



William & Mary  
Graduate Arts & Sciences

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

March 15<sup>th</sup>-16<sup>th</sup>, 2019



# Thinking Forward

[wm.edu/as/grs](http://wm.edu/as/grs)

The cover image is of the College of William & Mary's 1918-1919 Freshman Class and appears in the 1919 *Colonial Echo*. This year, William & Mary honors the 24 women who enrolled in 1918-1919, forever changing the learning and living environment of the University.

Photo provided courtesy of Special Collections Research Center, William & Mary Libraries

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William & Mary  
Graduate Arts & Sciences

*18<sup>th</sup> Annual Graduate Research Symposium  
Schedule at a Glance*

**Thursday, March 14, 2019 -- Sadler Center**

6:30 pm - 8:00 pm     Annual Raft Debate  
*Chesapeake ABC*

**Friday, March 15, 2019-- Sadler Center**

8:00 am - 8:30 am     Registration  
*Chesapeake AB*

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

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

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

11:45 am - 1:00 pm     Luncheon  
*Chesapeake AB*

1:15 pm - 2:15 pm     Concurrent Sessions  
*Tidewater A, Tidewater B, James Room*

2:30 pm - 3:30 pm     Concurrent Sessions  
*Tidewater A, Tidewater B, James Room, York Room*

3:30 pm - 6:00 pm     Poster Presentations/Professional Development and Networking Reception  
*Chesapeake ABC*

**Saturday, March 16, 2019 -- Sadler Center**

8:00 am - 8:30 am     Registration  
*Chesapeake AB*

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

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

11:00 am - 12:00 pm     Awards for Excellence in Scholarship Presentations  
*Tidewater A*

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

<https://www.wm.edu/as/grs>



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 18<sup>th</sup> Annual Arts & Sciences Graduate Research Symposium at the College of William & Mary! Over the past 18 years, well over 2,500 graduate students from across the country have presented their research to thousands of attendees. This year, 140 graduate students from William & Mary and 14 visiting institutions will add to this distinguished record of presenting excellence in graduate student research.

We have two special events to kick off the 18<sup>th</sup> Annual Graduate Research Symposium. The first is a professional development Elevator Pitch workshop, which will be held on Wednesday, March 13 at 5:00 pm in the Cohen Career Center. The workshop is designed to give graduate students the tools they need to develop a quick introduction summary of their credentials and expertise to quickly and effectively share with a general audience. The Raft Debate will be held the following evening on Thursday, March 14 at 6:30 pm. This event, an engaging blend of debate and comic relief, will be held in the Sadler Center, Chesapeake ABC.

The theme of this year's symposium is "Thinking Forward." This theme highlights and builds upon William & Mary President Katherine Rowe's campus wide discussions focused on the future of three of the Universities core mission areas – knowledge, work and service, and also creating space for reflection and aspiration. As a way to promote interactions across disciplines, we are holding this year's Poster Session jointly with the Networking Reception. This year's Reception will also include a Professional Development Fair, to help students develop the skills and networks that will serve them well into their professional careers. The joint Poster Session/ Professional Development Fair and Networking Reception will be held on Friday, March 15 from 3:30-6:00 pm in Chesapeake ABC. This event will give attendees the opportunity to polish their resumes, develop successful course syllabi, learn the ins and outs of academic CVs, and find out more about the services offered by the Graduate Writing Resources Center.

The success of the Graduate Research Symposium over the past eighteen years depends on all of the participants and volunteers who make this great symposium happen. I would especially like to thank the William & 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 organizing committee for all of their hard work and dedication that went into making this year's symposium better than ever!

Best,

A handwritten signature in cursive script that reads "Summer Moore".

Summer Moore  
2019 Graduate Research Symposium Chair





**WILLIAM & MARY**

CHARTERED 1693

OFFICE OF THE PROVOST

Dear Colleagues, Students and Friends,

Welcome to the 18<sup>th</sup> annual Graduate Research Symposium at William & Mary! It is great to have you here.

Universities expand our knowledge of the world, and W&M students contribute seriously to deeper understanding in many fields 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, "Thinking Forward," builds upon President Katherine Rowe's campus wide discussions focused on the future of three of William & Mary's core mission areas – knowledge, work and service – and creates space for reflection and aspiration.

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



Sincerely,

Michael R. Halleran  
Provost

# 2019 Graduate Research Symposium

## Program Chair

Summer Moore, *Anthropology*

## Graduate Student Committee

Nick Belluzzo, *Anthropology*  
Adrienna Bingham, *Applied Science*  
Brandon Kyle Eskridge, *Physics*  
Cheng Li, *Computer Science*  
Rebekah Planto, *Anthropology*  
Erin Schwartz, *Anthropology*

## Office of Graduate Studies & Research

Dean Virginia Torczon, *Graduate Studies*  
Chasity Roberts  
Wanda Carter  
Sarah Glosson  
Vicki Thompson Dopp

## Sponsors

A&S Graduate Student Association  
Graduate Studies Advisory Board

## Special Thanks To:

Rachel Follis, Creative Services  
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. Jody Allen, *History*  
Dr. John Burton, *Graduate Studies Advisory Board*  
Dr. Brian Morra, *Graduate Studies Advisory Board*  
Prof. Elaine McBeth, *Public Policy*  
Dr. Susan Rawles, *Graduate Studies Advisory Board*  
Dr. Betsy Sigman, *Graduate Studies Advisory Board*

### Natural & Computational Sciences

Dr. David Armstrong, *Physics*  
Dr. Robert Barnet, *Psychological Sciences*  
Dr. Adwait Jog, *Computer Science*  
Dr. Oliver Kerscher, *Biology*  
Dr. Gunter Luepke, *Applied Science*  
Dr. Matthias Leu, *Biology*  
Dr. Tyler Meldrum, *Chemistry*  
Dr. Cynthia Morton, *Graduate Studies Advisory Board*  
Dr. David Opie, *Graduate Studies Advisory Board*  
Dr. Leah Shaw, *Mathematics*

### Mentoring Awards: Humanities & Social Sciences

Dr. Tuska Benes, *History*  
Dr. Alexandra Joosse, *Public Policy*  
Dr. Neil Norman, *Anthropology*  
Dr. Bob Scholnick, *American Studies*

### Mentoring Awards: Natural & Computational Sciences

Dr. Christopher Del Negro, *Applied Science*  
Dr. Diane Shakes, *Biology*  
Dr. Mike Nichols, *Psychological Sciences*  
Dr. J.C. Poutsma, *Chemistry*  
Dr. Zhenming Liu, *Computer Science*  
Dr. Leah Shaw, *Mathematics/COR*  
Dr. Patricia Vahle, *Physics*

## **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.

### **David Marquis**

Ph.D. Candidate - Department of History  
Advisor: Dr. Cindy Hahamovitch

### ***Dynamite: Southern Violence and the Transformation of the Piney Woods***



***As a Ph.D. candidate in the department of History at William & Mary, David's research focuses on the social history of working-class in the Southern timber industry during the early twentieth century.***

***Join David as he presents his award winning research  
Saturday, March 16, 2019  
11:00am-12:00pm in Tidewater A***



## The Arts & Sciences Graduate Studies Advisory Board at William & Mary is a proud sponsor of the 2019 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 & 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 & Mary's faculty members in Arts & Sciences.

By sponsoring the 2019 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, 2018-19

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

**Vice-President:** Kathryn Caggiano '90 BS Math

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

**Chair, Communications and Advocacy Committee:** Laura J. Terry, '03 BS Biology and Jim David '04 MA History, '10 PhD History

**Chair, Finance and Development Committee:** Michael Bracken, '86 BS Mathematics and John D. Burton '89 MA History, '96 PhD History

**Chair, Student Professional Development Committee:** David K. Hood '90 BS Chemistry, '92 MA Chemistry, '96 PhD Applied Science and David Opie '88 MS Physics, '91 PhD Physics

Diane Alleva Cáceres '87 BA Economics, '89 MA Govt

Kurt Erskine '92 BA Public Policy

Mike Hoak '02 MA History

Karen Hooker, '81 MA Psychology

Rick Kuhn, '76 BA Psychology, '77 MBA

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

Cynthia C. Morton '77 BS Biology

Susan Rawles '05 PhD American Studies

Judith Ridner, '88 MA History, '94 PhD History

Betsy Page Sigman '78 BA Government

Eleanor K. Silverman '85 BA Mathematics

Gail Williams Wertz '66 BS Biology

## **Graduate Studies Advisory Board Award for Excellence in Scholarship in the Natural and Computation Sciences**

These awards acknowledge William & Mary 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 William & Mary.

### **Sofya Zaytseva**

Ph.D. Candidate - Department of Applied Science

Advisor: Dr. Leah Shaw

*A study of oyster reef morphology using remotely sensed data*



***As a Ph.D. candidate in the department of Applied Science at William & Mary, Sofya's dissertation investigates pattern formation in marine systems using mathematical modeling and analysis of remotely sensed data.***

***Join Sofya as she presents her research  
Saturday, March 16, 2019  
11:00am-12:00pm in Tidewater A***

## **Graduate Studies Advisory Board Award for Excellence in Scholarship in the Humanities and Social Sciences**

These awards acknowledge William & Mary 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 William & Mary.

### **Alexandra M. Macdonald**

Ph.D. Candidate - Department of History

Advisor: Nicholas Popper

*"The Shop on the Corner of Wing's Lane":  
Retail Spaces in Colonial Boston*



***As a Ph.D. student in the department of History at William & Mary, Alexandra has common themes running throughout her scholarly that work include the relationship between gender and material culture in the long eighteenth-century, the intersections of material and intellectual culture, and the role(s) of space in the British Atlantic World.***

***Join Alexandra as she presents her research  
Saturday, March 16, 2019  
11:00am-12:00pm in Tidewater A***

## Award Recipients for Excellence in Scholarship

### William & Mary Award for Excellence in the Humanities & Social Sciences

**MARIE PELLISSIER**

History, Advisor: Dr. Karin Wulf

*"Why We Need the Ballot":*

*The Woman's Christian Temperance Union and Local Involvement in the Fight for for Woman Suffrage, 1898-1920*

### William & Mary Honorable Mention

**ALEXIS OHMAN**

Anthropology, Advisor: Dr. Jennifer Kahn

*Making Their Mark: Ceramics and Soldier Identity in the 19th-century Caribbean*

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### Visiting Scholar Award for Excellence in the Humanities & Social Sciences

**GRANT E. STANTON**

History, University of Pennsylvania, Advisor: Dr. Daniel Richter

*The Language of Liberty:*

*Petitioning for Freedom in Revolutionary Massachusetts, 1773-1777*

### Visiting Scholar Honorable Mention

**KENNETH KAIZER**

Anthropology, George Mason University, Advisor: Dr. Rashmi Sadana

*The General Theory of Societal Domains:*

*The Exploration and Revelation of a Structural Framework for Human Society*

## Award Recipients for Excellence in Scholarship

### William & Mary Awards for Excellence in the Natural & Computational Sciences

#### **SARAH BLUMENTHAL**

Psychological Sciences, Advisor: Dr. Josh Burk  
*Effects of an Orexin-2 Receptor Agonist on Attention Following Loss  
of Cortical Cholinergic Inputs*

#### **MICHELE TUFANO**

Computer Science, Advisor: Dr. Denys Poshyvanyk  
*Learning Bug-Fixing Patches in the Wild via Neural Machine Translation*

### William & Mary Honorable Mentions

#### **PRAJKTA KALLURKAR**

Applied Science, Advisor: Dr. Christopher Del Negro  
*Burstlet Hypothesis of Inspiratory Rhythm Generation:  
are Rhythm- and Pattern- Generation Separate Mechanisms?*

#### **CHRISTOPHER WELD**

Applied Science, Advisor: Dr. Lawrence Leemis  
Golden Quantile Rank Sets: Implications and Applications of a  
“Perfectly” Representative Sample

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

#### **MADELEINE D. BRUCE**

Psychology, Virginia Tech, Advisor: Dr. Robin Panneton  
*Large-Scale Evaluation of Infants' Looking Patterns to Dynamic Audiovisual Displays*

### Visiting Scholar Honorable Mention

#### **SYED RIZVI**

Computer Science, Old Dominion University, Advisor: Dr. Stephan Olariu  
*ASAP: An Agent-Assisted Smart  
Auction-Based Parking System in Internet of Things*

## **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.

### **Awards for Excellence in the Humanities & Social Sciences**

GROVER JASPER CONNER  
History Department, M.A./Ph.D.  
Advisor: Dr. Adrienne Petty

KYLIE WHEELER  
Public Policy Program, M.P.P.  
Advisor: Dr. Eric Arias

### **Award for Excellence in the Natural & Computational Sciences**

KENNETH J. BLACKSHAW  
Chemistry Department, M.S.  
Advisor: Dr. Nathanael Kidwell



## **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 & Social Sciences**

ZARAH QUINN  
American Studies Program, Ph.D.  
Advisor: Dr. Kara Thompson

### **Awards for Excellence in Undergraduate Mentoring in the Natural & Computational Sciences**

SUDIP PAUDEL  
Applied Science Department, Ph.D.  
Advisor: Dr. Margaret Saha

MARIA ALEXANDRA LARRAZABAL CARRILLO  
Psychological Sciences Department, M.S.  
Advisor: Dr. Chris Conway

YASAMAN SETAYESHPOUR  
Biology Department, M.S.  
Advisor: Dr. Oliver Kerscher



A workshop in  
conjunction with:  
2019 Graduate  
Research Symposium,  
March 15-16

MARCH  
**13**



Who, What,  
How, & Why!

# ELEVATOR PITCH WORKSHOP

**Cohen Career Center  
Presentation Room  
5pm, Wed. March 13**

Learn what makes a good elevator pitch, see examples, and  
begin to work on your own! Get ready for networking at the  
Graduate Research Symposium!

**QUESTIONS: [SGGLOS@WM.EDU](mailto:SGGLOS@WM.EDU)**

WILLIAM & MARY  
CHARTERED 1693

Four William & Mary faculty members from diverse disciplines are stranded on a desolate island with only a one-person life raft to escape to civilization. Who should survive for the sake of humanity?

THE ANNUAL  
**RAFT DEBATE**

**Annie Blazer**  
for the Humanities

**Drew LaMar**  
for the Natural and Computational Sciences

**John Lopresti**  
for the Social Sciences

**Michael R. Halleran**  
as the Devil's Advocate

**Virginia Torczon**  
as the Judge

**THURSDAY, MARCH 14, 2019 @ 6:30PM**  
**SADLER CENTER, CHESAPEAKE ABC**

**The Debate is free and open to the public.**  
*Sponsored by the Office of Graduate Studies & Research*



# Graduate Writing Resources Center

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Learn to improve clarity, flow,  
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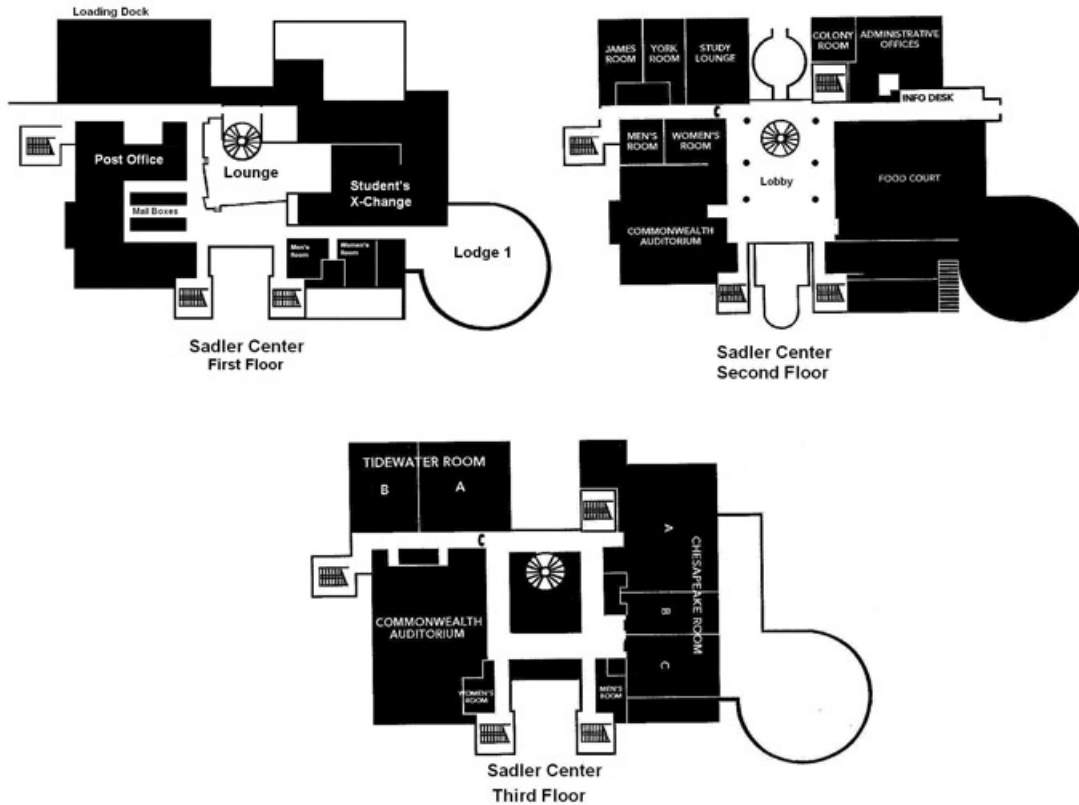
*Individual consultations*

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**Schedule an appointment  
or register for a Write-In:**  
**[www.wm.edu/wrc](http://www.wm.edu/wrc)**

# William & Mary Sadler Center





**18th Annual Graduate Research Symposium**  
**Friday, March 15, 2019**

*Highlighted names indicate award winners*

<b>8:30-9:30</b>	<b><u>Tidewater A</u></b> Joseph Cuozzo Savannah Cuozzo Scott Madaras Andrew Rotunno  <i>Chair: Eugeny Mikhailov</i>	<b><u>Tidewater B</u></b> Eden Maness <b>Sarah Blumenthal</b> Claire Gallagher Rachel Scrivano  <i>Chair: Josh Burk</i>	<b><u>Chesapeake C</u></b> Joseph Lawless Zhongzhe Pan Anjee Gorkhali  <i>Chair: Jennifer Mellor</i>	<b><u>James Room</u></b> Kaushal Kafle <b>Syed Rizvi</b> Hongyuan Liu  <i>Chair: Weizhen Mao</i>	<b><u>York Room</u></b> <b>Grover Conner</b> <b>Grant Stanton</b> <b>Marie Pellissier</b>  <i>Chair: Adreinne Petty</i>
<b>9:45-10:45</b>	<b><u>Tidewater A</u></b> Yan Wang <b>Christopher Weld</b> Avishi Abeywickrama Omaththage Dinidu Perera  <i>Chair: Larry Leemis</i>	<b><u>Tidewater B</u></b> Nichole Gustafson Benjamin Thompson Qijue Wang  <i>Chair: Margaret Saha</i>	<b><u>Chesapeake C</u></b> Marco Merchand Archana Radhakrishnan Adam Chiciak Hao Xu  <i>Chair: Marc Sher</i>		<b><u>York Room</u></b> Kaila Schwartz Hamza Radid Mitchell Oxford  <i>Chair: Kathrin Levitan</i>
<b>11:00-12:00</b>	<b><u>Tidewater A</u></b> Ti Hsu Repairer Etuk Danielle Gilmore Bendu Jackson  <i>Chair: Catherine Forestell</i>	<b><u>Tidewater B</u></b> Daniel Borrus <b>Sudip Paudel</b> Cameron Grover  <i>Chair: Christopher Del Negro</i>	<b><u>Chesapeake C</u></b> Victoria Owen Richard Reksoatmodjo Amy Schertz Ryan Chaban  <i>Chair: David Armstrong</i>	<b><u>James Room</u></b> Nick Belluzzo Erin Schwartz Chandler Fitzsimons  <i>Chair: Martin Gallivan</i>	<b><u>York Room</u></b> <b>Alexis Ohman</b> Hyunyoung Moon Jennifer Ross  <i>Chair: Leisa Meyer</i>
<b>12:00-1:00</b>	<b>Luncheon - Chesapeake AB</b>				





## 18th Annual Graduate Research Symposium

Friday, March 15, 2019

*Highlighted names indicate award winners*

1:15-2:15		<b><u>Tidewater B</u></b> Amanda Werrell Heather Kenny Robert Galvin Rachel Davis  <i>Chair: John Swaddle</i>	<b><u>James Room (1:15-3:00)</u></b> Summer Moore Laura Beltran-Rubio Rebekah Planto Jessica Bittner  <i>Chair: A. Horning/J. Kahn</i>	<b><u>York Room</u></b> Zarah Quinn Molly Shilo Brian Jones  <i>Chair: Sarah Glosson</i>
2:30-3:30	<b><u>Tidewater A (2:30-4:00)</u></b> Jacob Alter David Nader Woosub Jung Xiaodan Zhu Zhen Peng  <i>Chair: Dmitry Evtyushkin</i>	<b><u>Tidewater B</u></b> Dakota Hunter Sam Mason Kylie Wheeler  <i>Chair: Doug Deberry</i>		<b><u>York Room</u></b> Amy Filkins Brandon Eskridge Jason Creeden David Lahneman  <i>Chair: Mumtaz Qazilbash</i>
3:30-5:30	<b>Poster Presentation and Networking Reception - Chesapeake ABC</b>			
	1) Kenneth Blackshaw 2) Timothy Boycott 3) Madeleine Bruce 4) Jessica Burns 5) Yi Cui	6) John Mart DelosReyes 7) Lisa Graves 8) Walter Hardy 9) Daryl Hesse 10) Mohamed Ibrahim	11) Prajkta Kallurkar 12) Ali Kucukozyigit 13) Julie Laudenschlager 14) Casey McLaughlin 15) Molly Miller	16) Megan Moran 17) Adenrel Oludiran 18) Tanvi Patel 19) Chenoa Payne 20) Olivia Penrose Hamouch

