; Mage = 19.10) into High AQ and Low AQ groups. Statistical analyses indicated that at 100ms, High AQ participants attended less to faces in the inverted face distractor condition compared with the car distractor condition,  $p < .01$ . High AQ participants also exhibited face-avoidance at 100ms for the inverted face trials,  $p < .01$ , and at 1000ms for car trials,  $p = .05$ . These results help explain the findings in the autism face-bias literature, indicating that the attentional orientation to social stimuli by individuals high in autistic traits varies depending on temporal and contextual variables.

*Catherine Mitchell is an M.A. student in Psychology at the College of William & Mary. Her research interests include autism, social cognition, and facial processing.*

### **Relationship Between Event-Related Potentials and Response Kinematics in Older and Younger Adults**

*Presenter:* Kenneth Juston Osborne  
*Advisor:* Paul Kieffaber  
College of William & Mary,  
Psychology

Movement is one of the most important functions of our nervous system. Recent research has shown that cognitive and perceptual functions ranging from our perception of others' emotions to the planning of goal-directed behaviors depends critically on brain areas once thought to be primarily motor in nature. Given the important role our motor system plays in understanding and interacting with the world around us, it is surprising that the majority of cognitive neuroscience research has focused primarily on sensation and perception irrespective of its relationship(s) to the execution of movement. Combining a novel method for tracking dynamic cursor movement and electroencephalogram (EEG), the current study addressed this limitation in the field via assessment of goal-directed movements during an error-correction task. In contrast to current error-correction paradigms that afford limited assessment of the mechanisms involved in error-correction, we have developed a novel task that assesses the online kinematics of movement (e.g., velocity, acceleration, etc.). We are investigating these relationships in healthy older and younger adults in order to determine baseline functioning differences in aging. Our results in younger adults demonstrate that event-related potentials (ERPs) conventionally interpreted with respect to sensation and perception are in fact related to the kinematics of motor responses. We are currently determining how these processes may be altered during normal cognitive aging. This project will help determine if deficits in goal-directed behavior and error-processing are related to movement or to perception, and how these process change as we age.

*Juston Osborne is an M.A. student in Psychology at the College of William & Mary. He is broadly interested in studying the predictors and biomarkers of cognitive decline in neurodegenerative disorders.*

### **Good, Bad, and the Indifferent: Do Habits Have Trait-Like Qualities?**

*Presenter:* Kathryn Mary Rehberg  
*Advisor:* Niels Christensen  
Radford University,  
Psychology

The automatic nature of habits enables habitual behaviors to influence a wide range of daily actions (Bargh, 1994, 1996). For example, when habitual behavior is of moderate strength it appears to be influenced by goals, but as the strength of the habit increases, the goal is less influential (Neal et al., 2011; Neal et al., 2013). However, despite habits' importance, little research has examined this construct. Previous research on habits has predominately examined how to break bad habits, or promote positive habits; however, research has yet to assess the extent to which habits have trait-like qualities (Neal et al., 2013). Thus, the primary goal of the proposed study will be to gauge the degree to which individuals vary in their strength of habits across positive and negative habits. In order to assess this research question, 350 Radford University Undergraduates will be surveyed to determine if they differ in their habits by measuring the strength of their positive and negative habits. If the results are significant, it will illuminate the saliency of implementing habits and ultimately lead to greater emphasis on promoting habits. Thus, instead of thinking about the goals individuals want to pursue, it might be more useful to think about the number of habits people need to establish to achieve those goals, because ultimately strong habits are more indicative of behavior than goals.