Presenters are listed in order of appearance

Revised 03/08/19



**18th Annual Graduate Research Symposium**  
**Saturday March 16, 2019**

*Highlighted names indicate award winners*

8:30-9:30	<b><u>Tidewater A</u></b> Muloongo Simuzingili Hongyang Zhao Taiwo Oguntuyo  <i>Chair: Eleanor Silverman</i>	<b><u>Tidewater B</u></b> <b>Kenneth Kaizer</b> Lauren Howard Anniete Cohn-Lois  <i>Chair: Rob Saunders</i>	<b><u>Chesapeake C (8:30-10:30)</u></b> Jasmine Parham Katherine Bemis Adrienna Bingham Meredith Andersen Federica Castellani Morgan Claybrook  <i>Chair: Michael Bracken</i>	<b><u>James Room</u></b> Olawenraju Lasisi Tomos Evans Madeline Bassett  <i>Chair: John Burton</i>	<b><u>York Room</u></b> Kelsey Shaffer Joshua Lipson Tianfang Yang Caroline Jordan  <i>Chair: Joanna Schug</i>
9:45-10:45	<b><u>Tidewater A</u></b> Cheng Li <b>Michele Tufano</b> Susan Zehra  <i>Chair: Kathryn Caggiano</i>	<b><u>Tidewater B</u></b> Christopher Hipp Patrick McArdle Nikunj Kumar Prajapati Shuangli Du  <i>Chair: George Miller</i>		<b><u>James Room</u></b> Christopher Slaby Jessica Cowing  <i>Chair: Betsy Sigman</i>	<b><u>York Room</u></b> Alison Gerhard John Bedford Rochelle Evans Ana Dreab  <i>Chair: Eleanor Silverman</i>

**11:00-12:00 W&M Awards for Excellence in Scholarship Presentations - Tidewater A**

W&M Interdisciplinary Award for Excellence in Research -- David Marquis  
W&M Award for Excellence in the Humanities and Social Sciences -- Alexandra Macdonald  
W&M Award for Excellence in the Natural and Computational Sciences -- Sofya Zaytseva

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

*18th Annual Graduate Research Symposium*  
*Detailed Schedule*  
**Friday, March 15, 2019**

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**Friday 8:30 AM**

**TIDEWATER A — Responses of Atoms and Materials**

Andreev Reflection in Graphene–Superconductor Junctions in the Quantum Hall Regime

**Joseph Cuzzo** (William & Mary)

Tunable Dispersion via Four-wave Mixing for Enhance Laser Frequency Response

**Savannah Cuzzo** (William & Mary)

Ultrafast Response of Thin Film Vanadium Dioxide Grown on Titanium Dioxide Doped with Niobium

**Scott Madaras** (William & Mary)

Radiofrequency AC Zeeman Force for Ultracold Atoms

**Andrew Rotunno** (William & Mary)

**TIDEWATER B — Of Fish and Men**

The Effects of Orexinergic Manipulations in a Pharmacological Model of Schizophrenia:  
Identifying Novel Therapeutic Targets

**Eden Maness** (William & Mary)

Effects of an Orexin-2 Receptor Agonist on Attention Following Loss of Cortical Cholinergic  
Inputs

**Sarah Blumenthal** (William & Mary)

Spatial Management of Benthic Resources fisheries in Chile

**Claire Gallagher** (James Madison University)

Age-Related Differences in Inhibition: Investigation of Simon and Flanker Conflicts in ERP

**Rachel Scrivano** (William & Mary)

**CHESAPEAKE C — Digital Culture and Technologies**

The Viral Inquisition of the HIV-Positive Body: Technologies of Confession and Avowal on  
Grindr

**Joseph Lawless** (William & Mary)

Association Between Physician Fees And Quality Of HIV Care

**Zhongzhe Pan** (Virginia Commonwealth University)

Early Information Access to Alleviate Emergency Department Congestion

**Anjee Gorkhali** (Old Dominion University)

**JAMES ROOM — Assisted Automation**

A Study of Data Store-based Home Automation

**Kaushal Kafle** (William & Mary)

ASAP: An Agent-Assisted Smart Auction-Based Parking System in Internet of Things

**Syed Rizvi** (Old Dominion University)

Architectural Support for Efficient Large-Scale Automata Processing

**Hongyuan Liu** (William & Mary)

denotes award winner

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**Friday 8:30 AM**

**YORK ROOM — Acting for Change**

A Prairie Fire in Virginia: Divergent Approaches in the Sit-In Movement of 1960

**Grover Conner** (William & Mary)

The Language of Liberty: Petitioning for Freedom in Revolutionary Massachusetts, 1773-1777

**Grant Stanton** (University of Pennsylvania)

“Patriotism Was No Passive Virtue:” The Woman’s Christian Temperance Union and the Fight for Woman Suffrage, 1898-1920

**Marie Pellissier** (William & Mary)

**Friday 9:45 AM**

**TIDEWATER A — Applied Science to the Extreme**

Persistence and Extinction of Population in Reaction-Diffusion-Advection Model with Weak Allee Effect Growth

**Yan Wang** (William & Mary)

Golden Quantile Rank Sets: Implications and Applications of a “Perfectly” Representative Sample

**Christopher Weld** (William & Mary)

Exfoliation of Graphene at Liquid-Liquid Interfaces and Study of Interfacial Forces

**Avishi Abeywickrama** (William & Mary)

Characterization and Modeling of the Mechanical Anisotropy of Recluse Silk

**Omaththage Dinidu Perera** (William & Mary)

**TIDEWATER B — Beetles, Bats and Spiders, Oh My!**

Herbivores as Conditional Mutualists: Red Milkweed Beetle (*Tetraopes tetraphthalmus*) and Common Milkweed (*Asclepias syriaca*)

**Nichole Gustafson** (William & Mary)

Establishing the first unbiased baseline for aggregation size and genetic health of the endangered Fijian free-tailed bat

**Benjamin Thompson** (Christopher Newport University)

Vibrational Spectroscopy of Nanofibrillar Spider Silk

**Qijue Wang** (William & Mary)

denotes award winner

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**Friday 9:45 AM**

**CHESAPEAKE C — On the Lattice**

Phenomenology of 2HDM-Radion Mixing as Probe of a Compact Extra Dimension

**Marco Merchand** (William & Mary)

Studying  $K_\gamma \rightarrow K^* \rightarrow K\pi$  Transition Form Factors Using Lattice QCD

**Archana Radhakrishnan** (William & Mary)

Magnetic Orders in the Hole-Doped Three-Band Hubbard Model: Spin Spirals, Nematicity, and Ferromagnetic Domain Walls

**Adam Chiciak** (William & Mary)

Phase Diagram of the Two Dimensional Hubbard Model

**Hao Xu** (William & Mary)

**YORK ROOM — A World of Religion**

A Uniform “Hebrew Invasion” Replacing the “Pagan and Popish”? Naming in the Puritan Anglo-Atlantic in the 16th and 17th c.

**Kaila Schwartz** (William & Mary)

The Crisis of French laïcité in Contemporary Pluralistic Republic

**Hamza Radid** (Drew University)

Power in Portraiture: Catherine Spalding and the Sisters of Charity of Nazareth

**Mitchell Oxford** (William & Mary)

**FRIDAY 11:00 AM**

**TIDEWATER A — Stressful Studies**

A Daily Diary Investigation of the Effects of Stress on the Eating Behavior of Adolescents

**Ti Hsu** (William & Mary)

Automatic Approach and Avoidance Tendencies to Healthy and Unhealthy Foods in Food Neophobic Children

**Repairer Etuk** (William & Mary)

Examine Chronic Absenteeism Using Systemic Questioning

**Danielle Gilmore** (George Washington University)

First Generation Study: Stress, Depression, and Academic Success

**Bendu Jackson** (William & Mary)

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**Friday 11:00 AM**

**TIDEWATER B — Rhythmic Studies**

Unraveling the Mechanisms Behind the Eupnea and Sigh Rhythms

**Daniel Borrus** (William & Mary)

Role of Calcium Activity During Early Neural Development

**Sudip Paudel** (William & Mary)

Cell-specific Laser Ablation of Pacemaker Dbx1 Neurons Will Determine Their Role in Respiratory Rhythmogenesis

**Cameron Grover** (William & Mary)

**CHESAPEAKE C — It's Only Nuclear Physics**

Correcting Precision Electroweak Nuclear Physics Experiments for Beam Parameter Fluctuations

**Victoria Owen** (William & Mary)

Numerical SOLPS-ITER Study of the Effect of Fueling on Ionization and Neutral Density Profiles on the Alcator C-Mod Tokamak

**Richard Reksoatmodjo** (William & Mary)

Searching for Exotic Mesons in the Five-Pion Decay Mode at GlueX

**Amy Schertz** (William & Mary)

Two is Better than One: Using Stereoscopic Cameras to Study Tokamak Exhaust

**Ryan Chaban** (William & Mary)

**JAMES ROOM — Situating Archaeological Landscapes**

I waenakonu o ka 'a'ā: Environmental Uncertainty and Community Resilience at Manukā, Hawai'i Island

**Nick Belluzzo** (William & Mary)

Visible Labor, Invisible Landscapes: Transformation of Spaces and Selves in the Early Industrial South

**Erin Schwartz** (William & Mary)

Whose Mountain Is it Anyway?: Landscape Approaches to Archaeology, Identity, and Positionality in Abiquiú, New Mexico

**Chandler Fitzsimons** (William & Mary)

**YORK ROOM — Soldiering On**

Making Their Mark: Ceramics and Soldier Identity in the 19th-century Caribbean

**Alexis Ohman** (William & Mary)

Drone Warfare and Female Warrior: 'Good Kill' and 'Eye in the Sky'

**Hyunyoung Moon** (William & Mary)

Tactics of Battle, Strategies of State: Counterterrorism and the Hurricane Katrina Exception

**Jennifer Ross** (William & Mary)

**12:00 PM** Chesapeake A/B – **LUNCH** – Open to all presenters



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**FRIDAY 1:15**

**TIDEWATER B — Birds of a Feather**

Does a “Sonic Net” Protect Sunflower from Damage by Blackbirds?

**Amanda Werrell** (William & Mary)

Investigating the Interaction Between Anthropogenic Noise and Bold and Shy Personality Types in Eastern Bluebirds

**Heather Kenny** (William & Mary)

Wading Bird Use of Living Shorelines and Natural Fringing Marshes

**Robert Galvin** (William & Mary)

Methylmercury Exposure on Tissue-specific Reduction in Telomere Length in Multiple, Early Ages in the Zebra Finch

**Rachel Davis** (William & Mary)

**JAMES ROOM (1:15-3:00) — Places in Time**

Contrast and Connection in the Hinterlands: Household Archaeology at Post-Contact Hawaiian House Sites, Kaua‘i Island, Hawai‘i

**Summer Moore** (William & Mary)

Fashioning the Criollo: Female Dress and the Creation of Local Identities in Eighteenth-Century Spanish America

**Laura Beltran-Rubio** (William & Mary)

Heterotemporality, Materiality, and “Social Stratigraphy”: Toward a Life History of Bacon’s Castle, Surry County, Virginia

**Rebekah Planto** (William & Mary)

Archaeologists as 'Time Detectives' in the Construction of Indigenous Heritage Tourism Destinations

**Jessica Bittner** (William & Mary)

**YORK ROOM — You’re Only Human**

Haunted by the Human: Science, Storytelling, and the Anthropocene

**Zarah Quinn** (William & Mary)

"I Feel Your Pain": Service-Learning, Anti-Racism, and the Liberal Narrative of Empathy

**Molly Shilo** (William & Mary)

Paul Motian and Performance Capital: Expressive Labor in New York City, 1958-1964

**Brian Jones** (William & Mary)

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**Friday 2:30 PM**

**TIDEWATER A (2:30-4:00 pm) — Smart Minds Also Need Modeling**

SSD Failures in the Field: Symptoms, Causes, and Prediction Models

**Jacob Alter** (William & Mary)

Towards Reconstructing Software Evolution Trends with Statistical Models

**David Nader** (William & Mary)

IoT Botnet Detection via Power Consumption Modeling

**Woosub Jung** (William & Mary)

Shape-Based High-Dimensional Latent Source Model for Trajectory Inference

**Xiaodan Zhu** (William & Mary)

GraphPhi: Efficient Parallel Graph Processing on Emerging Throughput-oriented Architectures

**Zhen Peng** (William & Mary)

**TIDEWATER B — Water Power**

Invasive Species Research in Compensatory Wetland Mitigation

**Dakota Hunter** (William & Mary)

Describing the Regional Population Structure of a Salt Marsh Obligate Butterfly, *Panoquina panoquin*

**Sam Mason** (William & Mary)

Flooding and Electoral Outcomes: Lessons From Buenos Aires, 2015

**Kylie Wheeler** (William & Mary)

**Friday 2:30 PM**

**YORK ROOM — Understanding Interactions**

Measuring Charged Current Muon Neutrino Cross Sections in the MINERvA Experiment

**Amy Filkins** (William & Mary)

Applications of Local Embedding and Effective Downfolding in the Auxiliary-Field Quantum Monte Carlo Method

**Brandon Eskridge** (William & Mary)

Microstructural Engineering of the UV/Near-UV Photocurrent Production in VO<sub>2</sub> Thin Film Based Detectors

**Jason Creeden**

An Infrared Investigation of the Insulator-To-Metal Transition in a Thin, Epitaxially Strained VO<sub>2</sub> Film

**David Lahneman** (William & Mary)

denotes award winner

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**Friday 3:30 PM**

**Chesapeake A/B/C – POSTER PRESENTATION AND NETWORKING RECEPTION**

UV Photodissociation Dynamics of Brown Carbon Chromophores: ortho-Nitrophenol and Nitroresorcinol

**Kenneth Blackshaw** (William & Mary)

Reducing Avian Collisions with Human-Made Structures: an Informed Sensory Ecology Approach to Open-Air Settings

**Timothy Boycott** (William & Mary)

Large-Scale Evaluation of Infants' Looking Patterns to Dynamic Audiovisual Displays

**Madeleine Bruce** (Virginia Tech)

Changes in Study Methods and Problem-solving after Instruction in Sketching as Part of an Introductory Biology Course

**Jessica Burns** (William & Mary)

The Chills As a Unique Sensational Response to Inspiration

**Yi Cui** (William & Mary)

Estimation of the Correlation via the Bootstrap: Non-normal Distributions

**John Mart DelosReyes** (Old Dominion University)

Sensitization of Photochromic Reactions by Conjugated Polymer Nanoparticles

**Lisa Graves** (William & Mary)

How Art Can Dramatically Increase the Life Expectancy of African Americans

**Walter Hardy** (Norfolk State University)

How Paternal Contact Affects School Success in Children with Incarcerated Mothers

**Daryl Hesse** (William & Mary)

Design and Analysis of Efficient Inter-core Communication in GPUs

**Mohamed Ibrahim** (William & Mary)

Burstlet Hypothesis of Inspiratory Rhythm Generation: Are Rhythm- and Pattern- Generation Separate Mechanisms?

**Prajakta Kallurkar** (William & Mary)

Changes in the Security Environment and Its Effects on Emerging Leadership Skills

**Ali Kucukozyigit** (Old Dominion University)

Disparities in Time to Treatment for Breast Cancer Patients in Virginia

**Julie Laudenschlager** (University of Virginia)

Feather Corticosterone as a Bioassay for Stress from Mercury Exposure

**Casey McLaughlin** (William & Mary)

A Longitudinal Examination of the Effects of Parental Emotion Socialization on Adolescent Anxiety

**Molly Miller** (William & Mary)

denotes award winner

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**Friday 3:30 PM**

**Chesapeake A/B/C – POSTER PRESENTATION AND NETWORKING RECEPTION**

Mine Affinities of Townsend's Big-eared Bat (*Corynorhinus townsendii*) in Nevada

**Megan Moran** (Christopher Newport University)

Characterizing the Activity of Amps Against the Pathogenic Bacterium *Clostridium difficile* In Anaerobic Environment

**Adenrel Oludiran** (Old Dominion University)

Use of Thermal Imaging for the Study of Harbor Seal (*Phoca vitulina*) Habitat Associations

**Chenoa Payne** (Christopher Newport University)

Electron Transfer Reactions on Hyperbolic Metamaterials

**Olivia Penrose Hamouch** (Norfolk State University)

Single-cell Characterization of *Clostridium difficile* Motility and Chemotaxis Using Anaerobic Live Cell Microscopy

**Astha Pokhrel** (Old Dominion University)

The Molecular Basis of Antibiotic Resistance in *Clostridium difficile*

**Asia Poudel** (Old Dominion University)

Changes in the Abundance of B-Cell Population in the Spleen of Spawning Sockeye Salmon

**Fatima Quddos** (William & Mary)

Mentoring Characteristics in a Bi-National Sample

**Nyx Robey** (William & Mary)

Disentangling the Effects of Hybridization and Genome Duplication in Mimulus (Monkeyflower) Allopolyploids

**Caroline Schlutius** (William & Mary)

Show Me the Money! Philanthropy, Capitalism, and Public Science Education in Nineteenth-Century America

**Kasey Sease** (William & Mary)

The Biology of Robustness: How does SUMO Affect the Cell's Response to Stress?

**Yasaman Setayeshpour** (William & Mary)

Modeling Mitochondrial Stress Response During Alzheimer's Disease Onset

**Morgan Shelton** (William & Mary)

Photochemical Processing of Filter Collected  $\alpha$ -pinene SOA: Molecular Composition Changes and Absorption Properties

**Emma Walhout** (William & Mary)

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**Saturday, March 16, 2019**

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**Saturday 8:30 AM**

**TIDEWATER A — Telemedicine**

The Association Of Provider Experience And Adherence To Colonoscopy Practice Guidelines  
On Polyp And Adenoma Detection Rates

**Muloongo Simuzingili** (Virginia Commonwealth University)

MobiGesture: Mobility-Aware Hand Gesture

**Hongyang Zhao** (William & Mary)

Globalization and Non-Profit Organizations: Effective Service Delivery Dependency on the Use  
of Information and Technology

**Taiwo Oguntuyo** (Old Dominion University)

**TIDEWATER B — Social Climbing**

The General Theory of Societal Domains: The Exploration and Revelation of a Structural  
Framework for Human Society

**Kenneth Kaizer** (George Mason University)

When Your (Social) World Changes: Exploring the Role of Relational Mobility in Social  
Adjustment

**Lauren Howard** (William & Mary)

High-Skill Emigration: Is Willingness to Leave a Country Linked With its Government  
Performance?

**Annette Cohn-Lois** (Georgetown University)

**CHESAPEAKE C (8:30-10:30) — Dynamic Biology**

The Dietary Transfer of Methylmercury Between Aquatic and Terrestrial Food Webs in the  
South River Floodplain

**Jasmine Parham** (William & Mary)

Dentition of Living and Fossil Diodontidae (Porcupinefishes): Implications for Taxonomy of  
Isolated Jaws in the Fossil Record

**Katherine Bemis** (Virginia Institute of Marine Science)

Inter-Organ Patch Model for Competition Between Defective Interfering Particles and Wild  
Type Poliovirus

**Adrienna Bingham** (William & Mary)

Competitive Strategies and Community Composition in Mixed-Strain *Saccharomyces Cerevisiae*  
Biofilms

**Meredith Andersen** (William & Mary)

Molecular Dynamics Simulations of Ion Transport Through Electrically Stressed Biological  
Membranes

**Federica Castellani** (Old Dominion University)

Regulation of Somatic Cyst Stem Cell Behavior in *Drosophila* Testes by Chinmo Interacting  
Proteins

**Morgan Claybrook** (William & Mary)

denotes award winner

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**Saturday 8:30 AM**

**JAMES ROOM — African Anthropology**

Crisis and Transformation in the “Slave Rivers” at the Dawn of the Atlantic Trade

**Olawenraju Lasisi** (William & Mary)

Histories, Legends and Myths of the Yoruba – Politics and Possibilities in the Study of Nigerian Oral Traditions

**Tomos Evans** (William & Mary)

Mapping Pastoralist Landscapes: Results of Archaeological Research in Djibouti

**Madeline Bassett** (William & Mary)

**YORK ROOM — Social Networking**

Measuring Social Value

**Kelsey Shaffer** (William & Mary)

Predicting Bias Against ASD Individuals in the University Environment

**Joshua Lipson** (William & Mary)

Overlapping Maps: Exploring the Geographical Interplay of Personality Profiles and Political Orientation

**Tianfang Yang** (William & Mary)

Be a Friend to Meet a Friend? The Role of Relational Mobility and Extroversion on Friendship Formation

**Caroline Jordan** (William & Mary)

**Saturday 9:45 AM**

**TIDEWATER A — On the Edge**

Identity-based Encryption in Edge Computing

**Cheng Li** (William & Mary)

Learning Bug-Fixing Patches in the Wild via Neural Machine Translation

**Michele Tufano** (William & Mary)

AMBIENCE: An Adaptive Mobile-Edge Computing for Vehicular Networks

**Susan Zehra** (Old Dominion University)

**TIDEWATER B — Physics Fest**

Quantum Transport in Gapped Bilayer Graphene in the Presence of Long-Range Disorder

**Christopher Hipp** (William & Mary)

Quantitatively Accurate Numerical Modeling of Amplitude and Phase Contrast in Broadband Near-Field Infrared Spectroscopy

**Patrick McArdle** (William & Mary)

Sensitivity Beyond the Shot-Noise Limit Using a Simplified SU (1,1) Interferometer

**Nikunj Kumar Prajapati** (William & Mary)

Potential Roughness Suppression in Microwave Chip Traps

**Shuangli Du** (William & Mary)

denotes award winner



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**Saturday 9:45 AM**

**JAMES ROOM — Bodies of Power**

The Brafferton Club: Playing Indian at William & Mary, 1908-1918

**Christopher Slaby** (William & Mary)

Narratives of Gender, Assimilation, and Embodied Sovereignty

**Jessica Cowing** (William & Mary)

**YORK ROOM — Dyanmic Molecular Structures**

Synthetic Control of Dimensionality in Cd(II) Complexes with Flexible Pentadentate Ligands

**Alison Gerhard** (William & Mary)

Comparative Molecular Dynamics within the  $\beta$ -grasp Fold Reveals Insights into Structure and Stability

**John Bedford** (Old Dominion University)

Intranuclear Dynamics of RTH $\alpha$  Mutant Thyroid Hormone Receptors

**Rochelle Evans** (William & Mary)

QM/MM MD Simulations of the Reactivity of Zinc Finger Proteins

**Ana Dreab** (Old Dominion University)

**Saturday 11:00 AM**

**TIDEWATER A — Awards for Excellence in Scholarship Presentations**

Dynamite: Southern Violence and the Transformation of the Piney Woods

**David Marquis** (William & Mary)

“The Shop on the Corner of Wing’s Lane”: Retail Spaces in Colonial Boston

**Alexandra Macdonald** (William & Mary)

A Study of Oyster Reef Morphology Using Remotely Sensed Data

**Sofya Zaytseva** (William & Mary)

**Saturday 12:00 PM Chesapeake A/B – AWARDS LUNCHEON**

### **Fashioning the Criollo: Female Dress and the Creation of Local Identities in Eighteenth-Century Spanish America**

*Presenter:* Laura Beltran-Rubio  
*Advisor:* Susan Webster  
 William & Mary,  
 American Studies

The eighteenth century saw the spread of orientalism throughout the world. Stylish women around the world were eager to adopt these new trends, adorning their bodies with elaborate ensembles of “exotic” motifs. As the wealth of extant portraits from this period suggests, fashionable styles and silhouettes from Europe were adopted by the Spanish American elites, evidencing the global spread of French orientalist fashions in the eighteenth century. Yet somewhere in the process of transference of orientalist fashions from Europe to Spanish America, these fashions were adapted and personalized by the local elites, often borrowing inspirations from both earlier indigenous textile motifs and foreign motifs imported from Asia. Integrating a visual analysis of the portraits with a review of extant eighteenth-century textiles in Spanish America, this paper studies the adoption and adaptation of “exotic” motifs and fashions in the region. I argue that the mixing-and-matching of these motifs gave a special agency to the criollo in the process of defining their identity as American, without renouncing entirely to their European origins and heritage. The adoption of orientalist fashions was not just a sheepish attempt of emulation. Rather, it was an essential part of a process of identity-formation that took place among the local elites at a time when their own social position was being challenged, questioned, and reformulated.