*Kathryn Rehberg is an M.A. candidate in Experimental Psychology at Radford University. Her research interests are in social and clinical psychology.*

### **The Influence of Adolescent Stress on the Relationship Between Anxiety and Depressive Symptomology over Time**

*Presenter:* Casey E. Snyder  
*Advisor:* Christopher Conway  
College of William & Mary,  
Psychology

For decades, researchers have been trying to understand the relationship between anxiety and depression, and to further explain the essence of their comorbidity. The work of Clark and Watson (1991) revealed a tripartite structure of anxiety and depression that was a novel outlook from the widely accepted categorical model of diagnosis at the time as it included symptom dimensions that cut across these categories. According to this model, there is a shared nonspecific factor of negative affect, along with a specific factor for both anxiety (i.e. physiological hyperarousal) and depression (i.e. anhedonia). More recently, researchers have suggested that these symptom dimensions may co-occur and change in tandem over time (Howe et al, 2012; Leadbeater et al, 2012). One likely predictor of the relationship between these symptoms over time is the amount of life stress that one is experiencing, specifically during adolescence (Grant & McMahon 2005). Researchers have suggested that stress during adolescence could serve as a prognostic indicator of later depressive and anxiety symptomology (Vrshek-Schallhorn et al, 2014). We want to test this hypothesis as it relates to the aforementioned tripartite model of symptomology. Data came from participants in the Youth Emotion Project, which is a longitudinal study identifying risk factors for emotional disorders during the transition from adolescence to young adulthood. The current study uses latent growth curve modeling to determine the relationship between depressive and anxiety symptomology over a 5-year period as the result of chronic life stress at a baseline interview. The data are currently being analyzed.

*Casey Snyder is a M.A. student in Psychology at the College of William & Mary. Her research is in the field of Clinical Psychology.*

## Predicting Recidivism: Maternal Stress and Intimate Partner Violence

*Presenter:* Morgan Jane Thompson  
*Advisor:* Danielle Dallaire  
 College of William & Mary,  
 Psychology

All inmates experience similar stressors upon release; however, female inmates with young children or newborns must manage added maternal stress related to their maternal role. Also, incarcerated females are more likely to have previously experienced intimate partner violence (IPV), which may add an additional stressor impacting their day-to-day life. Considering 35% of females released from state prison recidivate within one year, the present study seeks to determine whether IPV and maternal stress predict recidivism among previously incarcerated mothers. Participants were recruited from seven jail facilities ( $n=182$ ), 51.1% were African American, 50% had not completed high school, 25% were first time mothers, 67% were single, and 30.8% recidivated within the year following the birth of their child. Average age and incarceration length was 25.6 years and 11 weeks, respectively. Factors related to maternal stress include delivery while incarcerated (20%), low birth weight or preterm babies (11.1%), and babies going to the neonatal intensive-care unit (NICU) (15.9%). Approximately 30% of participants reported abuse from an ex-partner, current partner, or someone else. Although IPV and maternal stress do not independently predict recidivism, there is a marginal interaction between IPV and maternal stress with those reporting previous IPV exposure and greater maternal stress being more likely to recidivate,  $\beta = .27$ ,  $p = .06$ ,  $\Delta r^2 = .07$ . By gaining a better understanding of factors contributing to recidivism, interventions and services can be tailored to meet recently incarcerated mothers' needs.

*Morgan J. Thompson is an M.A. student in Psychology at the College of William & Mary. She is currently involved in research promoting healthy birth outcomes among incarcerated pregnant women.*

## Why Do We Overeat? The Role of Impulsivity in Dietary Restraint

*Presenter:* Wen Winnie Zhuang  
*Co-Authors:* S. Saha, J. Paglione  
*Advisor:* Catherine Forestell  
 College of William & Mary,  
 Psychology

Dietary restraint, or chronically controlling one's diet for health or weight-loss reasons, is a difficult pursuit. When faced with tempting foods, most dieters succumb and disinhibit, and only a minority manage to resist and stick to their diet goals. What differentiates the successful from the unsuccessful dieters? Impulsivity, a multidimensional construct implicated in addictive behaviors, may be a factor. The current study examines the effect of consuming a diet-violating food on state impulsivity, and how changes in state impulsivity and dietary restraint influence subsequent overeating. In a laboratory study, female participants provided measures of dietary restraint and levels of state impulsiveness before and after consuming a 16oz preload of either water (control) or a milkshake (diet-violation). Calories consumed in a subsequent taste test assessed overeating. Preliminary results show that for restrained eaters in the milkshake condition, changes in state impulsivity positively predicted taste test calories consumed. Unrestrained eaters, on the other hand, ate less after in the milkshake compared to in the water condition, but no effects of state impulsivity were observed. These results suggest important differences between restrained and unrestrained eaters, and that changes in state impulsivity predict overconsumption in a subgroup of restrained eaters. Understanding this causal pathway between restraint and overeating clarifies the factors that undermine dietary restraint and informs future directions in creating healthy eating interventions.