*Laura Beltran-Rubio is a first-year Ph.D. student in the American Studies Program at William & Mary. She holds an M.A. in Fashion Studies from Parsons School of Design. Her research explores the role of fashion in the creation of national, gender, racial, and class identities, with a particular interest in the Spanish World between the seventeenth and the nineteenth century.*

### **Narratives of Gender, Assimilation, and Embodied Sovereignty**

*Presenter:* Jessica Cowing  
*Advisor:* Kara Thompson  
 William & Mary,  
 American Studies

In *They Called It Prairie Light: The Story of Chilocco Indian School*, K. Tsianina Lomawaima writes that “domesticity training” in U.S. federal Indian boarding schools “was training in dispossession” (86). In other words, boarding schools carried out projects of colonization. This paper argues that gendered labor training in the late nineteenth and early twentieth century relied on settler desires for ability and productivity as well as heteronormative domesticity. Boarding school historians often cite experiences of illness and acts of rebellion as evidence of the difficult quality of life for Native students. However, I suggest that critical disability perspectives reveal the ways in which the settler state has historically oppressed Native peoples through discourses—reform agendas and boarding school curricula—that rely on ableism, a form of oppression that targets disabled people. Disciplinary cases against female students enrolled in Carlisle reveal the degree to which gender and ability are deeply entangled with settler norms of fitness. In other words, the rhetoric of managing female students often conflated morality with intellectual and physical ability, justifying ableist arguments that Native women were unfit for settler citizenship. This paper takes up discourses of assimilation—Carlisle curricula and the Office of Indian Affairs’ directives focused on hygiene and morality—to suggest that narratives of Native resistance in boarding schools critique settler techniques of assimilation.

*Jessica Cowing is a Ph.D. candidate in the American Studies Program at William & Mary. Her dissertation, *Settler States of (Re)Productivity: Narratives of Gender, Assimilation, and Embodied Sovereignty*, examines how Native women and youth are key narrators of Native/Indigenous cultural histories and the long-term effects of historic and ongoing colonization and incarceration.*

### **How Art Can Dramatically Increase the Life Expectancy of African Americans**

*Presenter:* Walter Hardy  
*Advisor:* Solomon Isekeike  
 Norfolk State University,  
 Fine Arts

This research addresses how the visual arts can be used to decrease social injustice against African Americans. Among the variables that determine opportunities and achievement levels for African Americans are mainstream representations and attitudes toward African Americans. For millions of African Americans, the problem is negative stereotyping which contributes to cultural inequity, and the formulation of negative social judgments. This research methodology will collect, and analyze evidence from a variety of primary sources, such as academic journals, historical texts, official records, reports, and archival materials. This paper will reflect on the insights of Anderson and Anderson, (*Emotional Longevity; What Really Determines How Long You Live*, 2003). Anderson et al. opine that inequity and inequality on the part of potential employers, teachers, health care providers, police officers, and the media can influence the mortality of generations of African Americans, just as their self-esteem, identity, and sense of empowerment can affect their emotional well-being. My paper will examine how African American artists helped change persistent social perceptions, by redefining the image of African Americans, and by extension the distorted racial representations of African Americans in popular culture. These findings yield a positive results. It supports the opinion that visual arts can be used as a means for building cultural bridges and changing public opinions, due to its significant power to reshape prevailing ideas and attitudes. The implications of this research indicate that changes in perception towards African Americans, reduce inequality, and leads to increase in life expectancy of African Americans.

*Walter "Walt" Hardy is a first-year graduate student in the Fine Arts Department at Norfolk State University. His research includes contemporary art history with a focus on conceptual issues which examine African American identity, representation and perceptions.*

### **Paul Motian and Performance Capital: Expressive Labor in New York City, 1958-1964**

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

The years between 1958 and 1964 represent a critical juncture in jazz history. During this period, numerous incarnations of jazz practice and its concomitant cultural politics were simultaneously in the process of ossification and transformation. Older jazz musicians and the expressive cultures they epitomized existed simultaneously with the modern styles of younger players and the innovative methodologies they embodied. To put it mildly, 1958 to 1964 was a particularly tumultuous and productive time in the jazz continuum from the perspective of style, economics, and politics. Jazz drummer Paul Motian performed constantly in New York City during these years. This paper will delineate the ways in which Motian transformed his musical experiences as a working musician during this period into what I call "performance capital," a riff on Pierre Bourdieu's dual concepts of cultural and social capital. By analyzing Motian's "gig books," his personal datebooks in which he recorded the jobs he played, the musicians he worked with, and how he was financially compensated, I argue that from 1958 to 1964, the expressive labor that Motian performed in the field of jazz helped accrue the performance capital that would sustain him during the lower ebbs of his career and ultimately lead him to his next, even more prolific and high profile stage of his career: working with pianist Keith Jarrett, saxophonist Charles Lloyd, singer/songwriter Arlo Guthrie, and in due course, leading a band of his own.

*Brian Jones is a fourth-year Ph.D. candidate in the American Studies Program at William & Mary. His doctoral dissertation will focus on the life and work of jazz drummer/composer Paul Motian. As a freelance musician, he has worked with a wide variety of artists, including Jason Mraz, Matthew E. White, Mandy Moore, Jandek, Steven Bernstein, John Abercrombie, Randy Brecker, Liz Phair, and many others.*

### **The Viral Inquisition of the HIV-Positive Body: Technologies of Confession and Avowal on Grindr**

*Presenter:* Joseph F. Lawless  
*Advisor:* Elizabeth Losh  
 William & Mary,  
 American Studies

This discussion contends that the laudatory rhetoric with which Grindr, arguably the world's most popular cellphone dating application for queer men, is characterized often obscures, if not effaces, its role in the reproduction of violence within the expanding boundaries of its digital world. Said more plainly, for some users, Grindr is a site of sexual possibility as much as it is a site of sexual precarity. This precarity manifests in disciplinary discourses that range from expressions of HIV-phobia to pronouncements of racist orders of desire; what these discourses share is their capacity for ontological erasure and dehumanization. The vigilance with which the HIV-positive Grindr user is disciplined offers an instructive example of this imperiling scene. This paper argues that HIV-positive Grindr users are forcibly exposed to these discursive conditions of ontological precarity by the very infrastructure of Grindr itself. To deny an HIV-positive user's sexual personhood is an act of ontological erasure that exceeds the bounds of the sexual; it also represents the endpoint of a disciplinary system that captures the HIV-positive user within a constellation of ontologically punitive effects. The mediatic specificity of Grindr only amplifies such violence through its solicitation of certain forms of inter-user engagement. Ultimately argued is Grindr's role in the fortification of HIV-phobic violence, marking the application as a vector of a broader HIV-phobic social order, with all that implies for the many violent systems Grindr implicates.

*Joseph F. Lawless is a second-year Ph.D. student in the American Studies Program at William & Mary. He completed his B.A. at the University of Pennsylvania in 2012, studying political theory and continental philosophy. In 2017, he obtained his J.D. from Columbia University. His current research examines the relationship between HIV-criminalization jurisprudence and theories of the affective.*

### **Drone Warfare and Female Warrior: 'Good Kill' and 'Eye in the Sky'**

*Presenter:* Hyunyoung Moon  
*Advisor:* Leisa Meyer  
 William & Mary,  
 American Studies

In a highly militarized nation, like the United States, the military is both the primary producer and product of masculinity. The idealized military masculinity sets the standards not only for men in uniform but also for civilian men. Even though a large number of women participated in war in some capacity, Hollywood combat films predominantly depict soldiers as male. Considering that the military did not allow female soldiers to serve in combat roles until December 2015, such depiction is actually grounded in reality. However, with the development of weapons technology, especially the unmanned aerial vehicles, warrior and combat space is being redefined. When it comes to drone strikes, that is rapidly becoming common since the 2003 war in Iraq and Afghanistan, soldier no longer has to face the enemy and fight with muscle. A pilot located in Nevada flies an attacker drone over the enemy on the opposite side of the globe and kills them, and the pilot goes home to their family at the end of the day. The ideal female soldier of the near future is no longer G. I. Jane. The ideal soldier may even be genderless. Under these circumstances, this study will closely examine the female characters in 'Eye in the Sky' and 'Good Kill,' which both depict drone warfare. In both films, women appear as drone operators, decision makers, and the local villagers. By studying the new characteristics of female representation in films about drone warfare, this project will analyze the limitations and potentials of popular understanding of women in combat positions.

*Hyunyoung Moon is a third-year Ph.D. candidate in the American Studies Program at William & Mary. Her dissertation topic is gendered construction of "warrior" in the post-9/11 U.S. Army. She holds a B.A. (English) from Korea Military Academy and an M.A. (American Studies) from George Washington University.*



### **Haunted by the Human: Science, Storytelling, and the Anthropocene**

*Presenter:* Zarah Victoria Quinn  
*Advisor:* Kara Thompson  
 William & Mary,  
 American Studies

We live in an age haunted by mounting waste, global warming, endangered and extinct species, collapsing ecosystems, uninhabitable environments, and the end of our species, among others. Put another way, we are haunted by histories of our own making. "The Anthropocene" is a geological categorization for such hauntings, a time-marked category in which "the human" is now taken seriously as a planetary force affecting the earth and its inhabitants. In my talk, I will embrace the radical capacity of these hauntings. I will explain this embrace by elaborating on Jacques Derrida's notion of "hauntology"—an ethical way of being that embraces hauntedness and advocates being in the company of lives lost and lives yet to be lived. I will yoke this radical hauntology with the human need to tell stories—both in their scientific and fictional forms. By examining human stories that haunt, I aim to explore some ways haunting can help us humans question the most intimate facts our lives.

*Zarah Quinn is a Ph.D. candidate in the American Studies program at William & Mary. Her dissertation explores contemporary speculative storytelling, the Anthropocene, and narratives of science and fiction to respond to crises of the past, present, and future across all existing things.*

### **Tactics of Battle, Strategies of State: Counterterrorism and the Hurricane Katrina Exception**

*Presenter:* Jennifer Nicole Ross  
*Advisor:* Susan Donaldson  
 William & Mary,  
 American Studies

In the wake of Hurricane Katrina, Christian Parenti drew sharp parallels between the devastation of the US Gulf Coast and the wars in Afghanistan and Iraq. "It seems," he wrote, "the rescue effort is turning into an urban war game: An imaginary domestic version of the total victory that eludes America in Baghdad will be imposed here, on New Orleans." Though disregarded by 9/11 and counterterror scholarship, the Hurricane Katrina disaster played a vital role in developing and normalizing the post-September 11 state of exception. This paper theorizes Hurricane Katrina within the context of national security in order to explain how and why rescue and relief operations evolved into a heavily militarized emergency. I contend that the Katrina disaster reveals a crucial juncture at which counterterror discourse and policy overlapped with mass incarceration and American racism to normalize counterterror policy and reassert white supremacy. Specifically, US government, media and para/military actors used rhetoric and tactics unique to the War on Terror to legitimize, first, the extreme use of force against racial minorities and, second, the controversial tactics themselves. In the face of waning support for the wars abroad, key institutions were able to marshal the Katrina disaster in defense of the counterterror state, the racial status quo, and international military campaigns.

*Jennifer Ross is a Ph.D. candidate in the American Studies Program at William & Mary. She received dual bachelor degrees in Honors English and History, as well as her master's in English at the University of Michigan-Flint. Jennifer's dissertation examines the developing counterterror state by counterpoising the September 11 attacks and the aftermath of Hurricane Katrina. Her research includes neoliberalism, disaster literature, and American empire.*

### **"I Feel Your Pain": Service-Learning, Anti-Racism, and the Liberal Narrative of Empathy**

*Presenter:* Molly Shilo  
*Advisor:* Hannah Rosen  
 William & Mary,  
 American Studies

Through a case study of Fordham University's Global Outreach program, I hope to demonstrate how service-learning initiatives deploy empathy as the sole mechanism through which to radically transform oneself and thus set off a ripple of social change. Within these spaces, empathy is positioned as a the premier mode of gathering authentic and real 'knowledge' via direct encounters with racialized others that fundamentally works to reaffirm various transnational and postcolonial affective relations. When empathy is articulated as the most productive anti-racist tool, it promotes a view of racism as an interpersonal hatred or prejudice, reaffirms Western hierarchies of who gives and who receives, and obscures its entanglement with the legacies of colonialism and slavery. I argue that by connecting legacies of slavery and colonialism and historicizing the current talk about empathy, we can better understand why service-learning programs are marketed within the university setting as the best way to gain cultural competency, become a 'global citizen,' and work towards social justice.

*Molly Shilo is a first-year M.A./Ph.D. student in the American Studies Program at William & Mary. Her research areas currently include critical race theory, postcolonial studies, and gender and sexuality studies. She received her B.A. in English and Communication & Media Studies from Fordham University.*

### **The Brafferton Club: Playing Indian at William & Mary, 1908-1918**

*Presenter:* Christopher J. Slaby  
*Advisor:* Alan Braddock  
 William & Mary,  
 American Studies

William & Mary has long had a tradition of student clubs, focusing on recreational sports, particular academic fields, hobbies, and other varied interests. One club that existed from 1908 to 1918, however, stands out. Called the "Brafferton Indians," this group of between nineteen and thirty-six students involved taking on the identities of Indians, or what the historian Philip Deloria has termed playing Indian. These students did not assume the identities of actual local Indigenous individuals, such as Wahun-senacah or Pocahontas. Rather, they used known local Indigenous roles, such as Weroance (or leader), and generic racist identities for Indians, such as "braves." In club photographs from some years, this group of students is dressed in suits. In at least two others, they posed, in their minds, as Indians. Yearbook pages from the club also include a variety of images and texts that highlight what these students saw as the violence of Indians, the very same peoples whose identities they were, at least temporarily, claiming. What's going on here? Why did dozens of William & Mary students over the course of eleven years play Indian? Does this have something to do with William & Mary's history of educating Indigenous students during the eighteenth century at the Brafferton Indian School? Or is this just early twentieth-century racist role play? Is this a story particular to William & Mary? Or is it something that has played out all over the United States? In this brief but rich and complex story from William & Mary's past, the answer to all of these questions is "yes!"

*Christopher J. Slaby is a third-year Ph.D. candidate in the American Studies Program at William & Mary. His work focuses on the intersections of Native American, environmental, and art history. His dissertation is an Indigenous and environmental history of the Mohawk Trail. He received his M.A. in Art History from the University of Wisconsin-Madison and his B.A. in Art History and Asian Studies from Hobart and William Smith Colleges.*

### **Mapping Pastoralist Landscapes: Results of Archaeological Research in Djibouti**

*Presenter:* Madeleine Bassett  
*Advisor:* Neil Norman  
William & Mary,  
Anthropology

Dotted with stone tumuli, animal enclosures, and open-air mosques, Djibouti's Amboule River drainage is the ideal setting for a landscape-scale study of pastoralist settlement dynamics and social transformations during the Islamic Period (A.D. 800-1400). Like many of Djibouti's rivers, the Amboule was a locus of Islamic-Period pastoralist migration and settlement, and its archaeological remains attest to this history. This paper presents an overview of recent (2017-2018) archaeological research along the Amboule, focusing specifically on the spatial analysis of pastoralist camp sites and the dry-laid stone structures and artifact scatters that define them. As part of a long-term research project, these multi-scalar spatial analyses will enhance scholarly efforts to understand urbanism and religious change across East Africa.

*Madeleine Bassett is a fifth-year Ph.D. candidate in the Anthropology Department at William & Mary. She studies Islam in Africa and the archaeology of religious change in Islamic-Period Djibouti (A.D. 800-1300). She holds a B.A. (Anthropology, Geoscience) from Hamilton College and an M.A. (Anthropology) from William & Mary.*

### **I Waenakonu o ka 'A'ā: Environmental Uncertainty and Community Resilience at Manukā, Hawai'i Island**

*Presenter:* Nick Belluzzo  
*Advisor:* Jennifer Kahn  
William & Mary,  
Anthropology

Situated at the liminal transition between the leeward and windward sides of Hawai'i Island, the traditional land division of Manukā is a lavascape-tapestry continually formed and reshaped. It incorporates and juxtaposes unique microenvironments, comprising a landscape that is often mistakenly and uncritically described as "barren and solitary." Yet, these microenvironments supported local social resilience. Through novel innovation and social and settlement strategies, the community built durable communities, deploying agriculturally diverse practices, broad spatial mobility, and locally-oriented sources of authority and identity. These strategies are demonstrated in the archaeological record through material proxies, including nucleated activity areas, the infrastructure of mobility, and unique ritual and astronomical architecture under non-elite control. This paper interrogates the results of a landscape-level survey and geospatial analysis to reveal social and economic decisions deployed in an environmentally uncertain region. The results will be contextualized against normative socioeconomic strategies in Hawai'i characterized by a strong elite presence and restricted commoner mobility. The evaluations of land-use history in an environmentally-vulnerable region will also inform approaches to sustainability in our modern era, which is subjected to increasing climactic and environmental threats. A final assessment of historic-period land-use changes and the concomitant abandonment of Manukā will, by contrast, elucidate the ingenuity of pre-contact Manukā residents.

*Nick Belluzzo is a fourth-year Ph.D. student in the Anthropology Department at William & Mary. He specializes in landscape archaeology and geospatial analysis, focusing his research on the Pacific Islands. His dissertation focuses on a remote community on Hawai'i Island. He holds a B.A. in History from Boise State University and an M.A. in Archaeology from University College London. He has professional experience in historic preservation, cultural resource management, and GIS.*



### **Archaeologists as 'Time Detectives' in the Construction of Indigenous Heritage Tourism Destinations**

*Presenter:* Jessica Bittner

*Advisor:* Danielle Moretti-Langholtz  
William & Mary,  
Anthropology

Drawing from recent theorizing on colonialism and postmodernity, this study explores the politics of temporality within Indigenous heritage tourism in the American South. Heritage provides a foil to the linearity of modernity by collapsing the dichotomy between past and present, thus facilitating an exploration of past temporalities (Lowenthal 2015). In this paper, I consider the discursive production of archaeologists as figurative 'time travelers,' within the Indigenous heritage tourism industry as a means of exploring the social construction of whiteness in the mid-20th-century American South. The ways in which archaeologists and Indigenous peoples interact within tourism promotional literature, local newspapers, and museum exhibits are considered through a case study at Etowah Indian Mounds, a Mississippian-period mound and village center located near present-day Cartersville, Georgia. I suggest that for local white communities, the social construction of emplaced heritage at Etowah Mounds proceeded in part through the temporal ruptures embedded in public conceptions of archaeological practice. In the last section of the paper, I apply a recent theorizing on colonialism within touristic contexts to explore how the spatiotemporal positioning of Indigeneity within these narratives can be interpreted as a form of 'simulated imperialism' in which symbolic reenactments of colonial engagements reinforce imperial formations in settler colonial states (Hom 2013:25).

*Jessica Bittner is a third-year Ph.D. student in the Anthropology Department at William & Mary. Her research interests include tourism and memory at the intersections of race and colonialism in the American South. She holds a B.A. in Historic Preservation from the University of Mary Washington and an M.A. in Anthropology from William & Mary.*

### **Histories, Legends and Myths of the Yoruba: Politics and Possibilities in the Study of Nigerian Oral Traditions**

*Presenter:* Tomos Llywelyn Evans

*Advisor:* Neil Norman  
William & Mary,  
Anthropology

UNESCO considers oral tradition to be a form of intangible heritage utilized by societies to pass on knowledge, cultural and social values, and collective memory. In West Africa where many societies did not historically possess widespread written scripts, oral traditions have often received a great deal of attention from a range of stakeholders—scholars, politicians, colonial administrators, kings, local communities and educated metropolitan elites—due to the perceived insights that they may offer into the African past. Some anthropologists and historians have argued however that oral traditions are not isolated fragments of an objective past but rather are cultural resources that are constantly being borrowed, utilized and engaged with politically in a continually changing field of wider discourses. This presentation will consider these distinct points of view via an exploration of the myriad rich and diverse forms of oral tradition and the various mechanisms of transmitting them that have been present amongst Yoruba societies in south-western Nigeria. Drawing from these considerations, this presentation will particularly focus on critically re-evaluating oral traditions (collected by previous scholars) relating to the enigmatic Sungbo's Eredo earthwork (the largest monument in all of Africa) to identify and explain potential political influences (often interesting objects of anthropological study in themselves) as well as the extent to which the traditions can inform us about the earthwork's 600-year history.

*Tomos Evans is a second-year Ph.D. student in the Anthropology Department at William & Mary. His research focus is on the archaeology of earthworks and state formation in the West African forests and draws from insights deriving from archaeology, social anthropology, history and art history. He holds a B.A. in Archaeology from the University of Cambridge and an M.A. in African Studies with Heritage from University College London.*

### **Whose Mountain Is it Anyway?: Landscape Approaches to Archaeology, Identity, and Positionality in Abiquiú, New Mexico**

*Presenter:* Chandler E. Fitzsimons  
*Advisor:* Audrey Horning  
William & Mary,  
Anthropology

Current community-based, diachronic archaeological research in Abiquiú, New Mexico seeks to undertake specific projects that answer stakeholder questions about the past and bring these narratives about the past into conversations about the present. Balancing the diverse requirements and entailments of this kind of partnership and project necessitates thinking with the way that landscape, identity, and the community-based nature of the project are entangled. It also requires recognition of the fact that findings about the past have lives in the present. In Abiquiú, landscape is a point of both continuity and flux, the site of community livelihoods, identities, aspirations, and anxieties. Furthermore, the positionality of academic archaeologists—in identity, space, and time—has a direct and integral role to play in the way that research is conceptualized, performed, and articulated. Landscape-based archaeological and ethnographic approaches must not only take an emic perspective but also acknowledge the positionality of the archaeologist. Integrating the messiness inherent in these dynamics provides more nuanced and fuller view of not only the archaeological and historical record but the practice of fieldwork itself.