*Winnie Zhuang is an M.A. student in Experimental Psychology at the College of William & Mary. She conducts research on dietary restraint, impulsivity, and other traits that influence overeating.*

### Modeling Information Signals in a Composite Social Vulnerability Index

**Presenter:** Jeremy Ben Abramowitz  
**Advisor:** Sarah Stafford  
College of William & Mary,  
Public Policy



An important problem in social science research is identifying communities most likely to be impacted by natural disasters and other environmental hazards. Of particular interest is the development of quantitative measures that can be used to compare the relative vulnerability or resilience of different communities. One such metric is the Social Vulnerability Index (SoVI), which involves weighted component aggregation following principal component analysis (PCA) over a large number of social indicator variables. Since 2003, SoVI has been widely adopted by governments and other policy actors as a tool for advancing environmental justice goals, and it has become widely accepted as the predominant methodological paradigm in the interdisciplinary hazard of place research. This paper presents two years of empirical and theoretical work challenging the validity of SoVI as initially constructed. I propose a model for measuring the latent information signal and noise contained in a SoVI-type metric based on analysis of eigenvalues and examine the sensitivity of the measure at several decision points in index construction using census data from Virginia. These decision points include the number and type of indicator variables considered, component retention criteria, and component weighting. I consider alternatives to PCA such as maximum likelihood factor analysis that allow for a greater variety and better explicit comparison of models. I conclude by discussing the practical implications of these findings for researchers and policy-makers.

*Jeremy Abramowitz is an M.P.P. student in Public Policy at the College of William & Mary. His research focuses on energy and environmental policy issues, statistical modeling and applied econometrics. Jeremy is the 2016 recipient of the Carl J. Strikwerda Award for Excellence in the Humanities and Social Sciences.*

### The Judgment of Solomon: Jerusalem

**Presenter:** Kathleen Baugh  
**Advisor:** Elaine McBeth  
College of William & Mary,  
Public Policy

Since Israel's acceptance into the UN in 1947, there has been a conflict between Arabs and Israelis over the legitimacy of Israel and Palestine as states as well as a conflict over the control of key Jewish and Muslim religious sites. The development of these two states has been fraught with uprisings, wars and denials of legitimacy of the other through the denial of the other's claim to sovereignty over religious sites. There are groups within both the Arab and Israeli populations that believe that their group is the rightful sovereign over the area known as Israel. This has led to a deep rift between both groups that has only been exacerbated by the lack of cooperation on many fronts, from peace talks to control of religious sites. In this presentation, I will examine how control of key religious sites in Jerusalem plays into feelings of national sovereignty and political legitimacy in both an Israeli and Palestinian lens.

*Kathleen Baugh is an M.P.P. student in Public Policy at the College of William & Mary. Her research interests are in immigration law and refugee rights.*

**Did Medicaid Primary Care Reimbursement Rate Increase in 2013 and 2014 under the Affordable Care Act Impact Access to Primary Care of Medicaid Populations?**

*Presenter:* Mandar Vinayak Bodas  
*Advisor:* Tiffany Green  
 Virginia Commonwealth University,  
 Health Behavior and Policy



**Background:** An Affordable Care Act (ACA) provision raised Medicaid primary care reimbursement rate to match those of Medicare during the years 2013 and 2014. This was done to increase acceptance of Medicaid among primary care physicians thereby improving primary care access for Medicaid populations. However, evidence suggests that increasing payments may not be enough to improve physician participation in Medicaid. Further, short duration of and delay in the provision's implementation raised concerns about the provision's impact. **Objective:** To evaluate the impact of ACA Medicaid primary care reimbursement raise on access to primary care for Medicaid beneficiaries. **Design and methods:** Difference-in-difference and logistic regression estimation methods were used on data from 2011 to 2014 National Health Interview Survey to measure the probability of having a usual source of care and of having a physician as a usual source of care among Medicaid populations. **Results:** Preliminary results indicate that the reimbursement rise did not significantly impact primary care access for Medicaid patients at a national level. An explanation of the findings is that Medicaid reimbursement rates differ by states and hence a large, state-wise variation may be present in the measured outcomes. To precisely predict the provision's impact, further analysis which considers state-level factors is required. **Implications:** Assessment of the current provision indicates that addressing only low reimbursement rates may not be sufficient. Policymakers should explore other measures to improve acceptance of Medicaid patients among physicians.

*Mandar Bodas is a Ph.D. candidate in Healthcare Policy and Research at Virginia Commonwealth University. His research interests include healthcare access, innovative payment methods and health quality.*

**The Effects of the Affordable Care Act on Non-emergent Use of Emergency Departments Among Young Adults**

*Presenter:* Robert Tyler Braun  
*Advisor:* Andrew Barnes  
 Virginia Commonwealth University,  
 Health Behavior and Policy

**Objective:** The Patient Protection and Affordable Care Act (ACA) permits young adults up to the age of 26 to enroll as dependents on a parent's private health insurance plan. Non-emergent emergency department (ED) visits are a meaningful indicator of access to primary care services. Health insurance can reduce non-emergent ED overuse by removing economic barriers to primary care. This study examined how the implementation of the ACA changed non-emergent ED visits for young adults. **Methods:** This study analyzed data from the 2007-2013 Medical Expenditure Panel Survey (MEPS). Our sample consisted of 3,029 persons ages 19 to 31 across all survey years. We defined non-emergent ED use based on the New York University ED-classification algorithm and used a difference-in-differences analysis to examine changes in non-emergent ED utilization pre and post ACA for young adults affected (ages 19-25) and a comparison group (ages 26-31) not affected by the dependent insurance provision. Independent variables originated from Andersen's Behavioral Model of Health Services Utilization. **Results:** After implementation of the ACA in 2010, we found that ED use for non-emergent visits decreased among young adults ages 19 to 25, although the decrease was not statistically significant. **Conclusion:** There was no conclusive evidence that the ACA-dependent insurance expansion had an effect on non-emergent ED visits for young adults. Future years of data may be needed to see ACA's full effects on the young adult population's non-emergent ED utilization.

*Tyler Braun is a Ph.D. candidate in Healthcare Policy and Research at Virginia Commonwealth University. His research interests include healthcare supply-side economics, payment reform, and econometric modeling.*

### Is Transformation Surviving?

*Presenter:* Michael Redmond Daly  
*Advisor:* Cornelis Van Walbeek  
University of Cape Town,  
Economics

Recent political events in South Africa have emphasized the importance of faculty diversity. Very little research has considered why it is the case that 20 years after the end of Apartheid, only 14% of professors are black. Or, why the University of Cape Town does not have a single black South African woman who is a full professor. Is it the case that black faculty are discriminated against during the hiring process or is it the case that black faculty depart at significantly higher rates than white faculty as sometimes suggested? Further, how do race, education and institutional factors interact in determining diversity levels? Survival analysis statistical methods coupled with a novel data-set consisting of detailed administrative employee records, proxies for performance and various socio-economic variables are employed to test various hypothesis related to these questions. The findings are nuanced and suggest that it is not only an individual's personal characteristics that affects likelihood of survival at the organization, but also that dynamic effects from the overall composition of the department in which the employee works is equally important. Overall, race matters, not only is there direct correlation between employee race and tenure length, but also through indirect effects where employees who differ significantly (in terms of race, tenure, age, education and gender) from others in their respective departments face increased rates of departure from the work place.