*Chandler Fitzsimons is a second-year M.A./Ph.D. student in Historical Archaeology in the Anthropology Department at William & Mary. She holds a B.A. from the University of California, Berkeley. Her research interests include archaeology of the recent past; archaeology of displacement; place-based identity; community-based archaeology; landscape archaeology; Geographic Information Systems; race and racialization; and intersectionality of race, class and gender.*

### **The General Theory of Societal Domains: The Exploration and Revelation of a Structural Framework for Human Society**



*Presenter:* Kenneth Kaizer  
*Advisor:* Rashmi Sadana  
George Mason University,  
Anthropology

Beyond the arrangement of our DNA it is how we relate and socialize with each other that truly makes us human beings and throughout recorded history our species is defined by our social interactions. Aristotle knew this when he said that “society is something that precedes the individual” and every one of us knows this “in our bones”. We know this because we live within the social facts every day of our lives, we just rarely bother to notice it or name it. The structural framework is not unlike gravity which surrounds us from birth. We rarely notice gravity or call it out by name in our daily lives, yet we naturally accommodate it at every step we take. Many theorists throughout history have been aware of the effects of gravity but it was Newton’s naming it that allowed for communal exploration and experimentation. And this is the precise place we find ourselves now in relation to better understanding how we exist within the societal framework that surrounds us every day. Advancing the work done by Lévi-Strauss, Bourdieu, Foucault, and others, it is time for us to name the structure, experiment with it, and use that understanding to better benefit our species. This research will help set the ground rules, acknowledge the foundational elements, and create a project plan to better guide our hand in building our ontology of the societal domains. It has never been more important than now to level the playing field by exposing the foundational structures of our cultures and create the new models that will help us make more informed decisions.

*Kenneth Kaizer has spent over 25 years building frameworks and behavioral models for various client organizations. His graduate studies in anthropology at George Mason University are enhancing his experience as he turns his focus to discovering the foundational structures of our cultures and creating the new models that will help us make more informed decisions that benefit the full-spectrum of our societies.*

### **Crisis and Transformation in the “Slave Rivers” at the Dawn of the Atlantic Trade**

*Presenter:* Olanrewaju Blessing Lasisi

*Advisor:* Neil Norman

William & Mary,  
Anthropology

Why were captives for sale in the Bight of Benin in the late 1470s? In this presentation, I explore changes in the Ijebu and Benin polities before the opening of the Atlantic trade and their consequences in shaping the new trade in slaves in the late fifteenth and early sixteenth century. The departure point in this discussion is the recent dating of the ca. 180-km-long enclosure known as Sungbo's Eredo in southwestern Nigeria. Based on emerging archaeological data, there seems to be a scenario of change in the political economy of African polities in the Bight of Benin during the mid-fourteenth century. A demographic crisis might have triggered competition among regional polities for the control of people. The necessity to defend the local population and raids into neighboring areas led to radical change in the polities' organization and transformation of the landscape. Kingship was adopted in Ijebu, while a new dynasty took over power in Benin. The new political economy became dominated by the accumulation and consumption of dependents through raids and wars. Upon the Portuguese arrival in the Bight of Benin in 1472, they had found ready surpluses of captives that could be exchanged for exotic prestige goods brought from Europe, especially copper and brass. This situation contrasted markedly with the demand for captives the Portuguese had met on the Coast of Mina. They were able to take advantage of their understanding of these complementary markets to purchase people in the Bight of Benin for resale for gold on the Coast of Mina.

*Olanrewaju Blessing Lasisi is a third-year Ph.D. student in the Anthropology Department at William & Mary. He is a Nigerian with a keen interest on West African Archaeology. His ongoing dissertation focuses on the dynamics of power and landscape in Ijebu (Southwestern Nigeria) before and after the Atlantic era. His first publication co-authored with David A. Aremu, “New Lights on the Archaeology of Sungbo's Eredo” was published in 2016 in Dig It: The Journal of the Flinders Archaeological Society.*

### **Contrast and Connection in the Hinterlands: Household Archaeology at Post-Contact Hawaiian House Sites, Kaua'i Island, Hawai'i**

*Presenter:* Summer Moore

*Advisor:* Jennifer Kahn

William & Mary,  
Anthropology

Researchers have increasingly reframed hinterlands as dynamic zones of innovation and creative adaptation. While archaeologists studying indigenous sites in colonial settings have often discussed this topic, little attention has been paid to the remote areas of colonial-era Polynesia, including Hawai'i. While the Nā Pali Coast of Kaua'i Island, Hawai'i, was nominally incorporated into the Kaua'i kingdom, in the period after European contact shifts in settlement patterns and modes of transportation rendered this region increasingly isolated. My research investigates how trajectories of household-level social and material transformation in this remote area differed from those more central areas of Hawai'i. Preliminary results suggest that residents of the Nā Pali Coast maintained many familiar domestic practices throughout the nineteenth century, perhaps intentionally choosing to situate themselves on the margins of Hawai'i's emerging market economy. These practices included pursuits such as small-scale farming and fishing and household-level craft production. Despite the persistence of such established routines, however, artifacts from residential contexts suggest that residents of the Nā Pali Coast maintained deep connections to Hawai'i as a whole.

*Summer Moore is a sixth-year Ph.D. candidate in the Anthropology Department at William & Mary. Her research interests include the archaeology of Polynesia, household archaeology, and historical anthropology. She holds an M.A. in Anthropology from the University of Denver. She is a 2018-2019 Provost Dissertation Fellow and Chair of the 18th Annual Graduate Research Symposium. This research was supported by a National Science Dissertation Improvement Grant (Award 1730233).*



## **Making Their Mark: Ceramics and Soldier Identity in the 19th-Century Caribbean**

*Presenter:* Alexis Ohman  
*Advisor:* Jennifer Kahn  
 William & Mary,  
 Anthropology

Shirley Heights (1793-1854) was a military fort located on the former British colony of Antigua. Early Caribbean forts were built to defend British colonies from external threats. Yet by the 19th century, they increasingly protected the interests of the white plantocracy from uprisings by the enslaved Africans. During this period, the soldiers at Shirley Heights would have seen little action vis-a-vis formal battles or war. Their daily lives would largely have been characterized by arduous patrols and drills, interspersed with periods of leisure to eat, drink, smoke, and play games. Such leisure periods—when soldiers were free to interact in a relaxed setting—were important venues for fostering social cohesion, and for reaffirming individual identity within the unit. Some results of these processes of interaction are visible in the material culture they left behind. Archaeological research at Shirley Heights is beginning to shed light on the daily lives and identities of soldiers. Excavations conducted in 2018 uncovered three distinct types of material culture that speak to the individual identities of 19th century soldiers at Shirley Heights. Etched ceramics, notched clay pipes, and an engraved utensil handle suggest that soldiers—who could not afford the expensive patterns and teawares used by officers—modified the plainness of mass-produced items to signal both ownership and identity within the homogenized military unit.

*Alexis Ohman is a fifth-year Ph.D. candidate in the Anthropology Department at William & Mary. Her dissertation research focuses on the zooarchaeology of plantations and forts in Antigua, West Indies. She holds a B.A. (honors) in Anthropology from the University of Victoria and an M.A. in Archaeology from Simon Fraser University.*

## **Materiality of a Heterotemporal Site: Toward a Critical Archaeology of Bacon's Castle**

*Presenter:* Rebekah Leslie Planto  
*Advisor:* Audrey Horning  
 William & Mary,  
 Anthropology

Lying just across the river and a few miles inland from historic Jamestown, Bacon's Castle in Surry County is one of Virginia's most well-known, yet least-studied and understood historic buildings. Touted as "the oldest brick dwelling in North America" and "an example of High Jacobean architecture" by Preservation Virginia (2018) and identified on Google Maps as "Virginia's oldest house," its character in popular consciousness is that of a static architectural artifact. But even the most imaginative visitor to the site in the present encounters neither a Jacobean manor, nor an antebellum plantation, nor a replica of any other single period. This is not a criticism of preservation and interpretation efforts—though the issues discussed in this paper do have implications for historic preservation and heritage professionals, as well as historians and archaeologists. Rather, it is a recognition of what Dan Hicks and Audrey Horning refer to as the "distributed nature" of the site (2006:290)—the way in which it seems to exist in, or represent multiple periods of use and life at once—and its complex temporality, evident through both the extant architecture and the archaeological record. With an eye toward future research, I propose a reflexive approach which engages with the site in the present through an interrogation of its heterotemporality (after Shannon Dawdy 2016) that will demonstrate the potential for a critical historical archaeology of seemingly static historic buildings to illuminate the mutually constitutive character of dwelling spaces and the lived experiences of human actors.

*Rebekah Planto is a first-year Ph.D. student in the Anthropology Department at William & Mary, concentrating in Historical Archaeology. Her research interests include the early modern Atlantic world, materiality, colonialism, memory, identity, landscape, museology, pragmatism and practice. She holds an M.A. in Social Science (Anthropology) from the University of Chicago and a B.A. from NYU's Gallatin School of Individualized Study.*

### **Visible Labor, Invisible Landscapes: Transformation of Spaces and Selves in the Early Industrial South**

*Presenter:* Erin Schwartz

*Advisor:* Michelle Lelièvre

William & Mary,  
Anthropology

Often overshadowed by its agriculture-based counterpart, industrial slavery altered the physical, economic, and social landscapes of the antebellum South on multiple scales. Mills, mines, factories, and other industrial operations exploited natural resources and human labor across the region; at the same time, enslaved individuals and communities attempted to leverage skills, resources, and connections to reshape surrounding landscapes in small, yet significant, ways. This paper explores enslaved individuals' transformation of spaces and selves in industrial contexts, using the Buffalo Forge iron plantation in Glasgow, VA, as its case study. While Buffalo Forge's ironmasters oversaw its large workforce across discrete, yet interconnected spaces, spaces around enslaved quarters in particular could be used to participate in diverse individual and communal activities invisible to ironmasters. Recent geospatial analyses of extant domestic structures and yard spaces at Buffalo Forge, generated via drone-acquired aerial imagery, has identified several previously-unidentified features and areas of (in)visibility. Analyzed together with new archival, architectural, and archaeological data, this research illuminates enslaved individuals' abilities to gradually shape their surroundings to improve their circumstances in marked ways.

*Erin Schwartz is a fourth-year Ph.D. student in the Anthropology Department at William & Mary. Her dissertation research explores enslaved women's shifting roles, relationships, and identities in the antebellum industrial South. She holds a B.A. from Washington & Lee University and an M.A. from William & Mary.*

### **Exfoliation of Graphene at Liquid-Liquid Interfaces and Study of Interfacial Forces**

*Presenter:* Walakulage Dona Avishi  
Abeywickrama  
*Advisor:* Hannes Schniepp  
William & Mary,  
Applied Science

Mass production of graphene in a cost-effective way is still a challenge. We have found an inexpensive and scalable method called 'Interface trapping method' to produce graphene using only natural flake graphite and two immiscible solvents. According to this method, graphene shows a strong affinity to specific interfaces. Our research aims to understand the interaction between graphene and liquid-liquid interface, so that we can develop the interface trapping method to yield single layer graphene. Since we have found that graphene is exfoliated at the heptane-water interface, we first study the interaction between graphene and heptane-water interface. Force spectroscopy, a mode of atomic force microscope (AFM) is a powerful tool to study these interactions. To employ this technique to measure the force between graphene and heptane-water interface, we manufacture graphene functionalized AFM probes and immobilize heptane droplets in water using a special substrate. Force spectroscopy results clearly show an attractive force of graphene towards the heptane-water interface, so we will further investigate these interactions to understand graphene exfoliation at the interface. Parallel to experimental measurements, we theoretically model the force between graphene and interface. Since the interface deformability makes the model complex, we follow a special process. This model will enable us to determine force between graphene and any liquid-liquid interface. With the knowledge of interfacial forces, we will develop the interface trapping method to yield graphene in mass scale.

*Avishi Abeywickrama is a second-year Ph.D. student in the Applied Science Department at William & Mary. Her research areas include nanotechnology and material science. She is currently working on understanding the interfacial properties of graphene, which is a 2D material with amazing properties.*

### **Inter-Organ Patch Model for Competition Between Defective Interfering Particles and Wild Type Poliovirus**

*Presenter:* Adrienna N. Bingham  
*Co-Authors:* E. Rousseau, R. Andino,  
S. Bianco  
*Advisor:* Leah Shaw  
William & Mary,  
Applied Science

Poliovirus, still endemic in three countries, has a small chance of entering the central nervous system and leaving the host permanently paralyzed. Poliovirus is also a model virus, meaning results can be easily compared to other viruses. Defective interfering particles (DIPs) are a mutation of a wild type (WT) virus that lack essential elements needed for viral reproduction. In order to successfully reproduce, they steal these elements from the WT, limiting WT production. DIPs have been engineered to steal the protective shell of the WT poliovirus in order to eliminate poliovirus from the host. We have created a two-organ model to simulate the competition between DIPs and WT poliovirus allowing free virus particles to travel from one organ to another (such as traveling from the intestine to the central nervous system). By changing parameter values, initial virus particle counts, and virus particle movement rate we can simulate different scenarios of DIP and WT competition. We observe that with parameter values found in literature and from experiments, DIPs will lower the WT population but do not completely eradicate the virus from the host.

*Adrienna Bingham is a fifth-year Ph.D. candidate in the Applied Science Department at William & Mary working under the direction of Dr. Leah Shaw. Her work focuses on using mathematical modeling to implement different forms of disease control measures.*

### Unraveling the Mechanisms Behind the Eupnea and Sigh Rhythms

*Presenter:* Daniel Scott Borrus  
*Advisor:* Christopher Del Negro  
 William & Mary,  
 Applied Science

Breathing is an important behavior for all terrestrial mammals. It consists of two centrally generated rhythms: eupnea and sighs. Eupnea drives the ventilation of the lungs, which enables the alveolar gas exchange that underlies respiration. Sighs keep the lungs from collapsing, and also play a role in emotion. Both the eupnea and sigh rhythms originate in the same region of the brain. Despite the significant role of these behaviors, it is still unclear how the same group of neurons generates these two distinct rhythms. We use electrophysiology to understand the role synaptic inhibition plays in maintaining these rhythms, and how synaptic inhibition may couple the two rhythms.

*Daniel Borrus is a second-year Ph.D. candidate in the Applied Science Department at William & Mary. He works in the Del Negro lab, where he studies in the neural control of breathing rhythms in mammals. In particular, Daniel combines computational modeling with electrophysiology techniques to uncover the cellular and network mechanisms responsible for generating the normal breathing rhythm and the sigh rhythm.*

### Two is Better than One: Using Stereoscopic Cameras to Study Tokamak Exhaust

*Presenter:* Ryan Chaban  
*Co-Authors:* T. Farley, N. Walkden,  
 F. Militello  
*Advisor:* Saskia Mordijck  
 William & Mary,  
 Applied Science

The tokamak is the most studied method to magnetically confine a plasma for nuclear fusion used to provide clean energy for the increasing demands of a growing world population and economy. A significant challenge that incorporates a great deal of physics and engineering across many disciplines is using a divertor to control tokamak exhaust at temperatures 1 million times hotter than the sun and heat loads ~5000 times what the space shuttle experienced on re-entry. These heat loads manifest as filaments caused by turbulence events crossing the boundary from the confined to the unconfined region. Fast cameras (10,000+ frames per second) capture the filament's light which we then analyze in 2D using the Elzar tomographic inversion technique. This algorithm compares filament geometries to the magnetic field and has been employed with one camera for several years, however, theory and empirical evidence suggests that these filaments are not perfectly aligned with the magnetic field and their 3D structure is important. This work represents the first use of stereoscopic cameras to understand the errors of the Elzar algorithm and lays the foundation for techniques to create a true 3D reconstruction of the filaments and better understand their effects on the plasma exhaust for current and future magnetic fusion devices.

*Ryan Chaban is a second-year Ph.D. candidate in the Applied Science Department at William & Mary. His research areas include Magnetic Confinement Nuclear Fusion and the History of Fusion Energy. He has done research on the DIII-D tokamak in San Diego and is an active collaborator on the MAST tokamak in the U.K. where he is researching the 3D structures of the plasma exhaust.*



### **Cell-Specific Laser Ablation of Pacemaker Dbx1 Neurons Will Determine Their Role in Respiratory Rhythmogenesis**

*Presenter:* Cameron Joseph Grover  
*Advisor:* Christopher Del Negro  
 William & Mary,  
 Applied Science

In order to understand the cellular mechanism that generates the inspiratory rhythm, the neurons that are essential for rhythmogenesis must be characterized. The specific location within the medulla that generates the rhythm, the preBötzinger complex, has been identified, and its constituent neurons have been the focus of research for decades. A subset of these neurons, dubbed “pacemakers,” possess autorhythmic properties and are viewed as the drivers of the respiratory rhythm. This project aims to unambiguously test this pacemaker hypothesis and show pacemaker neurons are no more or less important than the other neurons in the preBötzinger complex. The project will utilize mice that express a genetically encoded calcium indicator and a two-photon laser-scanning microscope system to image and selectively ablate individual neurons. By identifying and ablating pacemaker neurons versus non-pacemaker neurons while continuously monitoring the motor output, we will be able to determine the importance of pacemaker neurons in rhythmogenesis.

*Cameron Grover is a second-year Ph.D. candidate in the Applied Science Department at William & Mary. His diverse background and interests in engineering and biology have led him to the Del Negro laboratory where his research entails functional imaging of systems of neurons and interrogation of system function via cell-specific laser ablation. He holds a B.S. (Biomedical Engineering) and M.S. (Applied Physics) from Virginia Commonwealth University.*

### **Burstlet Hypothesis of Inspiratory Rhythm Generation: Are Rhythm- and Pattern- Generation Separate Mechanisms?**

*Presenter:* Prajkta Kallurkar  
*Co-Author:* M. Picardo  
*Advisor:* Christopher Del Negro  
 William & Mary,  
 Applied Science



Breathing is a vital rhythmic behavior essential to life. The core oscillator for inspiratory rhythm generation is the preBötzinger complex (preBötC), a cluster of excitatory interneurons in the brainstem, that generates the neural rhythm and basic motor pattern for inspiration in mammals. The preBötC neural bursts are critical for the inspiratory motor output pattern, but their role in rhythmogenesis is unclear. Here we test ‘burstlet’ theory, which hypothesizes that the neural mechanisms of inspiratory rhythm generation, a result of an underlying burstlet rhythm and preinspiratory activity, are distinct from neural mechanisms that influence the motor output pattern for inspiratory breathing movements, an outcome of a suprathreshold process that transforms the burstlets into bursts. The preBötC can be isolated in reduced slice preparations in vitro and its output remains rhythmically active, generating breathing-related motor output which is measurable via the hypoglossal nerve (XII) activity. Under standard conditions in vitro, the field recordings in the preBötC neural activity consist of bursts and concurrent XII motor output, intermingled with lower amplitude preBötC burstlets, that do not produce XII motor output. We found that burst and burstlet rhythms were voltage-dependent, graded changes in external K<sup>+</sup> concentration potentially regulated the frequency of bursts and burstlets. These data show that the inspiratory rhythmogenesis is a voltage-dependent network behavior, which is independent of full amplitude neural bursts.

*Prajakta Kallurkar is a third-year Ph.D. candidate in the Applied Science Department at William & Mary. Her research focuses on studying the neural mechanisms for inspiratory rhythm generation, as well as the neural mechanisms that influence the motor output pattern for inspiratory breathing movements.*

### Orexinergic Manipulations and Schizophrenia: Exploring Novel Pharmacotherapeutic Targets

**Presenter:** Eden Blake-Lea Maness  
**Co-Author:** S. Blumenthal  
**Advisor:** Joshua Burk  
 William & Mary,  
 Applied Science

Schizophrenia (SZ) is a psychiatric condition encompassing two distinct symptomatologies: positive symptoms, such as hallucinations and delusions, and negative symptoms, including motivational and cognitive deficits. While current antipsychotics are efficacious in alleviating sensory and thought disturbances, they are highly sedative in nature and, as such, worsen motivational and cognitive impairments. Because the severity of negative symptoms more accurately predicts functional and clinical outcomes than does the pervasiveness of positive symptoms, there is a substantial need for alternative pharmacotherapies which boost attention, learning, and memory function for individuals with SZ. The lateral hypothalamic orexinergic system and its endogenous neuropeptides and receptors modulate several transmitter systems involved in attentional processing and performance through the facilitation of stimulatory frontocortical neurotransmission. Because extant research on the influence of orexinergic ligands in the context of SZ is scarce, the proposed research aims to elucidate the therapeutic potential of orexin-mimetic compounds in the treatment of sustained attentional processing impairments in clinical populations. The composite findings from these experiments may inform future clinical research exploring novel psychiatric medications to treat the profound cognitive deficits of this illness.

*Eden Maness is a second-year neuroscience Ph.D. student in the Applied Science Department at William & Mary. Her area of research is behavioral and clinical neuropharmacology, broadly focusing on the neurobiology underlying sustained attentional processing and performance. Her doctoral dissertation involves exploring alternative brain networks and identifying novel pharmacotherapeutic targets to address cognitive impairment in schizophrenia.*

### Role of Calcium Activity During Early Neural Development

**Presenter:** Sudip Paudel  
**Co-Authors:** M. Rahman, P. Kemper  
**Advisor:** Margaret Saha  
 William & Mary,  
 Applied Science



Calcium signaling is characterized by occurrence of calcium influxes at different frequencies, amplitudes, and locations, which then alters enzymatic activity, activity of ion pumps, permeability of ion channels, and gene expression. Therefore, calcium regulates a wide range of developmental processes, including cell proliferation, coordinated tissue movement and neurogenesis. Studies have shown that embryos exhibit two major types of calcium activity, waves and spikes, throughout embryonic development. However, whether there is a conserved pattern of calcium activity among embryos at a given stage of a given species during early development, and whether this pattern correlates with gene expression is poorly understood. In order to answer this question, a comprehensive method is needed, which allows users to analyze calcium activity at a single cell level preserving its spatial information. Such a method is still lacking. Towards this end, we imaged calcium activity of multiple neural plates of *Xenopus laevis* to develop a composite neural plate at a cellular resolution and represent each cell with its calcium activity features such as spiking rate, entropy, trace and dynamic time warping. In addition, we demonstrate the applicability of our method by correlating this calcium activity with the expression patterns of representative genes. The method is more generally applicable to any data type that entails making a composite image from many tissue samples and correlating the individual cells with cellular-molecular attributes such as gene expression.

*Sudip Paudel is fourth-year Ph.D. candidate in the Applied Science Department at William & Mary. His broad interest is to understand how does the nervous system develop during embryonic development. This system is the most complicated organ system and it enables us to think, imagine, and solve the problems. Currently, he has been working on the role of calcium activity during early neural development.*

### **Characterization and Modeling of the Mechanical Anisotropy of Recluse Silk**

*Presenter:* Omaththage Dinidu Prabhath Perera

*Advisor:* Hannes Schniepp  
William & Mary,  
Applied Science

Spider silk is a biopolymer with a remarkable combination of strength and extensibility. Its tensile strength is comparable to high strength steel and it can absorb 5x more energy than Kevlar before it breaks. Hence it has many potential applications in various fields. Since spiders do not produce enough silk, production of synthetic spider silks has drawn a serious attention in current scientific community. Complete and accurate knowledge on the structure and properties of natural spider silk is essential to produce comparable synthetic silks. One such important aspect is the knowledge on silk's anisotropic mechanical properties such as transverse stiffness and transverse breaking strength (mechanical properties perpendicular to fiber axis). The complex structure and micro-scale diameter of cylindrical silks make it extremely difficult to characterize these properties. However, the silk of recluse spiders has a much simpler structure and flat ribbon-like morphology. Also, its mechanical properties are comparable to best cylindrical spider silks. We use a specially tailored experimental setup by suspending a recluse silk ribbon over a 1 um diameter hole and use an atomic force microscope to indent the suspended region at different positions to find the required forces. Then, we combine the experiments with computer simulations (finite element analysis) to characterize the anisotropic mechanical properties of recluse silk. Since recluse silk is completely made of axially oriented nanofibrils, tensile mechanical properties are expected to be higher than transverse properties.

*Dinidu Perera is a second-year Ph.D. candidate in the Applied Science Department at William & Mary. His research areas include spider silk and metamaterials. He is currently working on characterizing the structure and properties of recluse silk by combining specially tailored experiments with computer simulations.*

### **Numerical SOLPS-ITER Study of the Effect of Fueling on Ionization and Neutral Density Profiles on the Alcator C-Mod Tokamak**

*Presenter:* Richard Reksoatmodjo  
*Co-Authors:* J. Hughes, J. Lore, X. Bonnin  
*Advisor:* Saskia Mordijck  
William & Mary,  
Applied Science

Magnetically confined plasmas for nuclear fusion energy represent an important area of research; of particular interest are the complex interactions of the boundary edge region. The effect of plasma edge opacity to neutrals on density pedestal structure was evaluated in experiments on the Alcator C-Mod tokamak, in high-confinement regimes approaching future reactor-relevant edge opacities. Gas puff injections of varying magnitude were applied to two high-confinement discharges, in which one discharge had a high opacity to neutrals, while the other had a lower opacity. In order to assess the role of gas fueling versus particle transport at the plasma edge, we use the SOLPS-ITER fluid plasma/kinetic neutral code to first calculate the radial and poloidal neutral density profiles for both high and low opacity discharges. We produce steady-state simulations that match the experimental radial electron density and temperature profiles by adjusting the radial transport coefficients in our model. The effect of varying the relative ratio of the diffusion and pinch contributions upon the neutral and electron density profiles are evaluated. By comparing the simulations and experimental observations of two discharges at different opacity we address the relative role of transport versus fueling in determining the local electron density in the Scrape-Off Layer and pedestal region of the plasma.

*Richard Reksoatmodjo is a second-year Ph.D. student in the Applied Science Department at William & Mary. He is pursuing a Ph.D. in Plasma Physics and Fusion Sciences. His active area of research concerns the computational modeling of fusion plasmas, focused specifically on the transport and turbulence phenomena that occur in the boundary edge region of such plasmas. This work was supported by the U.S. Department of Energy awards DE-SC0014264, DE-SC0007880, DE-FC02-99ER54512.*

### **Vibrational Spectroscopy of Nanofibrillar Spider Silk**

*Presenter:* Qijue Wang

*Co-Authors:* P. McArdle, S. Wang, Z. Xing

*Advisor:* Hannes Schniepp

William & Mary,

Applied Science

The origin of spider silk's superior mechanical properties has been intensively studied for several decades. It is widely accepted that such appealing properties originate from the hierarchical structure of silk threads. Although the protein sequence and macroscopic morphology of the silk fiber are well known, our understanding regarding structural organization for length scales in between is still limited. Nanofibrils have been suggested as an important building block in this intermediate length scale. However, no consensus model regarding their concentration in spider silk fibers or even their dimensions has emerged, which has hindered a systematic analysis of these materials. We study the silk ribbons (major ampullate (MA) silk) of the recluse (*Loxosceles*) spider, which entirely consist of 20-nm thin nanofibrils. This much simpler silk system thus provides an excellent opportunity to study its structure-property relations. Having performed polarized Fourier transform infrared (FTIR) and polarized Raman spectroscopy on single fibers of this silk, we know that the spectra stem solely from nanofibrils. This has allowed us to quantitatively determine the relative orientation and volumetric percentage of  $\beta$ -sheets vs. other types of protein secondary structures directly. Hence, our approach provides a path toward a significantly improved understanding of the structure of this protein-based material and useful insights towards replicating its merits in synthetic fibers.

*Qijue Wang is a fifth-year Ph.D. candidate in the Department of Applied Science at William & Mary. He works in the Nanomaterial and Imaging Lab led by Prof. Hannes Schniepp. His research project focuses on the mechanical properties, internal structure as well as their relationships in silk materials.*

### **Persistence and Extinction of Population in Reaction-Diffusion-Advection Model with Weak Allee Effect Growth**

*Presenter:* Yan Wang

*Advisor:* Junping Shi

William & Mary,

Applied Science

The dynamical behavior of a reaction-diffusion-advection model of a stream population with weak Allee effect type growth is studied. Under the open environment, it is shown that the persistence or extinction of population depends on the diffusion coefficient, advection rate and type of boundary condition, and the existence of multiple positive steady states is proved for intermediate advection rate using bifurcation theory. On the other hand, for closed environment, the stream population always persists for all diffusion coefficients and advection rates.

*Yan Wang is a fifth-year Ph.D. candidate in the Applied Science Department at William & Mary. She is interested in population persistence and extinction in river systems.*



### **Golden Quantile Rank Sets: Implications and Applications of a “Perfectly” Representative Sample**

*Presenter:* Christopher Weld  
*Advisor:* Lawrence Leemis  
William & Mary,  
Applied Science

Golden quantile rank sets offer insights and applications to historically well-studied statistical problems—including maximum likelihood estimation, confidence region coverage, and optimal sample spacing—by way of a unique alternative perspective. A quantile rank set is defined as the cumulative distribution function values associated with a random sample. Golden quantile rank sets can be regarded as “perfectly” representative of their distribution because their associated sample values always result in a maximum likelihood estimator matching its true population parameter(s). Golden quantile rank sets are not ubiquitous; they are unique to particular continuous parametric population distributions. This manuscript introduces and defines golden quantile rank sets, their existence criteria, and identifies important implications when they exist. Specifically, applications include: an alternative (and at times computationally superior) method for maximum likelihood estimation, exact actual coverage calculations for small sample confidence regions (at times where currently only estimates exist), and connections to optimal quantile spacing. Distributions with golden quantile rank sets include the normal, exponential, Weibull, log logistic, and one-parameter exponential power distributions.

*Christopher Weld is a third-year Ph.D. candidate in the Applied Science Department at William & Mary. His dissertation focus is computational probability, with particular attention on confidence regions for univariate probability models. He holds a Bachelor of Science degree in Mechanical Engineering from Cornell University, and a master’s degree in Computational Operations Research from William & Mary.*



### **A Study of Oyster Reef Morphology Using Remotely Sensed Data**

*Presenter:* Sofya Zaytseva  
*Co-Authors:* R. Lipcius, D. Gong  
*Advisor:* Leah Shaw  
William & Mary,  
Applied Science

Despite being a resilient species, the Eastern oyster population has plummeted over the last century due to largely unregulated harvesting, effects of pollution and prevalence of disease. Because the Eastern oyster population serves a variety of ecological and economic functions, restoration has become of critical importance. While factors such as water temperature, salinity, bottom hardness, and food availability are important for successful oyster restoration, water flow and geophysical processes remain key aspects of successful reef development and have not been investigated in detail. Three oyster reef configurations are thought to dominate the landscape—string reefs (perpendicular to flow), fringing reefs (parallel to flow) and patch reefs (no particular orientation). Currently, the mechanism of this pattern formation and the role that the reefs’ orientations to flow play in their persistence are not well understood. We use a Geographic Information System (GIS) approach to investigate the spatial self-organization of historic oyster reefs in conjunction with hydrodynamics and topography by analyzing remotely sensed data of oyster reefs. The ultimate goal is to have a better understanding of reef morphology and inform oyster restoration efforts in determining suitable locations and configurations of artificial oyster reefs to maximize their success.

*Sofya Zaytseva is a fifth-year Ph.D. candidate in the Applied Science Department at William & Mary. Her dissertation investigates pattern formation in marine systems using mathematical modeling and analysis of remotely sensed data.*

## Competitive Strategies and Community Composition in Mixed-Strain *Saccharomyces cerevisiae* Biofilms

*Presenter:* Meredith Andersen  
*Advisor:* Helen Murphy  
 William & Mary,  
 Biology

Biofilms, cooperative communities of microbes with complex architecture and social interactions, are some of the oldest forms of life on earth. They are found in nearly all environments, including associated with clinical infections, posing serious problems in healthcare settings. Designing intervention strategies based on microbial ecology theory to disrupt biofilms could circumvent their natural antibiotic resistance and make treatment easier. Little research has been conducted in this area using communities with multiple strains and/or species, which is a common clinical presentation of biofilm-based infections. Some *Saccharomyces cerevisiae* strains naturally form biofilms, and some produce killer toxin to increase their competitive strength. This research investigates the question: how do biofilm formation and toxin production interact in multi-strain communities with varying levels of toxin resistance? Using natural *S. cerevisiae* strains engineered to have the desired characteristics, I will compete toxin-producing strains against strains with and without biofilm and toxin-resistance. I will then conduct 3-strain competitions to determine how the presence of multiple strains with varying characteristics changes these interactions, and whether certain strategies have a strong competitive advantage. This information will help formulate competition-based strategies to destabilize biofilms.

*Meredith Andersen is a second-year M.S. candidate in the Biology Department at William & Mary. Their research interests include microbial evolution and community ecology. Their thesis focuses on competitive dynamics in fungal biofilms.*

## Dentition of Living and Fossil Diodontidae (Porcupinefishes): Implications for Taxonomy of Isolated Jaws in the Fossil Record

*Presenter:* Kate Bemis  
*Co-Author:* J. Tyler  
*Advisor:* Eric Hilton  
 Virginia Institute of Marine Science,  
 Fisheries Science

Porcupinefishes (Tetraodontiformes: Tetraodontidae: Diodontidae) are familiar Cenozoic fossils commonly encountered by amateur and professional fossil hunters. Whole skeletons are rare and almost all fossil diodontids are known only from jaws and their unique hypermineralized triturating (=grinding/crushing) plates that are used to feed on hard-shelled prey. There are seven genera of diodontids known only as fossils that are currently considered valid; other fossils have been referred to the extant genera *Diodon* and *Chilomycterus*. Many fossil taxa that are represented only by triturating plates are referred to as Diodontidae *incertae sedis* because few diagnostic generic characters for the jaws and teeth are known. Within fossil diodontids, genus-level distinctions are informed by differences in the number of triturating plates, but this character is strongly correlated with body size. We used CT-scans to collect data on jaws and triturating plates from all extant genera and four fossil genera to evaluate individual and ontogenetic variation in the number of triturating plates across a wide range of sizes. We describe species-level characters (while considering ontogenetic and individual variation) and provide recommendations for the use and limitations of dental characters in diodontid taxonomy.

*Kate Bemis is a Ph.D. candidate in Fisheries Science at the Virginia Institute of Marine Science. She studies tooth replacement in fishes.*

### **Reducing Avian Collisions with Human-Made Structures: An Informed Sensory Ecology Approach to Open-Air Settings**

*Presenter:* Timothy James Boycott  
*Advisor:* John Swaddle  
William & Mary,  
Biology

Bird collisions with human-made structures are a significant threat to bird populations and pose challenges for some areas of human industry. Efforts to reduce collisions have centered on making structures more visible to birds but have been met with limited success. Solutions addressing the environmental context of hazards and the behavioral ecology of at-risk birds are needed. Birds have largely evolved without tall human-made structures, such as communication towers, in their flight path. Consequently, avian perception and behavior may not be suitably primed to detect these evolutionarily novel hazards. Work in captive settings has shown that conspicuous acoustic signals may aid in drawing attention of flying birds to collision hazards. This study aims to corroborate these findings in the field. By projecting acoustic signals into air space surrounding communication towers, we aim to quantify the movement patterns of flying birds and use differential movement patterns between treatment and control trials as indicators of collision avoidance behavior. We will also identify which intrinsic elements of acoustic signals elicit higher degrees of collision-avoidance behavior in flying birds. Tests using captive zebra finches in a flight corridor will quantify collision-avoidance among treatments employing different types of acoustic signals. Findings from these studies will inform acoustic signal designs and prompt further analysis of their use in mitigating avian collisions in natural settings.

*Tim Boycott is a first-year M.S. candidate in the Biology Department at William & Mary. He has a broad interest in studying animal behavioral ecology in a contemporary context, as a way of addressing some of the pressing conservation concerns of today.*

### **Changes in Study Methods and Problem-Solving after Instruction in Sketching as Part of an Introductory Biology Course**

*Presenter:* Jessica R. Burns  
*Advisor:* Paul Heideman  
William & Mary,  
Biology

Model usage is important to STEM fields, as it allows the storage of large and complex sets of information and application for problem solving. Drawing a mechanism to interconvert between internal and external information, including integrating new information into mental models, organizing known information, and expressing information externally. This is important because drawing can help the drawer to learn information (study), solve problems (use model-based reasoning), and communicate information with their peers. Unfortunately, many students fail to adopt such skills due to the effort and instruction required to learn it. Van Meter and Garner (2005) proposed overcoming this obstacle to using guided practice. This requires a demonstration of the skill by an expert, time for student practice, followed by instructor feedback on the student's practice. This study applies guided practice of drawing to a real-life undergraduate Introductory Biology course at the College of William and Mary. Using a combination of web-based surveys and semi-structured, "think aloud" interviews (Hmelo Silver 2004; Dauer and Long 2015; Dye and Stanton 2017), this study aims to (1) determine how much students continue to use sketching as a study tool in other courses through their college years, (2) to assess the extent of sketching usage for their model-based reasoning, and (3) to relate the use of sketches during studying to understanding and correct answers on exams.

*Jessica Burns is a first-year M.S. candidate in the Biology Department at William & Mary. Her research focuses on the use of drawing in undergraduate biology as a tool for studying and problem-solving. She holds a B.S. in Biology from East Stroudsburg University in Pennsylvania with a concentration in organismal biology and a minor in chemistry.*



## Regulation of Somatic Cyst Stem Cell Behavior in *Drosophila* Testes by Chinmo Interacting Proteins

*Presenter:* Morgan Claybrook

*Co-Authors:* L. Rinehart, O. Kerscher

*Advisor:* Matthew Wawersik

William & Mary,

Biology

Gonadal stem cells are essential for creation of gametes and homeostasis of reproductive tissue. For these stem cells to retain functionality, they must actively self-renew and maintain their sexual identity. In some cases, male gonadal stem cells can adopt a female sexual identity, leading to loss of reproductive capacity and morphological changes that cause the testis to resemble an ovary. Recent data has shown that somatic sex must be actively maintained in adult male flies (Ma, Wawersik, & Matunis, 2014). The transcription factor *chronologically inappropriate morphogenesis (chinmo)* prevents feminization of somatic cyst stem cells (CySCs). When Chinmo functionality is reduced, aggregates of ovarian-like follicle cells appear, causing overproliferation of under-differentiated germ cells. This study strives to understand mechanisms of Chinmo's action in CySCs and how these may be modulated by interacting proteins, identified using the yeast two-hybrid system (Rinehart, Kerscher, Wawersik, 2017). To investigate interactor function, tissue-specific gene knock down was performing using the Gal4-UAS system. Aspects of CySC behavior including self-renewal, differentiation, and sex maintenance were assessed via immunostaining and fluorescence microscopy. Our findings suggest that the Chinmo interactor, CG11180, may play a role in maintenance of CySC identity, impacting self-renewal and differentiation. Investigation continues on whether CG11180 plays a role in CySC sex maintenance. As Chinmo has a mammalian ortholog, ZFP509, that is also expressed in ovaries and testes, gaining better understanding of the impact of Chinmo's function in regulating stem cell behavior and sex maintenance may provide valuable insight into human health issues like gonadal cancers and infertility.

*Morgan Claybrook is a second-year M.S. candidate in the Biology Department at William & Mary. Her research focuses on regulation of somatic cyst stem cell behavior in the adult Drosophila testis. She holds a B.S. in Biology and a minor in Chemistry from Roanoke College.*

## Methylmercury Exposure on Tissue-specific Reduction in Telomere Length in Multiple, Early Ages in the Zebra Finch

*Presenter:* Rachel Davis

*Advisor:* John Swaddle

William & Mary,

Biology

Methylmercury (MeHg) is a highly toxic global pollutant that affects human, wildlife, and ecosystem health. Specific organs, such as the liver or kidney, both which play important roles in the excretory system, may be overwhelmed by the cellular damage brought upon by chronic MeHg exposure. Telomeres, the protective endcaps of linear DNA, are a phenotypic trait influenced by genetics but sensitive to environmental conditions. Telomere length is a recently popularized indicator of biological aging in the field of molecular biology and may allow us to quantitatively measure the adverse effects on specific tissues due to chemical exposure. MeHg is capable of inducing systemic oxidative stress, which is an imbalance of antioxidants and reactive oxidative species in the body. Oxidative stress in general has been connected to biomolecular damage, including accelerated telomere loss of chromosomal DNA. Using the zebra finch model, the impacts of dietary MeHg exposure on tissue-specific telomere length during early development are measured using qPCR. We assessed telomere length in blood, liver, and brain at four ages: hatchling, fledgling, independence from parents, and finally, sexual maturity. We measured the rate of change in telomere length across these age groups, allowing for a comprehensive look at telomere dynamics in early life when exposed to an environmental toxicant. Correlations in degradation of various organs will allow us to understand the consequences of methylmercury at an organismal level, potentially shaping pollutant management strategies and conservation.

*Rachel Davis is second-year year M.S. candidate in the Biology Department at William & Mary. She is broadly interested in global change, conservation, and toxicology. In late summer of 2019 she hopes to defend her thesis on telomere degradation in response to dietary methylmercury exposure within the zebra finch model. Originally from the North, Rachel obtained her Bachelor of Science (Ecology) from the University of Minnesota in 2016.*

## **Intranuclear Dynamics of RTH $\alpha$ Mutant Thyroid Hormone Receptors**

*Presenter:* Rochelle Marie Evans  
*Advisor:* Elizabeth Allison  
William & Mary,  
Biology

Resistance to Thyroid Hormone  $\alpha$  (RTH $\alpha$ ), a reduced sensitivity to thyroid hormone (T3) in peripheral tissues, is caused by mutations in thyroid hormone receptor  $\alpha$  (TR $\alpha$ ), a nuclear receptor that regulates gene expression when bound to T3. These mutations often result in receptors incapable of binding T3 and, thus far, have been found in the ligand binding domain (LBD) of TR $\alpha$ , some of which result in truncated proteins lacking all or part of helix 12. Some studies have shown that Nuclear Receptor Corepressor 1 (NCoR1), which interacts with the hinge region of TR $\alpha$  (the region between the DNA-binding domain and LBD) has a higher affinity for RTH $\alpha$  mutants compared to wild-type TR $\alpha$ , supporting the hypothesis that helix 12 of the LBD also functions to disassociate NCoR1 from TR $\alpha$  when it is bound to T3. Our main research question is how do the mutations in TR $\alpha$  and the altered affinity for NCoR1 impact the mobility of the receptor? We hypothesize that an increased affinity for NCoR1 will alter the mobility of TR $\alpha$  in the nucleus, impacting its function. We are using Fluorescence Recovery after Photobleaching (FRAP) to examine the effects of select RTH $\alpha$  mutations, Ala382ProfsX7 and F397fs406X, on nuclear localization and intranuclear mobility. After transfecting HeLa cells with expression plasmids for green fluorescent protein (GFP)-tagged wild-type TR $\alpha$  and each of the mutants, we first assessed their intracellular distribution and initial intranuclear mobility. We predict that there will be significant reductions in intranuclear mobility of RTH TR $\alpha$  mutants compared to wild-type TR $\alpha$ .

*Rochelle Evans is a second-year M.S. candidate in the Biology Department at William & Mary. Her research interest includes thyroid hormone receptor and how mutations in this protein alters its function. She is currently investigating receptors characterized in Resistance to Thyroid Hormone Syndrome. She holds a B.S. (Biology) from William & Mary.*

## **Wading Bird Use of Living Shorelines and Natural Fringing Marshes**

*Presenter:* Robert Michael Galvin  
*Co-Author:* S. Mason  
*Advisor:* Randolph Chambers  
William & Mary,  
Biology

Climate change is one of the biggest factors affecting global biodiversity. In the Chesapeake Bay, climate change and associated sea level rise threaten shorelines used by birds and other species. Rising waters exacerbate coastal erosion, prompting coastline managers to implement strategies to address this destructive process. The current paradigm for managers is to armor shorelines; armoring does protect the shore behind the protective structure, but eliminates the natural shoreline in the process. Living shorelines are a recently developed management tool designed to both protect against coastal erosion and mimic the ecosystem functionality of a natural fringing marsh. The degree to which these living shorelines actually copy natural marshes with respect to use by mobile fauna has been examined to some extent for fish and crustaceans, but not for birds. Using customized video camera modules placed in both fringing marshes and living shorelines in the lower Chesapeake Bay, I am comparing the numbers and activities of wading birds at different times and tides during and after the nesting season. This research fills a critical gap in our knowledge regarding avian use of these narrow fringing marshes, and will help guide management decisions in the future.

*Bob Galvin is a second-year M.S. candidate in the Biology Department at William & Mary. His research interests include ecology, climate change, ornithology, and anthropogenic effects on natural systems. His thesis investigates the differences in wading bird use between natural fringing marshes and living shoreline ecosystems. He holds a B.S. in Marine Biology with a minor in Philosophy from the University of Delaware. In his spare time, Bob enjoys bird watching, rock climbing, picking up trash, and roping people into conversations about the problems facing people, ecosystems, and the world at large.*

### **Herbivores as Conditional Mutualists: Red Milkweed Beetle (*Tetraopes tetrophthalmus*) and Common Milkweed (*Asclepias syriaca*)**

*Presenter:* Nichole W. Gustafson  
*Advisor:* Harmony Dalglish  
William & Mary,  
Biology

Mutualisms are often thought about in terms of the benefits they convey, but they also come at a cost. Relationships that shift from one extreme to the other are conditional mutualisms. While this concept has been applied to pollination biology it has not been applied to herbivores. The red milkweed beetle (*Tetraopes tetrophthalmus*) is an overlooked specialist herbivore that feeds on the roots of common milkweed (*Asclepias syriaca*) as a larva and has the potential to be either costly or beneficial to asexual reproduction. My research will investigate if the red milkweed beetle can function as conditional mutualist by altering asexual reproduction. To better understand this potential I am asking, 1) Does feeding by red milkweed beetles alter bud or ramet production? 2) What is the effect on above ground biomass? 3) And does feeding alter time to resprout? If the beetles are a conditional mutualist there should be an increase in asexual reproduction with low densities and a decrease at high densities. We introduced beetles in varying densities to the roots of greenhouse plants. We then looked at the effect of pre-existing buds and beetle densities on bud and ramet production, days to resprout and above ground biomass. We found that bud and ramet production were best explained by pre-existing buds, but biomass and time to resprout were negatively affected by beetle density. Indicating that beetles have mostly negative impacts on asexual reproduction, it appears that the consumptive interactions with red milkweed beetles are costly for common milkweed.