*Michael Daly is a Research Associate at the Schroeder Center for Health Policy at the College of William & Mary and a graduate student in Development Economics at the University of Cape Town. His research interests are in applied microeconomics at the intersection of health, labor and development. Current work includes a geo-spatial examination of physician accessibility in Virginia and a project that measures the impact of the Medicare Re-admission Reduction Program.*

### Multi-level Model Based Clustering with Parameter and Pairwise Constraints

*Presenter:* Paul Gerard Diver  
*Advisor:* Dan Spitzner  
University of Virginia,  
Statistics

Incorporating constraints into a cluster analysis allows for extrinsic information to influence, preference, or require certain groupings of data over others. Typically, these constraints have been limited to pairwise must (must-not) link relationships between observation values and have not extended to the associated estimation of unknown parameters of underlying data distributions. When cluster analysis is desired at both individual and consolidated levels of a given data set, failing to appropriately model the relationship between the parameters across these levels can lead to inconsistent parameter estimation. Moreover, failing to appropriately incorporate parameter and pairwise observation constraints can obfuscate the sought after intrinsic structures at both levels within the data so desired to uncover. This research moves beyond ad-hoc distance based techniques and applies a principled mixture-model approach, a modification to the EM algorithm, and BIC based model selection to multi-level data while imposing, simultaneously, constraints on the bidirectional relationship between group and individual level cluster population means, a variety of pairwise constraints at the individual level, and a minimum number of observations in each cluster. The relevance of this approach and these constraints are demonstrated on real world data including politician voting records at the individual and consolidated state level and NBA player and team performance. This research allows for robust and statistically consistent identification of unknown structures and parameters of interest which can be applied in settings such as campaign or roster management strategy.

*Paul Diver is a Ph.D. student in Statistics at the University of Virginia. His research interests include model based and Bayesian methods for clustering and variable selection.*

### **Factors Determining Receipt of Breast Reconstruction Surgery: Systematic Review and Meta-analyses**

*Presenter:* Jaya Shankar Khushalani  
*Advisor:* Jan Clement  
Virginia Commonwealth University,  
Health Administration

**Background:** Breast reconstruction provides psycho-social and quality of life benefits for breast cancer patients after mastectomy. The Women's Health and Cancer Rights Act mandated insurance coverage of breast reconstruction in 1999 to improve access. Yet, race, income, type of insurance and region hinder access to breast reconstruction. No systematic review has examined racial and other disparities in breast reconstruction and their trends over time. **Objectives:** To review literature and identify disparities in access to breast reconstruction, quantitatively determine the magnitude of these disparities and to assess trends in these disparities over time. **Methods:** Systematic review and meta-analysis of 34 relevant articles published between 1999 to 2015 which were obtained through PubMed and manual searches of reference lists. **Findings:** Patient-level factors such as race, insurance, region of residence and employment; area-level factors such as average education, median income, number of plastic surgeons in the region and provider-level factors such as teaching status of hospital, volume of breast surgeries, number of beds and hospital region are associated with access to breast reconstruction despite controlling for age and clinical characteristics. Meta-analyses showed that African Americans were 38% less likely than non-Hispanic Whites, Medicaid patients were 75% less likely than Privately insured patients. These disparities did not change over time. **Implications:** Despite policy effort, significant disparities persist in access to breast reconstruction.

*Jaya Khushalani is a Ph.D. candidate in Health Administration at Virginia Commonwealth University Department of Health Administration at Virginia Commonwealth University. Her current research interests are assessing disparities in cancer care and the role of health information technology in care delivery. Her dissertation focuses on understanding racial disparities in breast cancer treatment.*

### **The Aid Effectiveness Debate: The Impact of Aid on Health Outcomes in Uganda**

*Presenter:* Robert A. Marty  
*Advisor:* Matthias Leu  
College of William & Mary,  
Public Policy

The health sector has attracted significant foreign aid; however, evidence on the effectiveness of this support is mixed. By combining household panel data with geographically-referenced foreign aid data, this paper uses a difference-in-differences approach to investigate the contribution of aid on key health outcomes in Uganda. We find that even though aid was not targeted to localities with the worst health conditions, health aid achieved an overall significant impact in reducing both disease severity and burden, with the impact most robust for disease burden. In addition, we observe increased aid effectiveness if resources are channeled to locations that are closer to communities in need, given ease of access to health services. From a policy perspective, the results point to the need for development partners to better target aid to sub-national areas with higher disease prevalence in order to enhance aid effectiveness.