*Nichole Gustafson is a second-year M.S. candidate in the Biology Department at William & Mary. Her research interests include reproductive ecology as well as insect plant interactions. She holds a B.A. in Biology from the College of Wooster in Ohio.*

### **Invasive Species Research in Compensatory Wetland Mitigation**

*Presenter:* Dakota M. Hunter  
*Advisor:* Doug DeBerry  
William & Mary,  
Biology

Invasive plant species can alter natural communities and degrade ecosystem functions, yet the factors influencing species' invasions are poorly understood. On compensatory wetland mitigation sites, techniques such as chemical spraying and uprooting are often implemented to combat invasive species and comply with Section 404 of the Clean Water Act. However, current management techniques are costly and often fail to control the targeted species. Understanding how environmental factors impact plant invasion on compensatory wetland mitigation sites would allow wetland managers to alter restored wetland environments prior to invasion and minimize invasive plant colonization. Our study asks which key environmental factors are correlated with invasive plant dominance on compensatory wetland mitigation sites. By answering our research question, we will determine how environmental variables relate to within-population density of three invasive plant species. We will also examine the relationship between these invasive plants and native plant composition and provide invasive species management guidelines for compensatory wetland policy. To accomplish these goals, we employed a novel stratified-random approach to collect soil samples, canopy cover photographs, and vegetation data from within invasive plant populations on 23 compensatory wetland mitigation banks in the Coastal Plain and Piedmont of Virginia. Using these data, we will model our measured parameters and determine which factors best explain plant invasion on compensatory wetland mitigation banks in the State of Virginia.

*Dakota Hunter is a second-year M.S. candidate in the Biology Department at William & Mary. His research focuses on invasive plant ecology in created and restored wetland ecosystems, and has a close tie not only to biology but also to environmental policy. He received B.S. degrees in Biology and Environmental Science from William & Mary (Class of 2017).*

### **Investigating the Interaction Between Anthropogenic Noise and Bold and Shy Personality Types in Eastern Bluebirds**

*Presenter:* Heather Violet Kenny  
*Advisor:* Dan Cristol  
William & Mary,  
Biology

Noise pollution from human activities such as vehicle traffic is becoming increasingly common and is known to impact wildlife species living near sources of noise. Animals such as songbirds that rely heavily on vocal communication can be disturbed by noise because it masks vocal signals between individuals and makes it harder to hear approaching predators. Some songbird species are able to coexist with human disturbance, but it is likely that certain individuals in the population are better suited to noisy environments than others. Individuals vary in their expression of behavioral traits, and the behaviors of an individual are sometimes grouped into defined "personality types." For example, an individual that is both aggressive and quick to explore is bold type, while an individual that is non-aggressive and slow to explore is shy type. While recent studies suggest that urban birds tend to be bolder and more aggressive than rural birds, it is not clear how variation in personality type influences an individual's response to specific urban stressors such as human caused noise. The goal of this study is to investigate whether wild, bold type Eastern Bluebirds (*Sialia sialis*) are more tolerant to experimentally applied traffic noise than shy type bluebirds. The study will also track whether shy type birds are more likely to move away from noisy areas. This is important to investigate because if populations in noisy areas become dominated by bold type birds, it could lead to emergent effects on population level processes.

*Heather Kenny is a first-year M.S. student in the Biology Department at William & Mary. Her research centers on animal behavior and wildlife ecology, specifically animal personality in songbirds. Her thesis project will investigate the interaction between human caused noise and personality type in Eastern Bluebirds. She holds a B.S. in Wildlife Biology from the University of California-Davis.*

### **Describing the Regional Population Structure of a Salt Marsh Obligate Butterfly, *Panoquina panoquin***

*Presenter:* Sam Mason  
*Advisor:* Mattias Leu  
William & Mary,  
Biology

Sea-level rise, driven locally by land subsidence and the climatic processes associated with anthropogenic global climate change, poses a severe risk to coastal ecosystems through the conversion and loss of tidal salt marsh habitat. The Salt-marsh Skipper (*Panoquina panoquin*), an obligate resident of these declining coastal wetlands, requires Salt Grass (*Distichlis spicata*), a high-marsh graminoid, to complete the pre-metamorphic stages of its life-cycle. As salt marshes are inundated and fragmented by rising ocean levels, the Salt-marsh Skipper faces serious risk of regional population decline. To assess the wetland butterfly's current distribution along the Virginia Peninsula, and further, to relate this distribution to its local and regional ecology, we conducted butterfly surveys within 24 salt marshes along the coasts of the greater Hampton Roads area throughout July, August, and September of 2018. Using an occupancy modeling framework, which scales the probability of a marsh being occupied by the probability of detecting a butterfly, we will estimate how resource availability, competitor abundance, and landscape connectivity inform the species' spatial structure. Initial results show that salt marshes along the peninsula have a 0.565 probability of being occupied by the Salt-marsh Skipper. Continuing analysis will offer valuable insights into the landscape and community contexts conducive to the population stability of this species.

*Sam Mason is a second-year M.S. candidate in the Biology Department at William & Mary. As a population and community ecologist, Sam is broadly interested in the local and regional ecological processes that work over time and space to structure species distributions and biotic assemblages. His current work focuses on the conservation of tidal marsh butterflies in the face of accelerated sea-level rise throughout the Chesapeake Bay.*

### Feather Corticosterone as a Bioassay for Stress from Mercury Exposure

*Presenter:* Casey Lee McLaughlin

*Advisor:* Dan Cristol

William & Mary,  
Biology

In birds, the stress response is mediated by the hormone corticosterone (CORT). During acute stress, blood CORT levels transiently spike, facilitating the "fight or flight" response. Chronic stress, however, often results in chronically elevated CORT, which can negatively impact survival and reproduction. I will examine the effect of a potential chronic stressor - environmental mercury (Hg) - on CORT in songbirds. The impact of this persistent, global, and bioavailable pollutant on CORT is unclear, despite several studies. One potential reason could be the use of CORT measured in blood, which provides only a snapshot of CORT levels. Blood CORT and Hg also give no information on the recent history of exposure at a contaminated site. I will examine the relationship between Hg and CORT in feathers, using a feather CORT extraction and assay. This technique assesses CORT deposited in the feather over its weeks of growth, capturing fluctuations in CORT over this period. I will use feathers from contaminated and control sites to study the relationship between feather CORT and feather Hg in an uncontrolled polluted environment. I will also examine this in a controlled captive setting, using zebra finches fed a known concentration of Hg. If Hg is acting as a chronic stressor, I hypothesize that Hg-exposed birds will show higher feather CORT in the field and aviary. With this study, I hope to shed light on Hg's role as an endocrine disruptor, improve our mechanistic understanding of feather CORT, and validate its use as a bioassay of chronic stress.

*Casey Lee McLaughlin is a first-year M.S. student in the Biology Department at William & Mary. She is interested in avian stress physiology and the impacts of urbanization on the behavior and physiology of birds. She will be studying how mercury impacts the stress response in songbirds, by measuring the stress hormone corticosterone deposited in feathers. Casey holds a B.S. in Chemistry and Psychology from Yale University (Class of 2015).*

### Mine Affinities of Townsend's Big-Eared Bat (*Corynorhinus townsendii*) in Nevada

*Presenter:* Megan Louise Moran

*Advisor:* Richard Sherwin

Christopher Newport University,  
Environmental Science

Our goal was to use information collected during internal mine surveys to assess use by Townsend's big-eared bat (*Corynorhinus townsendii*), characterized by the presence of bats, guano, and/or culled insect parts. These data were then used to investigate potential relationships between external characteristics, including portal area and shape, total depth, elevation, and number of openings with bat use. Of these, none were found to have significant associations with bat use except for depth. Deeper mines exhibited a higher likelihood for use. We also analyzed potential relationships between use of mines and proximity to three land cover types and proximity to water sources. We found significant differences in mine use for sites that fell within the boundaries of each land use type, with the highest percentage of occupied mines in the open woodland grazed land category. We also found a significant difference in the percentage of mine use as proximity to water decreased from five to two kilometers. However, at larger scale levels (5, 10, and 15 km from water), there was no significant difference in use. Our findings suggest that, on smaller scales, land use cover type and proximity to water may be significant factors in roost choice. However, in order to better understand the importance of this relationship future research is needed on a broader landscape level.

*Megan Moran is a second-year M.S. student in the Environmental Science Program at Christopher Newport University. Her research interests include evolutionary biology and ecology and her thesis topic is on population genetics of Townsend's big-eared bat (*Corynorhinus townsendii*) in the Southwestern United States.*

### **The Dietary Transfer of Methylmercury Between Aquatic and Terrestrial Food Webs in the South River Floodplain**

*Presenter:* Jasmine Alexandria Parham  
*Advisor:* Dan Cristol  
William & Mary,  
Biology

Mercury contamination in aquatic environments, and subsequent methylmercury accumulation in aquatic organisms, has been of great concern for decades. Recent studies have begun to focus on the lateral movement of methylmercury from aquatic food webs into terrestrial ones. This includes the significant finding that forest bird species living near the contaminated South River have elevated mercury levels despite having no direct trophic connection to that river. Further research in the system found that spiders deliver 70% of mercury to breeding birds in the floodplain. The bulk of those spiders are wolf spiders (Lycosidae). The role spiders play in transferring energy and contaminants between aquatic and terrestrial systems is now well documented. However, this transfer usually involves obligate riparian web-building spiders consuming emergent aquatic insects caught in their webs. Wolf spiders are highly mobile, terrestrial, non-web building spiders. As generalist predators, they are known to consume any prey they can subdue. Determining whether these spiders mainly feed on aquatic or terrestrial prey will help determine the proximate source of methylmercury in the terrestrial food web. I used stable isotope analysis to model what proportion of wolf spider diet is made up by terrestrial or aquatic prey. I also measured mercury content in wolf spiders and potential prey groups. Using these data, I addressed the larger question of whether methylmercury enters the terrestrial floodplain food web via annual emergence of aquatic insects or historically contaminated floodplain soil.

*Jasmine Alexandria Parham is a second-year M.S. candidate in the Biology Department at William & Mary. Her research interests include trophic interactions, ecosystem processes, community dynamics, and research with strong relevance to conservation and fundamental ecological questions. She holds a Bachelor of Science in Biology from Stetson University.*

### **Use of Thermal Imaging for the Study of Harbor Seal (*Phoca vitulina*) Habitat Associations**

*Presenter:* Chenoa Payne  
*Co-Authors:* E. Kidder, M. Meyer, J. Steven  
*Advisor:* Richard Sherwin  
Christopher Newport University,  
Organismal and Environmental Biology

For pinniped species, hauling-out is an important activity for energy conservation and regulation of body temperatures. Harbor seals (*Phoca vitulina*) utilize many substrate types when hauling-out; in Alaska, the most common substrates include rock and calved glacial ice. Choice of haul-out type and location may affect activity budgets and energy expenditure due to environmental pressures within the habitats. With projected climate change and potential habitat loss, understanding the complex nature of harbor seal haul-out selection has many implications for management and conservation. This study seeks to quantify habitat association of glacial and terrestrial harbor seals in Kenai Fjords National Park by comparing the microclimate and influence of temperature on site usage and behavior using infrared thermal technology. Thermal imaging allows for precise modeling of substrate temperatures and may provide insight into potential type, timing, and behavioral variability of habitat usage. Boat-based surveys were employed bi-weekly during June-August 2017 and 2018 to collect images of haul-out locations using a thermal imaging camera. The thermal qualities of the surrounding habitat, weather conditions, and behavior will be compared to observe variation between haul-out substrates and potential basis for habitat association. The goal of this study is to further elucidate patterns of physiological ecology in harbor seal haul-out usage by observing influence of thermal properties within habitat, thus, better informing conservation and management practices for this species.

*Chenoa Payne is a second-year M.S. student in the Organismal and Environmental Biology Department at Christopher Newport University. Her research areas include environmental science, applied ecology, and conservation biology with a focus on marine ecosystems. Her thesis topic investigates the use of thermal imaging technology for the study of harbor seal habitat associations.*

### Changes in the Abundance of B-Cell Population in the Spleen of Spawning Sockeye Salmon

*Presenter:* Fatima Quddos  
*Advisor:* Patty Zwollo  
 William & Mary,  
 Biology

Pacific salmon, including *Oncorhynchus nerka* (sockeye salmon), migrate long distances to spawn. This rigorous journey is a part of their lifecycle during which the adults migrate from sea to their natal stream undergoing major endocrine, physiological and immune changes. Cortisol, the primary stress hormone, is regulated by the hypothalamus-pituitary-Interrenal (HPI) axis and produced by chromaffin cells in the anterior kidney. Prolonged high levels of cortisol in higher animals are linked to chronic stress which has deleterious health effects, including suppression of immune system. Earlier studies have shown that cortisol inhibits the proliferation and activation of B cells. While cortisol is working in the fish to suppress the immune system, the pathogens encountered in the freshwater may or may not stimulate it to overcome the infection. A recent study from our lab showed an increase in abundance of B cells in anterior kidney of sockeye salmon during the spawning run which is suggestive of activation of the immune system during this journey. This study proposes to look at a) effects of cortisol on B-cell lines and tissue culture from Rainbow trout in-vitro and compare the results with tissue samples collected from sockeye salmon in-vivo, b) the abundance of B-cells in the spleen of sockeye salmon using flow cytometry and c) the pathogen load using qPCR. This study will help us in understanding effects of cortisol on the sockeye salmon immune system and may improve fish management policies in the pacific northwest.

*Fatima Quddos is a first-year M.S. student in the Biology Department at William & Mary. She has a broad interest in immunology, especially in the affects of stress on the immune system. She is currently exploring how prolonged levels of stress hormone, cortisol, affect the different types of immune cell populations using fish as a model organism.*

### Disentangling the Effects of Hybridization and Genome Duplication in *Mimulus* (Monkeyflower) Allopolyploids

*Presenter:* Caroline Victoria Schlutius  
*Advisor:* Joshua Puzey  
 William & Mary,  
 Biology

Polyploidy, the condition of having more than two complete sets of chromosomes, is widespread throughout the tree of life and is particularly well-studied in the plant kingdom. A conservatively estimated 70% of angiosperms are descended from a polyploid ancestor. Polyploidy is especially widespread in agriculture. For allopolyploids—the product of a hybridization event coupled with a whole genome duplication—polyploidization results in a massive genomic shock. The nucleus must now moderate the doubled number of genes and must also regulate cellular processes with two parental subgenomes from different evolutionary trajectories, leading to large genomic and phenotypic changes. However, it is not understood how much of these changes is due to hybridization versus genome duplication. In this study, we seek to disentangle the unique genomic and phenotypic effects of hybridization and genome duplication in two *Mimulus* species and their hybrid crosses. To do this, the following data will be collected for parental species, hybrids, colchicine induced autopolyploids of parental species, and allopolyploids: (1) RNA-sequencing will be used to compare the gene-expression consequences; (2) Small-RNA sequencing will be used to understand the regulatory differences between parental species and hybrid offspring; and (3) morphometric data, namely plant size metrics and reproductive measures, will be used to determine the unique phenotypic consequences of each of these processes. Disentangling these effects will provide insight into this important evolutionary phenomenon.

*Caroline Schlutius is a first-year M.S. student in the Biology Department at William & Mary. Her research interests include evolutionary biology, genomics, and plant biology. Her thesis studies the evolutionary consequences of polyploidy on the plant genome and the unique effects caused by hybridization and genome duplication in polyploids. She holds a B.S. in Ecology and Evolutionary Biology from Yale University.*





## **The Biology of Robustness: How Does SUMO Affect the Cell's Response to Stress?**

*Presenter:* Yasaman Setayeshpour  
*Co-Author:* N. Nguyen  
*Advisor:* Oliver Kerscher  
 William & Mary,  
 Biology

SUMO, a small protein that is conserved in yeast, plants and humans, becomes attached to specific cellular proteins to modulate their function and activity. Previous research has established the importance of SUMO modification in cell cycle progression, DNA damage-related processes, and transcriptional regulation. Additionally, a SUMO-dependent stress response (SSR) exists, but this process remains ill-defined. The SSR involves a rapid increase in SUMO-modified proteins when cells are exposed to proteotoxic and genotoxic stressors. Whether the increase in SUMO conjugates plays a protective role for cells, and which components of the SUMOylation pathway are involved is unknown. Previous work from the lab with the thermotolerant yeast *Kluyveromyces marxianus* (Km) provided novel evidence that enzymes of the Km SUMOylation pathway modulate the ability of this yeast to respond to various stressors. Therefore, we now have cloned nine Km SUMOylation pathway components to study their contribution to stress tolerance in vivo and in vitro. Understanding the potential mechanism that enables *K. marxianus*' resilience will help in utilizing its qualities in research and in industrial applications. Additionally, this work can provide novel insights into how organisms cope with adverse conditions, such as globally rising temperatures.

*Yasaman Setayeshpour is a first-year M.S. student in the Biology Department at William & Mary. She has a broad interest in the study of functional consequences due to genetic variants. She is currently investigating the involvement of certain proteins in stress tolerance in yeast.*

## **Establishing the first unbiased baseline for aggregation size and genetic health of the endangered Fijian free-tailed bat**

*Presenter:* Benjamin Louis Thompson  
*Advisor:* Richard Sherwin  
 Christopher Newport University,  
 Organismal and Environmental Biology

Prerequisite to effective conservation efforts, an unbiased baseline of data must be established for any target species. For rare populations, a reliable baseline may be even more important. The Fijian free-tailed bat (*Chaerephon bregullae*) is considered endangered, found only in Fiji and Vanuatu. The species' only known roost, Nakanacagi Cave on Vanua Levu, Fiji, is regarded widely to house a critical maternity colony of 5,000 individuals, assumed to be 95% of the global population. However, there has been no attempt to develop an unbiased, repeatable estimate of aggregation size or assess the genetic health of the Fiji population. By combining thermography with repeated, independent analysis of the bats' nightly exodus, we establish the first error-inclusive survey of Nakanacagi Cave. The genetic health of *C. bregullae* will be evaluated with respect to gene flow between the Nakanacagi aggregation and potentially future aggregations across the islands of Vanua Levu and Taveuni. These data will be instrumental in the development of effective cave bat research and conservation in Fiji and the broader South Pacific.

*Benjamin Thompson is a second-year M.S. candidate in the Organismal and Environmental Biology Department at Christopher Newport University. His research area is focused on the population ecology of rare species and island biogeography. His thesis is aimed at establishing the first error-inclusive baseline for the size and genetic health of the Fijian free-tailed bat (*Chaerephon bregullae*).*

## **Does a “Sonic Net” Protect Sunflower from Damage by Blackbirds?**

*Presenter:* Amanda Werrell

*Co-Author:* P. Klug

*Advisor:* John Swaddle

William & Mary,  
Biology

Red-winged blackbirds cause millions of dollars of damage to North Dakota's sunflower crops each year. My research explores the use of sound that is designed to mask communication among birds (termed a “sonic net”) to deter red-winged blackbirds from two key habitat types: fields of growing sunflowers where they damage the crop and nearby roosting sites in cattail marshes. The sonic net works by masking communication of a target species producing “pink noise” overlapping the frequencies in which a species communicates. If birds can't listen out for predators or conspecific warning calls they are predicted to leave the area. Working with local sunflower producers in North Dakota, we set up experimental sites in five sunflower fields and two cattail marsh roost sites that were being actively used by large flocks of blackbirds. Preliminary results suggest different responses in the different habitat types. It appears that the Sonic Net largely protected the sunflower plants from damage by the birds, but there was minimal effect of the Sonic Net displacing the blackbirds from their roost habitat.

*Amanda Werrell is a second-year M.S. candidate in the Biology Department at William & Mary. Her area of research falls in the overlap of animal behavior, wildlife management, and noise pollution. Her thesis research involved field experiments to test the effectiveness of a sonic net, an acoustic deterrent, to reduce red-wing blackbird presence in target habitats. She holds a B.A. from Middlebury College, where she studied conservation biology.*

**UV Photodissociation Dynamics of Brown Carbon Chromophores: Ortho-Nitrophenol and Nitroresorcinol**

*Presenter:* Kenneth Jacob Blackshaw  
*Co-Authors:* N. Quartey, D. Hood, S. Chen  
*Advisor:* Nathanael Kidwell  
William & Mary,  
Chemistry

Brown carbon (BrC) aerosols are primarily formed from atmospheric organic compounds and have only recently been identified as important climate forcers. The light-absorbing nitroaromatic chromophores embedded in the aerosol particulate are particularly responsible for its solar absorptivity from the visible to the UV, releasing reactive photofragments as a result. In this study we investigate the UV dissociation dynamics of two BrC chromophores—ortho-nitrophenol and nitroresorcinol—to nitric oxide (NO) detected using velocity map imaging (VMI). Ion images collected from 226 and 355 nm photolysis of both parent compounds reveal that dissociation is slow compared to their period of rotation. The corresponding TKER distributions are broad and featureless, indicating modest energy partitioning to translation and subsequent high cofragment internal energy. Furthermore, NO product state distributions at both photolysis wavelengths report on the strikingly different dissociation mechanisms for ortho-nitrophenol and nitroresorcinol. Indeed, we observe a clear non-Boltzmann distribution for nitroresorcinol dissociation, which is in stark contrast to our previous studies on BrC chromophores. These experimental results provide stringent tests of high-level theoretical calculations, which are carried out in tandem to obtain insights into the fragmentation mechanisms. By gaining a better understanding of the dissociation dynamics of BrC chromophores, a more accurate modeling of their solar photochemical outcomes will be obtained.

*K. Jacob Blackshaw is a second-year M.S. candidate in the Chemistry Department at William & Mary. His primary academic interests include physical chemistry, as well as atmospheric and environmental sciences. His current research utilizes velocity map imaging to probe the dynamics of atmospherically active aerosols.*

**Comparative Molecular Dynamics Within the  $\beta$ -grasp Fold Reveals Insights into Structure and Stability**

*Presenter:* John T. Bedford  
*Co-Author:* J. Poutsma  
*Advisor:* Lesley Greene  
Old Dominion University,  
Chemistry & Biochemistry

Protein folding is an interdisciplinary field of research which seeks to solve one of the most fundamental questions in science. That is, how the amino acid sequence of a protein encodes for its three-dimensional topology. My research seeks to answer this question in the context of the  $\beta$ -grasp fold. My hypothesis is that certain long-range interactions within proteins are key to determining their final topology. A long-range interaction is one between two residues that are seven or more residues removed from each other in the primary sequence and closer than five angstroms in three-dimensional space. The immunoglobulin-binding domain of protein G (GB1) and the small archaeal modifier protein 1 (SAMP1) are two proteins that adopt the  $\beta$ -grasp fold. These two proteins were studied using molecular dynamics techniques to assess the persistence of their long-range interactions as they unfold over the course of a simulation. Simulation lengths were 120ns and 80ns for both GB1 and SAMP1. Unfolding of a protein is indicated by an increase in RMSD. At time points where different simulations differ greatly in RMSD, long-range contacts are recalculated and compared. It was found that simulations with an increased RMSD have fewer long-range contacts and that the long-range contacts lost are predominately located between specific protein secondary elements. Results from these studies and others will be presented.

*John Bedford is a fifth-year Ph.D. candidate in the Chemistry & Biochemistry Department at Old Dominion University. His research areas include protein folding, kinetics, and thermodynamics and molecular dynamics. His dissertation topic is the investigation of the  $\beta$ -grasp fold for structure, stability, and folding. He holds a M.S. (Chemistry) and two B.S. (Chemistry and Biochemistry) degrees from Old Dominion University.*

**QM/MM MD Simulations of the Reactivity of Zinc Finger Proteins**

*Presenter:* Ana Dreab  
*Co-Author:* P. Lutz  
*Advisor:* Craig Bayse  
Old Dominion University,  
Chemistry & Biochemistry

Zn-S centers are important to different biological processes such as DNA transcription and repair, biochemical recognition and protein regulation. Zn (II) is released by reducible sulfur and selenium compounds from zinc-sulfur proteins such as zinc fingers (ZFs) and metallothionein. Zn(II) ejection from ZFs leads to the loss of tertiary structure to inhibit the protein's ability to recognize DNA. We explored the mechanism of Zn(II) release from ZFs by ebselen, diselenides and disulfides through a series of QM/MM studies within AMBER. Molecular dynamics simulations of ZFs of the CCHH, CCHC and CCCC types show that the solvent accessibility and the charge of all ZF Cys S atoms relate to the most favorable site for the attack of the electrophilic r-S/Se compound. Activation barriers will be compared to previous small-molecule gas-phase calculations.

*Ana Dreab is a third-year Ph.D. student in the Chemistry & Biochemistry Department at Old Dominion University. Her research area includes zinc-containing proteins, chalcogen bonding interactions and molecular docking studies. She is currently exploring the reactivity of reducible S/Se compounds with zinc finger protein through quantum mechanics/molecular mechanics studies. She holds a B.S. (Chemistry) from University of the Academy of Sciences of Moldova.*

**Synthetic Control of Dimensionality in Cd(II) Complexes with Flexible Pentadentate Ligands**

*Presenter:* Alison Gerhard  
*Co-Authors:* D. Tice, C. Tourkin, R. Pike  
*Advisor:* Deborah Bebout  
William & Mary,  
Chemistry

Coordination complexes feature across a wide variety of research interests, ranging from catalysis and gas storage to enzyme and toxicity studies. However, many of these compounds are sensitive to initial reaction conditions. The inclusion of flexible ligands in coordination compounds provides an additional layer of difficulty, as these ligands are able to adopt a range of conformations and make final structures difficult to predict. Research into synthetic control provides valuable knowledge towards the future application of such coordination compounds. Here, we report a series of five different complexes of cadmium(II) halides with flexible linear pentadentate pyridine ligands. The series is comprised of monomeric, dimeric, and one-dimensional polymeric compounds, with varying ligand topologies and extended pi-stacking interactions. Our group was able to exercise synthetic control of the resulting compounds through the initial metal to ligand ratio. Complexes were characterized by x-ray crystallography, x-ray powder diffraction, NMR, and IR spectroscopy. Photoluminescent behavior was also examined.

*Alison Gerhard is a first-year M.S. student in the Chemistry Department at William & Mary. Her research explores the behavior of biologically-inspired ligands and group 12 heavy metals, with an eye towards protein analogs and coordination polymer chemistry. Alison holds a B.S. (Neuroscience, Chemistry) from William & Mary.*

**Sensitization of Photochromic Reactions by Conjugated Polymer Nanoparticles**

*Presenter:* Lisa Graves  
*Advisor:* Elizabeth Harbron  
William & Mary,  
Chemistry

Conjugated polymer nanoparticles (CPNs) can transfer their excited state energy via fluorescence resonance energy transfer (FRET) to dyes that are present within or on the surface of the CPN. If the acceptor dyes are photochromic, the energy transfer process can induce the molecular transformation from a UV-absorbing form to a visible-absorbing form. This transformation is the result of a light-stimulated isomerism that alters the degree of conjugation within the structural framework of the dye. The goal of this work is to determine how CPN size affects the reaction dynamics of the photochromic dye in its transformation from the UV to visible absorbing form. The photophysical properties of the CPN, such as fluorescence quantum yield and non-radiative energy pathways like FRET, can be manipulated by modifying the size of the nanoparticle. Optimal CPN size, doping concentration and nanoparticle surface modifications for the photochromic transformation will be presented.

*Lisa Graves is a second-year M.S. candidate in the Chemistry Department at William & Mary. Her research focuses on the energy-transfer mediated photoreaction in conjugated polymer nanoparticles doped with organic functional dyes.*

**Regioselective Cycloadditions Utilizing Nitrenoid Precursors in the Synthesis of Nitrogen Heterocycles**

*Presenter:* Julie E. Laudenschlager  
*Co-Authors:* L. Combee, S. Johnson  
*Advisor:* Michael Hilinski  
University of Virginia,  
Chemistry

Nitrogen-containing functional groups are ubiquitous in the pharmaceutical industry with 46 of the 50 most prescribed pharmaceutical drugs containing nitrogen, according to a recent study. While there are known methods to synthesize nitrogen heterocycles, many are inefficient and require the use of non-readily available starting materials. Due to this, our lab aims to develop new synthetic methods through cycloadditions using nitrenes or nitrene equivalents as the nitrogen source. We have developed a novel [5+1] cycloaddition using vinyl cyclopropanes as the aliphatic backbone and nitrenoid precursors to synthesize regioselective mono-, di- and tri-substituted tetrahydropyridine rings. A tetrahydropyridine can be further reduced to form a piperidine, which is the most abundant nitrogen-containing ring in pharmaceuticals. Interestingly, we found that the nature of the substrate affects the type of catalyst and nitrogen source that can be employed to carry out the cycloaddition. Thus, we developed two different methods—one using scandium (III) triflate and the other using Rh<sub>2</sub>(esp)<sub>2</sub>—with complementary substrate scope that could potentially be used as reliable avenues in the synthesis of pharmaceuticals and bioactive molecules.

*Julie Laudenschlager received her B.S. at Gettysburg College and is now a third-year Ph.D. candidate in the Chemistry Department at the University of Virginia. Her research interests lie in organic synthetic chemistry, particularly in methodology. She is currently studying nitrogen transfer as a way to assemble heterocycles through novel cycloaddition strategies.*

**Characterizing the Activity of AMPs Against the Pathogenic Bacterium *Clostridium difficile* in an Aerobic Environment**

*Presenter:* Adenrele Mojeed Oludiran  
*Advisor:* Erin Purcell  
Old Dominion University,  
Chemistry & Biochemistry

*Clostridium difficile* is an anaerobic gram-positive pathogen with high treatment costs and mortality with very high antibiotic tolerance. Antimicrobial host-defense peptides (HDPs) produced naturally by animal immune systems are promising candidates to develop novel therapies for bacterial infection because they cause oxidative stress that damages multiple targets in bacterial cells, so it is difficult for bacteria to evolve resistance to these attacks. Piscidins, fish-derived HDPs that can also form complexes with copper (Cu) to enhance their activities, are very active against multiple bacterial species in aerobic environment. We examined their activity against *C. difficile* and other species in an anaerobic environment and found that the interaction of piscidins and copper is different in different oxygen environments. Piscidins are highly active against *C. difficile* vegetative cells and could be a good candidate for drug development, but other *C. difficile* oxidative stress response are yet to be conclusive. Antimicrobial metals alone not complexed with peptides showed different pattern to the peptides and their metallic complexes.

*Adenrele Oludiran is a first-year Ph.D. student in the Chemistry & Biochemistry Department at Old Dominion University. He recently completed his M.S. at the same university. He has a strong interest in antimicrobial substances and the responses of microbes to them.*

**Electron Transfer Reactions on Hyperbolic Metamaterials**

*Presenter:* Olivia Penrose Hamouch  
*Advisor:* Carl Bonner  
Norfolk State University,  
Materials Science

Recent studies have shown that the dielectric constant of the material several nanometers away from the D/A pair can enhance the rate of photochemical reactions such as the photodecomposition of P3HT in the presence of a layer with an anisotropic dielectric constant. Hyperbolic metamaterials are composed of alternating thin layers of metallic Au and dielectric  $\text{MgF}_2$ . As an assembly, the dielectric constant is metallic in one direction and resistive in other directions. To further explore this link between the non-local dielectric constant and the reaction, we have used cyclic voltammetry to observe the rate constant of the simplest chemical reaction, the transfer of an electron from  $\text{Fe}^{3+}$  to  $\text{Fe}^{2+}$ , to monitor the effect of the non-local dielectric environment. According to Marcus Theory, the rate of a reaction is influenced by the dielectric constant of the material in the vicinity of the electron D/A pair, most typically between the donor and acceptor. The electron transfer current and potential on Au surfaces have been measured to determine the carrier diffusivity and the rate constant for the electron transfer reactions to and from  $\text{Fe}(\text{CN})_6^{3+}$  on a gold surface and are influenced by the presence of a hyperbolic metamaterial. An increase in the rate constant has been observed for the electron transfer reactions in the vicinity of the metamaterials. Future work will examine the effects of dielectric constants on the rates of the forward and reverse rate constants from which the overall rate constant is formed.

*Olivia Penrose Hamouch is a fourth-year M.S. student in the Materials Science program at Norfolk State University. She received a B.S. from Norfolk State in Chemistry. She is currently studying a branch of photonics called hyperbolic metamaterials. These unique materials has peaked her interest in photonic crystals since her favorite hobby is collecting crystals. She would like to use the science of photonics in the nuclear field.*

**Single-Cell Characterization of *Clostridium difficile* Motility and Chemotaxis Using Anaerobic Live Cell Microscopy**

*Presenter:* Astha Pokhrel  
*Co-Authors:* C. Scott, M. Madrill  
*Advisor:* Erin Purcell  
Old Dominion University,  
Chemistry & Biochemistry

*Clostridium difficile* infection (CDI) is caused by a spore-forming intestinal pathogen, and is a major cause of hospital-acquired diarrhea. The mechanisms by which the bacteria regulate colonization in the host remain to be elucidated. It is known that this pathogen is flagellated and is capable of swimming through liquid and semi-solid medium. *C. difficile* is also capable of flagellum-independent movement upon solid surfaces through Type IV pili. Disruption of either one of the machineries reduces the ability of *C. difficile* to colonize host intestinal epithelium. Motile bacteria exhibit deliberate motility towards nutrient sources and away from toxigenic compounds via chemotaxis. Notably, chemotaxis in *C. difficile* bacterium has not been reported in the past. Nutrient availability in the gut is in part influenced by commensal bacteria that efficiently metabolize nutrients and negatively impact *C. difficile* colonization. But antibiotic-treatment imposed disruption of the gut environment and healthy microbiota results in a transient increase in nutrient availability that *C. difficile* can thrive in. In this work, we present for the first time a simple live cell imaging system to image obligate anaerobic pathogens outside of the anaerobic chamber. Using the system, we demonstrate that *C. difficile* survives, grows and more importantly, exhibits chemotactic motility towards N-acetylneuraminic acid (Neu5). Conclusively, our single-cell analysis confirms that *C. difficile* motility is heavily regulated by environmental cues.

*Astha Pokhrel is a fourth-year Ph.D. candidate in the Chemistry & Biochemistry Department at Old Dominion University. She is interested in characterizing the ability of Clostridium difficile to chemotaxis based on environmental cues. She is currently looking at the bacteria's ability to sense neuraminic acid in its niche macroscopically as well as through a single-cell imaging system.*

**The Molecular Basis of Antibiotic Resistance in *Clostridium difficile***

*Presenter:* Asia Poudel  
*Advisor:* Erin Purcell  
Old Dominion University,  
Chemistry & Biochemistry

*Clostridium difficile* infection (CDI) is one of the most common causes of nosocomial diarrhea in developed world. The management of the infection is challenging as the bacterium exhibits resistance to most of the antibiotics in use. Therefore, development of alternative therapeutics and in-depth understanding of resistance mechanisms are imperative against CDI. The stringent response, an adaptive bacterial response during environmental stress, contributes to antibiotic tolerance in many pathogens but it has never been characterized in *C. difficile*. The stringent response drives cellular reprogramming of transcriptional as well as translational machinery via two intracellular signaling molecules - pppGpp and ppGpp. Both multidomain RSH and single domain small alarmone synthetases (SASs) catalyze the production of these signaling molecules. RSH enzymes are well characterized but the SAS family was discovered recently and its function and regulation are poorly understood. *C. difficile* possesses genes encoding these enzymes whose expression is believed to be stimulated by various environmental cues including antibiotic stress. We are studying the structural and functional characteristics of the *C. difficile* SAS, RelQ, and its role in antibiotic resistance. Recently, we developed a methodology to express the protein in *E. coli* and constructed a transcriptional reporter to analyze the temporal expression of these proteins in *C. difficile*. Using these tools we have identified ampicillin and clindamycin as triggers of the the RelQ mediated stringent response in *C. difficile*.

*Asia Poudel is a second-year Ph.D. student in the Chemistry & Biochemistry Department at Old Dominion University. He is exploring the effect of small alarmone synthetase mediated stringent response on survival, persistence and antibiotic tolerance in Clostridium difficile.*



**Modeling Mitochondrial Stress Response During Alzheimer's Disease Onset**

*Presenter:* Morgan Griffin Shelton  
*Co-Authors:* Z. Han, S. Shirali,  
S. Holden-Kapshuck  
*Advisor:* Randolph Coleman  
William & Mary,  
Chemistry

Alzheimer's disease affects multiple pathways within individual neurons. It is known that mitochondria produce an excess of reactive oxygen species and become dysfunctional as AD progresses, and studies have shown that pathogenic amyloid-beta and the hyper-phosphorylation of tau protein play a role in this dysfunction. Mathematical modeling using biological systems modeling software COPASI allows for simulation of these pathways to investigate critical points in disease progression and identify potential drug targets. Previous models have used this data to present AD-related mitochondrial dysfunction and eventual cell death. The pathways in this model focus on mitochondrial respiration, antioxidant activity and changes in gene expression related to mitochondrial maintenance and repair. The current model aims to test different gene knock-down therapy targets for guiding wet lab research in the most viable direction to produce potential drug treatments for Alzheimer's disease.

*Morgan Shelton is a second-year M.S. candidate in the Chemistry Department of William & Mary. She is studying Alzheimer's disease through biological systems modeling of important biochemical pathways. She holds a B.S. in Neuroscience from William & Mary.*

**Photochemical Processing of Filter Collected  $\alpha$ -pinene SOA: Molecular Composition Changes and Absorption Properties**

*Presenter:* Emma Q. Walhout  
*Co-Authors:* C. Thrasher, J. Schusterman,  
J. Martens, G. Berden  
*Advisor:* Rachel O'Brien  
William & Mary,  
Chemistry

Laboratory studies are fundamental to understand atmospheric chemistry and processes over a broad range of conditions and environments in order to apply observations and knowledge to improve atmospheric models. Secondary organic aerosols (SOAs) are particles formed from the oxidation of volatile organic compounds from pollutants emitted by both anthropogenic and natural sources. Absorption of solar radiation by SOAs in the atmosphere causes loss of organic particulate matter; however, the kinetics of this mass loss and the effects on the average molecular composition and optical properties are not well known. In order to investigate SOAs' impact on the atmosphere, SOAs produced from the ozonolysis of  $\alpha$ -pinene, a naturally occurring substance from pine trees, were examined. SOAs were exposed to UV/Vis radiation from a xenon arc lamp to simulate photolysis. Changes in the molecular composition and absorption properties of the organic mixture were measured at discrete time points using ultra-high resolution mass spectrometry, IR, and UV/Vis spectroscopy. Presented here is the current understanding of chemical composition changes of dry SOAs as a result of long term atmospheric aging/photolysis, and what effects this has on absorption properties; modeling and theoretical studies; along with development of foundational methods that enable a more thorough analysis of this atmospheric processing.

*Emma Q. Walhout is a second-year M.S. candidate in the Chemistry Department at William & Mary. As an analytical chemist, her thesis explores atmospheric reactions, particularly the chemical composition changes of secondary organic aerosols as a result of long term atmospheric aging. Her research involved developing foundational methods that enable a more thorough analysis of this atmospheric processing.*

**SSD Failures in the Field: Symptoms, Causes, and Prediction Models**

*Presenter:* Jacob Alter  
*Co-Authors:* J. Xue, A. Dimnaku  
*Advisor:* Evgenia Smirni  
 William & Mary,  
 Computer Science

In recent years, solid state drives (SSDs) have become a staple in high-performance data centers due to their high speed and energy efficiency. In this work, we study the failure characteristics of 30,000 drives from a Google data center across a span of six years. We characterize the complex workload conditions that lead to SSD failures and illustrate that their root causes differ from traditional beliefs but remain difficult to discern. In particular, we focus on failure incidents that result in manual intervention as part of the repair process. We find evidence of high levels of infant mortality and characterize the differences between these infant and non-infant failures. We develop several machine-learning failure prediction models that are shown to be surprisingly accurate, achieving high true positive rates and low false positive rates. These models are used beyond simple prediction as they aid us to untangle the complex interaction of workload characteristics that lead to failures and identify failure root causes from monitored symptoms.

*Jacob Alter is a second-year Ph.D. student in the Computer Science Department at William & Mary. He is interested in systems reliability and performance modeling and the application of machine learning and data mining techniques to these fields.*

**Molecular Dynamics Simulations of Ion Transport Through Electrically Stressed Biological Membranes**

*Presenter:* Federica Castellani  
*Co-Author:* E. Sözer  
*Advisor:* P. Thomas Vernier  
 Old Dominion University,  
 Biomedical Engineering

One of our research goals is to use molecular simulations of biological membranes to enable optimization of  $\text{Ca}^{2+}$  electroporation, an exciting new clinical application. Electroporation (EP) is used in biomedicine and biotechnology to increase membrane permeability and to insert drugs, plasmids, or other normally impermeant material into cells with pulsed electric fields. We use molecular dynamics (MD) tools to analyze electric-field-induced pore formation in phospholipid bilayer systems. We study the interactions between  $\text{Ca}^{2+}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ , and  $\text{Cl}^-$  and the lipid membrane and how these interactions influence electropore formation and the transport of these ions through the pores. This physics-based knowledge about ion conductance through electropores will facilitate calculations of dose and determination of delivery methods for  $\text{Ca}^{2+}$  electroporation, which kills tumor cells by overloading their intracellular calcium capacity. Here we describe the incomplete ionization of  $\text{CaCl}_2$  from a commonly used MD package, and the modifications that result in more realistic interactions between  $\text{Ca}^{2+}$ , water, and phospholipids. Following a recently published method, we improved the  $\text{Ca}^{2+}$  and  $\text{Cl}^-$  models and tested them in a lipid-aqueous environment. Our results show that  $\text{Ca}^{2+}$  interacts more strongly with the lipid bilayer than do the ions  $\text{Na}^+$ ,  $\text{K}^+$ , and  $\text{Cl}^-$ . We demonstrate also the very long time required for equilibration of  $\text{Ca}^{2+}$  with the phospholipid bilayer interface, about 10  $\mu\text{s}$ . Our simulations are the first to investigate  $\text{Ca}^{2+}$  binding to phospholipid membranes on such a long time scale.

*Federica Castellani is a fourth-year Ph.D. candidate in the Biomedical Engineering Institute at Old Dominion University. Her doctoral research utilizes molecular models to simulate material transport.*

**Early Information Access to Alleviate  
Emergency Department Congestion**

*Presenter:* Anjee Gorkhali

*Advisor:* Ling Li

Old Dominion University,  
Information Technology and Decision  
Sciences

Alleviating Emergency Department (ED) congestion results in shorter hospital stay which not only reduces the cost of medical procedure but also increase the hospital performance. Length of patient stay is used to determine the hospital performance. It is explained that lack of timely information and ambiguous information about the patients is one of the major reason behind the ED congestion. Organization Information Processing (OIPT) Theory is used to explain the impact of information access and availability on the information processing need and ability of a hospital. This paper establishes that to reduce ambiguous nature of information in a high information need system such as a hospital, it is important to increase information availability and processing capacity of an organization. Furthermore, it also suggests that technical devices such as RFID that works as "Auto Identification tags" increase the information availability as well as the information processing capability of the hospitals. On the other hand institutional factors such as employee behavior towards the new technology is studied to analyze the impact of human factors in the implementation of these technical devices in the ED procedures. In addition to that, it is also explained how other factors such as employee trainings, management structure and management policies moderate the relationship between information availability and the processing capability of a hospital ED.

*Anjee Gorkhali is a fourth-year Ph.D. student in the Strome College of Business, Old Dominion University. Her research interest is "Healthcare Analytics/Management" and she is currently focused on optimizing hospital process for patients. She is also conducting research in the area of national culture and how it impacts the innovation of different type of firms.*

**Design and Analysis of Efficient  
Inter-Core Communication in GPUs**

*Presenter:* Mohamed Assem Ibrahim

*Co-Author:* H. Liu

*Advisor:* Adwait Jog  
William & Mary,  
Computer Science

Bandwidth achieved from local/shared caches and memory is a major performance determinant in Graphics Processing Units (GPUs). These existing sources of bandwidth are often not enough for optimal GPU performance. Therefore, to enhance the performance further, we focus on efficiently unlocking additional potential source of bandwidth, which we call as remote-core bandwidth. The source of this bandwidth is based on the observation that a fraction of data (i.e., L1 read misses) required by one GPU core (also called as streaming multiprocessor (SM)) can also be found in the local caches of other GPU cores. In this paper, we propose to efficiently coordinate the data movement across cores in GPUs to exploit this remote-core bandwidth. However, we find that its efficient detection and utilization presents several challenges. To this end, we specifically address: a) which data is shared across cores, b) which cores have the shared data, and c) how we can get the data as soon as possible. Our extensive evaluation across a wide set of GPGPU applications shows that significant performance improvement can be achieved at a modest hardware cost on account of the additional bandwidth received from the remote cores.