*Robert Marty is a joint-degree masters student at the College of William & Mary studying Public Policy and Operations Research. He is interested in how foreign aid can be better targeted to improve development outcomes and how tools such as GIS can improve decisions related to foreign aid.*

### Effects of the ACA Dependent Coverage Expansion on Virginia's Young Adults

*Presenter:* John J. Snouffer  
*Advisor:* Jennifer Mellor  
College of William & Mary,  
Public Policy

The Affordable Care Act (ACA) required that all insurance plans covering dependents extend that coverage to children up to age 26 beginning on or after September 23, 2010. This study presents new research findings on the impact of the ACA's dependent coverage mandate on Virginia's young adults and their use of inpatient hospital care for all non-birth related admissions as well as mental illness and substance abuse admissions. Analysis of hospital discharge data from 2008-2014 shows that the ACA's dependent coverage mandate increased all non-emergency admissions as well as mental illness and substance abuse admissions. Additional evidence shows that the dependent coverage mandate reduced the share of young adult hospital admissions paid by Medicaid and increased the share of admissions paid by private insurance. The dependent coverage mandate also led to an increase in treatment intensity among hospitalized persons, defined as increased lengths of stay and total charges for non-birth admissions. Overall, this study shows that the ACA's dependent coverage mandate increases inpatient healthcare utilization. At the same time, a large fraction of patients aged 19-34 who were admitted to hospitals for mental illness treatment in the post-ACA period (2012-2014) remain uninsured. Policymakers may want to consider other means to expand coverage to those young adults left uninsured in Virginia.

*John Snouffer is an M.P.P. student in Public Policy at the College of William & Mary.*

### Perceptions of Healthcare Provider Communication Skills in Race and Sex Concordant Interactions: Does Income Matter?

*Presenter:* Anushree M. Vichare  
*Co-Author:* T. Green  
*Advisor:* Lindsay Sabik  
Virginia Commonwealth University,  
Health Behavior and Policy



**Purpose:** Empirical evidence suggests higher satisfaction with care when patient and provider race and sex align; although unknown if satisfaction differs across patient income when concordance is achieved. This analysis examines whether the relationship between concordance and perceptions of provider communication skills differs by income. **Methods:** Analytic sample was 32671 respondents from 2007-2012 Medical Expenditure Panel Survey. Four domains measured communication skills; how often provider listened carefully, explained medical care to understand, showed respect and spent enough time during consultation. Concordance was identified when patient race/ethnicity or sex aligned with provider. Income defined at federal poverty level was categorized as; low <200%, middle 200-400% and high >400%. **Results:** In spite of concordance; compared to high income, low income patients were more likely to be dissatisfied in all four domains of provider communication. Largest differences were detected in satisfaction with provider's ability to explain medical care and showing respect (4.2 and 4.8 percentage points respectively;  $p < 0.001$ ). **Conclusion:** Vulnerable populations experience ineffective patient-provider communication and their perceptions of similarity likely extend beyond demographics. With growing policy emphasis on patient satisfaction scores, key challenge is recognizing complexities of measuring satisfaction and enhancing provider skills to elicit patient communication preferences.

*Anushree Vichare is a doctoral candidate in Health Policy and is interested in examining access to quality care among the underserved population.*



### **Aid Allocation among Non-Traditional Donors: A Study of Chinese and Venezuelan Aid in Latin America and the Caribbean**

*Presenter:* Darice Xue

*Advisor:* Michael Tierney  
College of William & Mary,  
Public Policy

This study examines the geostrategic, economic, and ideological determinants of development assistance among non-OECD donors by comparing the allocation patterns of Chinese and Venezuelan development finance in the Western Hemisphere. Although many emerging donors have self-identified as alternatives to traditional or “Western” sources of foreign aid, empirical studies of their aid allocation have been limited due to a lack of precise, publicly-available project-level data. Using new, project-level data from AidData on Chinese and Venezuelan development finance from 2000 to 2014, this study develops a model for analyzing ideological determinants of aid and for capturing specific attributes of aid financing that are associated with ideological aid. Better understanding of the nuances between different forms of non-traditional donor aid will assist the United States in structuring its foreign aid policy to address the growing influence of emerging donors abroad.

*Darice Xue is a second-year student in the joint B.A./M.P.P. program at the College of William and Mary. She is interested in the economic development strategies of emerging donors and improving donor coordination between emerging and traditional donors.*

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