*Mohamed Ibrahim is a third-year Ph.D. student in the Computer Science Department at William & Mary. His research interests include all aspects of computer architecture, specifically data-parallel architectures (e.g., GPUs), CPU-GPU heterogeneous architectures, and interconnection networks. His current research focuses on enhancing the communication between GPGPU components via interconnection networks.*

**IoT Botnet Detection via Power Consumption Modeling**

*Presenter:* Woosub Jung  
*Advisor:* Gang Zhou  
 William & Mary,  
 Computer Science

Many IoT botnets that exploit vulnerabilities of IoT devices have emerged recently. After taking over control of IoT devices, the bot-nets generate tremendous traffic to attack target nodes. To detect the malicious IoT botnets, many researchers have proposed bot-net detection systems; however, these are not easily applicable to resource-constrained IoT devices. Moreover, since the bot-nets' early stage makes marginal differences in terms of traffic, it is hard to detect when they first attack the victim nodes. However, we observe that the IoT botnets generate distinguishable power consumption patterns. Thus, we aim to classify whether the IoT device is affected by malicious behaviors or not through power consumption patterns. We propose a CNN-based model that consists of a data processing module as well as an 8-layer CNN. Prior to applying the CNN model, we segment and normalize the collected power consumption data to help our CNN model to achieve higher accuracy. The 8-layer CNN classifies the processed data into four classes including a botnet class, which is our primary target. To demonstrate the performance, we run self-evaluation, cross-device-evaluation, and leave-one-device-out tests on three common types of IoT devices, which are Security Camera, Router, and Voice Assistant devices. The self-tests achieve up to 96.5% classification accuracy whereas the cross-evaluation tests perform about 90% accuracy. Leave-one-out tests introduce higher than 90% accuracy for botnet detection.

*Woosub Jung is a third-year Ph.D. candidate in the Computer Science Department at William & Mary. His research areas include wireless networking, mobile computing, and Internet of things. He received his B.S. in Information and Communication in 2009 and M.S. in Electronics and Computer Engineering in 2011 from Hanyang University, Korea.*

**A Study of Data Store-Based Home Automation**

*Presenter:* Kaushal Kafle  
*Co-Author:* S. Manandhar  
*Advisor:* Adwait Nadkarni  
 William & Mary,  
 Computer Science

Home automation platforms provide a new level of convenience by enabling consumers to automate various aspects of physical objects in their homes. While the convenience is beneficial, security flaws in the platforms or integrated third-party products can have serious consequences for the integrity of a user's physical environment. In this paper we perform a systematic security evaluation of two popular smart home platforms, Google's Nest platform and Philips Hue, that implement home automation "routines" (i.e., trigger-action programs involving apps and devices) via manipulation of state variables in a centralized data store. Our semi-automated analysis examines, among other things, platform access control enforcement, the rigor of non-system enforcement procedures, and the potential for misuse of routines. This analysis results in ten key findings with serious security implications. For instance, we demonstrate the potential for the misuse of smart home routines in the Nest platform to perform a lateral privilege escalation, illustrate how Nest's product review system is ineffective at preventing multiple stages of this attack that it examines, and demonstrate how emerging platforms may fail to provide even bare-minimum security by allowing apps to arbitrarily add/remove other apps from the user's smart home. Our findings draw attention to the unique security challenges of platforms that execute routines via centralized data stores and highlight the importance of enforcing security by design in emerging home automation platforms.

*Kaushal Kafle is a second-year Ph.D. student in the Computer Science Department at William & Mary. His primary research interest lie in computer security, especially in areas that include Android security, IoT security, privacy and access control analysis. He is currently focused in analysing the security of an emerging operating platform, the smart home.*

**Identity-Based Encryption in Edge Computing***Presenter:* Cheng Li*Advisor:* Qun LiWilliam & Mary,  
Computer Science

Identity-based Encryption (IBE) is a public-key encryption primitive in which users public keys are generated based on users' identification. This encryption primitive is very efficient in terms of public key distribution since users may directly generate a message receiver's public key based on the receiver's ID without querying from any third party. This feature can be leveraged in the Internet of Things (IoT) scenarios in which tens of thousands smart objects communicate with each other using encryptions. However, this IBE involves Weil-pairing, a computing intensive operation, in both the encryption and the decryption process. Because some smart objects have limited computing resources, IBE may not be feasible on these devices. In this work, we leverage edge computing technique to offload Weil-pairing to edge servers without leaking any knowledge about the plain text. In this way, smart objects can safely use the resources of edge servers to achieve IBE primitive.

*Cheng Li is a sixth-year Ph.D. candidate in the Computer Science Department at William & Mary. His research interests include Software-defined Networking (SDN), machine learning, network security, edge computing, Internet of Things (IoT). He is currently exploring privacy and security issues in edge computing.*

**Architectural Support for Efficient Large-Scale Automata Processing***Presenter:* Hongyuan Liu*Co-Authors:* M. Ibrahim, O. Kayiran, S. Pai*Advisor:* Adwait JogWilliam & Mary,  
Computer Science

The Automata Processor (AP) accelerates applications from domains ranging from machine learning to genomics. However, as a spatial architecture, it is unable to handle larger automata programs without repeated reconfiguration and re-execution. To achieve high throughput, this paper proposes for the first time architectural support for AP to efficiently execute large-scale applications. We find that a large number of existing and new Non-deterministic Finite Automata (NFA) based applications have states that are never enabled but are still configured on the AP chips leading to their underutilization. With the help of careful characterization and profiling-based mechanisms, we predict which states are never enabled and hence need not be configured on AP. Furthermore, we develop SparseAP, a new execution mode for AP to efficiently handle the mis-predicted NFA states. Our detailed simulations across 26 applications from various domains show that our newly proposed execution model for AP can obtain 2.1x geometric mean speedup (up to 47x) over the baseline AP execution.

*Hongyuan Liu is a third-year Ph.D. candidate in the Computer Science Department at William & Mary. His advisor is Adwait Jog. He works on the area of computer architecture. Currently, his research focuses on accelerating automata processing on different architectures.*

**Towards Reconstructing Software Evolution Trends with Statistical Models**

*Presenter:* David A. Nader  
*Advisor:* Denys Poshyvanyk  
 William & Mary,  
 Computer Science

Software Evolution Trends is the study of time-dependent variables from software maintenance tasks. Statistical Software Evolution Models are probability distributions over repositories dynamic data to understand and estimate trends in software. These trends are behavioral aspects like project growth (number of commits), bug appearance (number of issues), and the developer activity (effort). We proposed and investigated how statistical models reconstruct trends from data repositories to simulate the software evolution process. We used the dataset MSR2014 challenge from the Mining Software Engineering conference, which includes the top-10 starred software projects for the top programming languages deployed in GitHub. In total, there are 90 different projects with their respective derivations (forks). The datasets were preprocessed and transformed into proper time-traces. The traces were fitted into probability distributions that describe the stochastic nature of the trends. We modeled a single-server (ssq) and a multi-server system (msq) to analyze time metrics (e.g., issue arrivals, waits, delays, and service) and software metrics (e.g., number of stakeholders, commits and effort). Our empirical analysis suggested that the average service time is 31.97 days with an average wait of 32.34 days and interarrival time of 0.21 days. The approximate number of servers is 1177 with an average utilization of 0.13. Moreover, our results demonstrate that the effort is correlated with wait time ( $r=.64$ ), delay ( $r=0.51$ ), and autocorrelation in issue arrivals.

*David Nader is a second-year Ph.D. candidate in the Computer Science Department at William & Mary. His research areas include software engineering, artificial intelligence, and optimization. He is currently working on the traceability problem with statistical methods.*

**GraphPhi: Efficient Parallel Graph Processing on Emerging Throughput-Oriented Architectures**

*Presenter:* Zhen Peng  
*Co-Authors:* A. Powell, B. Wu, T. Bicer  
*Advisor:* Bin Ren  
 William & Mary,  
 Computer Science

Modern parallel architecture design has increasingly turned to throughput-oriented devices to address concerns about energy efficiency and power consumption. However, graph applications cannot tap into the full potential of such architectures because of highly unstructured computations and irregular memory accesses. In this paper, we present GraphPhi, a new approach to graph processing on emerging Intel Xeon Phi-like architectures, by addressing the restrictions of migrating existing graph processing frameworks on shared-memory multi-core CPUs to this new architecture. Specifically, GraphPhi consists of 1) an optimized hierarchically blocked graph representation to enhance the data locality for both edges and vertices within and among threads, 2) a hybrid vertex-centric and edge-centric execution to efficiently find and process active edges, and 3) a uniform MIMD-SIMD scheduler integrated with a lock-free update support to achieve both good thread-level load balance and SIMD-level utilization. Besides, our efficient MIMD-SIMD execution is capable of hiding memory latency by increasing the number of concurrent memory access requests, thus benefiting more from the latest High-Bandwidth Memory technique. We evaluate our GraphPhi on six graph processing applications. Compared to two state-of-the-art shared-memory graph processing frameworks, it results in speedups up to 4X and 35X, respectively.

*Zhen Peng is a third-year Ph.D. candidate in the Computer Science Department at William & Mary. His research currently focuses on parallel computing for graph processing. He is developing a graph analytics system on the Xeon Phi architecture. He holds a B.E. (Computer Science) and an M.S. (Computer Software and Theory) from Huaqiao University.*



### **ASAP: An Agent-Assisted Smart Auction-Based Parking System in Internet of Things**

*Presenter:* Syed R. Rizvi  
*Advisor:* Stephan Olariu  
 Old Dominion University,  
 Computer Science

By exploiting the ubiquitous nature of Internet of Things (IoT) technology in smart cities, we propose an Agent-assisted Smart Auction-based Parking (ASAP) system for driverless cars and Parking Facility Providers (PFP). In order to improve parking space allocation, the new idea in this paper is to incorporate parking auction that is strategy-proof with respect to price, budget-balanced, allocation efficient and individually rational. ASAP leverages real-time reservation pricing and priorities-based fair mechanisms for parkers while providing higher utilization to PFPs due to the inherent ability of driverless cars to move themselves, thus increasing revenue. The main contribution of this paper is the introduction of parking auction through sophisticated software agents that are capable of quickly and seamlessly performing tasks such as parking lookup, negotiation, pricing, and reservation. Simulation results show that the proposed scalable and interactive agents of ASAP enable efficient processing of a vast amount of data, providing cost savings for parkers looking for parking, and improving usability of public and private parking facilities.

*Syed R Rizvi is a Ph.D. student in the Computer Science Department at Old Dominion University. His research areas include embedded systems, vehicular ad-hoc networks, wireless networks, QoS provisioning, wireless multimedia, and web applications. His dissertation topic is related to intelligent transportation in Smart City and Internet of Things. He holds an M.S. in Computer Science from Old Dominion University.*

### **Learning Bug-Fixing Patches in the Wild via Neural Machine Translation**

*Presenter:* Michele Tufano  
*Co-Authors:* C. Watson, G. Bavota,  
 M. Di Penta, M. White  
*Advisor:* Denys Poshyvanyk  
 William & Mary,  
 Computer Science



Millions of open-source projects with numerous bug fixes are available in code repositories. This proliferation of software development histories can be leveraged to learn how to fix common programming bugs. To explore such a potential, we perform an empirical study to assess the feasibility of using Neural Machine Translation techniques for learning bug-fixing patches for real defects. First, we mine millions of bug-fixes from the change histories of projects hosted on GitHub, in order to extract meaningful examples of such bug-fixes. Next, we abstract the buggy and corresponding fixed code, and use them to train an Encoder-Decoder model able to translate buggy code into its fixed version. In our empirical investigation we found that such a model is able to fix thousands of unique buggy methods in the wild. Overall, this model is capable of predicting fixed patches generated by developers in 9-50% of the cases, depending on the number of candidate patches we allow it to generate. Also, the model is able to emulate a variety of different Abstract Syntax Tree operations and generate candidate patches in a split second.

*Michele Tufano is a fifth-year Ph.D. candidate in the Computer Science Department at William & Mary. His research interests include the application of deep learning techniques to software engineering tasks such as automated program repair, software testing, maintenance and evolution. He has also worked on Android testing, mining software repositories, code quality, and software building.*



**AMBIENCE: An Adaptive Mobile-Edge Computing for Vehicular Networks**

*Presenter:* Susan Zehra

*Advisor:* Stephan Olariu  
Old Dominion University,  
Computer Science

Cloud-based Vehicular Computing (CVC) can provide improved vehicular services through distributed computing between local On-Board Unit (OBU) and remote cloud such that a task originating from the OBU can be solved by one or more remote cloud service. However, latency and the transmission cost of computation can potentially become an intolerable issue due to large physical distance between the cloud servers and the mobile vehicles. Recently, Mobile Edge Computing (MEC) has gained significant attention in the computing world. We propose an Adaptive MoBile-Edge ComputiNg for VehiCular NEtworks (AMBIENCE). The main contribution of this work is the incorporation of a unified location and vehicular density-based off-loading strategy along with consideration to communication preference, both from the RSU-backhaul and V2I/V2V communication perspective. Our contributions in this research are (1) a framework for AMBIENCE in an IoT environment, (2) a concept of how to integrate sophisticated task-off-loading mechanism that can carefully select the most efficient RSU/MEC server(s), and a suitable combination of V2V, V2I, RSU-backhaul, or backbone network communication, and (3) a simulative evaluation of the proposed approach using a detailed simulation model. Full simulation results highlight the importance of the desirable paradigms such as distributed computing, accurate and real-time traffic and weather information, and adaptive and innovative approaches to address dynamic demands.

*Susan Zehra is a Ph.D. student in the Computer Science Department at Old Dominion University. Her research areas include cybersecurity, information assurance, embedded systems, vehicular ad-hoc networks, and wireless networks. Her dissertation topic is related to future intelligent transportation. She holds an M.S. in Electronics Engineering from Norfolk State University.*

**MobiGesture: Mobility-Aware Hand Gesture Recognition for Healthcare**

*Presenter:* Hongyang Zhao  
*Co-Authors:* Y. Ma, S. Wang, A. Watson  
*Advisor:* Gang Zhou  
 William & Mary,  
 Computer Science

Accurate recognition of hand gestures while moving is still a significant challenge, which prevents the wide use of existing gesture recognition technology. In this paper, we propose a novel mobility-aware hand gesture segmentation algorithm to detect and segment hand gestures. We also propose a Convolutional Neural Network (CNN) to classify hand gestures with mobility noises. Based on the segmentation and classification algorithms, we develop MobiGesture, a mobility-aware hand gesture recognition system for healthcare. For the leave-one-subject-out cross-validation test, experiments with human subjects show that the proposed segmentation algorithm achieves 94.0% precision, and 91.2% recall when the user is moving. The proposed hand gesture classification algorithm is 16.1%, 15.3%, and 14.4% more accurate than state-of-the-art work when the user is standing, walking and jogging, respectively.

*Hongyang Zhao is a fifth-year Ph.D. candidate in the Computer Science Department at William & Mary. His research areas include gesture recognition and ubiquitous computing. He holds an M.S. from Zhejiang University, China, and a B.S. from Shanghai Jiaotong University, China.*

**Shape-Based High-Dimensional Latent Source Model for Trajectory Inference**

*Presenter:* Xiaodan Zhu  
*Co-Author:* N. Liu  
*Advisor:* Zhenming Liu  
 William & Mary,  
 Computer Science

Nearest Neighbor is one of the most effective methods of time series classification. The distance metric is the warping-based distance which evaluates the position similarity between the individual warping paths. There are two limitations, however, for trajectory inference. First, the similarity of the trajectories depends mainly on the similarity of the shapes. Second, in group movement, the individual trajectory will be affected by other trajectories. To overcome these limitations, we modify the warping-based time series latent source model to a shape-based high-dimensional latent source model. Based on this model, we define a new metric to estimate the shape similarity between group trajectories and develop a weighted averaging method for inference. We test our model on a synthetic dataset and a real dataset consisting of player trajectories from FPS (First Person Shooter) game. On the synthetic dataset, the predicted offset is consistent with our theoretical boundaries. On the real data set, our model outperforms other state-of-the-art trajectory inference methods.

*Xiaodan Zhu is a fourth-year Ph.D. candidate in the Computer Science Department at William & Mary. He has interests in computer Graphics, computer vision and machine learning. He is currently exploring time series prediction by using advanced machine learning models.*



## **A Prairie Fire in Virginia: Divergent Approaches in the Sit-In Movement of 1960**

*Presenter:* Grover Jasper Conner  
*Advisor:* Adrienne Petty  
 William & Mary,  
 History

As the first state-based history of the lunch counter sit-in movement of 1960, this study challenges the historiography concerning the scope, strategy, and leadership of the movement. This research reveals that sixteen communities in Virginia held sit-ins in 1960, five more than previous historians understood. The sit-in movement in Virginia represents a significant break with the established civil rights tradition of the state, which relied on a highly skilled cadre of lawyers securing court rulings on the equalization and integration of state education. The sit-ins leveraged the organized power of the Black community to starve reluctant businesses instead of seeking intervention from the government on their behalf, a dramatic shift in the strategy of the movement. The advent of the sit-in signaled a new era of Black struggle in Virginia and the South but that new era developed over the course of the year as local movements throughout the state experimented with divergent approaches to the sit-in tactic. High school and college students emerged as vibrant leaders in 1960 and demonstrated that the confrontational approach of the sit-ins was a more successful tactic than the legal approach often utilized by traditional leaders. In 1959 NAACP attorneys could accurately claim to be at the forefront of the civil rights struggle in the state but the advent of the sit-in movement catapulted the youth of the state to the front lines of the fight, altering the movement irrevocably.

*Jasper Conner is a first-year Ph.D. student in the History Department at William & Mary. He studies twentieth century social movements with a focus on Black, labor, and Deaf campaigns for justice. In 2018 Jasper was an accepted presenter at the Association for the Study of African American Life and History Conference and he has been accepted to present at the 2019 Labor and Working Class History Association Conference as well. He received his B.A. in African American Studies from Virginia Commonwealth University in 2016.*



## **“The Shop on the Corner of Wing’s Lane”: Retail Spaces in Colonial Boston**

*Presenter:* Alexandra M. Macdonald  
*Advisor:* Nicholas Popper  
 William & Mary,  
 History

Between 1754 and 1775, retailer and merchant Samuel Abbot operated a retail space in colonial Boston. On any given day, Abbot participated in what T.H. Breen has termed the “empire of goods” that came to dominate the British Atlantic world after 1740. This study of Abbot’s shop attempts to reconstruct both the physical space in which he worked and plied his trade—situating his shop in the city, neighborhood, and street wherein it was located and begins to examine the day-to-day retail activities that took place “on the corner of Wing’s lane, near the town dock.” Focusing on the twenty-year period between 1754 and 1774, it illuminates the physicality of shopping and retailing in colonial Boston in the years leading up to the American Revolution to build up a picture of the materiality of Boston shops in the eighteenth century and to interpret the impact of space on polite shopping practices. Colonial Boston was a city shaped by consumption; however, consumption was also shaped by the city. It is thus important to re-place these practices within the physical spaces in which they took place, as architectural space, of both the shop itself and the city’s urban space writ large, impacted practices of consumption.

*Alexandra M. Macdonald is a second-year Ph.D. student in History at William & Mary. Common themes running throughout her scholarly work include the relationship between gender and material culture in the long eighteenth-century, the intersections of material and intellectual culture, and the role(s) of space in the British Atlantic World. She holds a B.A. and an M.A. (Art History and Visual Studies) from the University of Victoria and an M.A. (History) from William & Mary.*



## **Dynamite: Southern Violence and the Transformation of the Piney Woods**

*Presenter:* David Marquis  
*Advisor:* Cindy Hahamovitch  
 William & Mary,  
 History

The timber industry was one of the pillars of the South's transition to industrial capitalism in the early twentieth century. Beyond the ability to simply earn profits for timber companies, this industry played a role in the development of national and international economies through the provision of timber for railroad construction in the US, Mexico, and beyond. The timber companies were highly leveraged and were thus encouraged to maximize production as quickly as possible in order to pay off their debt. This resulted in a strategy called "cut and run," which entailed the total devastation of millions of acres of virgin forest with little to no concern for workers or the region's economic future. It was a dirty business. These same companies attempted to further maximize their profits by attempting to sell this denuded acreage to cattle ranchers. However, there is tick endemic to the Southern US that sickens and even kills cattle that lack relative hereditary immunity. As the federal government discovered the tick's role in the disease they created a program to eliminate the tick in 1906. This program and the interests of the timber companies and cattle ranchers collided with interests of the regions yeoman farmers. This collision of interests resulted in one of the largest bombing campaigns in US history. This paper explores the struggle between the yeoman farmers and the ranching interests as well as its effect on the development of the Southern economy.

*David "Mac" Marquis is a fourth-year Ph.D. candidate in the History Department at William & Mary. Mac is an editorial assistant at the journal LABOR: Studies in Working Class History and a board member of the Southern Labor Studies Association. Mac's dissertation is tentatively titled, "Clear-cut Blues: Violence, Culture, and Labor in the Jim Crow Piney Woods."*

## **Power in Portraiture: Catherine Spalding and the Sisters of Charity of Nazareth**

*Presenter:* Mitchell Oxford  
*Advisor:* Christopher Grasso  
 William & Mary,  
 History

At some unknown date, likely in the 1830s or 1840s, Mother Catherine Spalding of the Sisters of Charity of Nazareth sat for an unknown artist, likely in Louisville, Kentucky, where she had lived since 1831. The artist's obvious skill—seen most clearly in subtlety of Spalding's expression—suggests a level of investment by the Sisters befitting their prosperity, prominence, and significance to the community. Moreover, the portrait also asserted the Sisters' considerable social power and independence—from other orders of women religious, and to some extent their bishop, Benoit Flaget. In the decades after their founding in 1812, the Sisters' sartorial decisions revealed, and even initiated, disputes with male religious authorities. On two occasions, the order embellished their initially entirely-black habits: first, with a tight-fitting white cap, and later with a prominent white collar. Bishop Flaget blanched at each addition, as they seemed to expose the Sisters' vanity, unruliness, and willingness to thwart his authority. The Sisters, led by Spalding, successfully mollified their bishop's concerns, retained these changes, and defended their independence. This striking depiction of Spalding in her habit—complete with its white accents—affirmed the Sisters' confidence in their position amid these contests. Accordingly, both the painting and its subject underscore the significance of material culture to disputes between male religious authorities and their (often quite powerful) female subordinates in early America.

*Mitchell Oxford is a Ph.D. candidate in the History Department at William & Mary, focusing his research on Roman Catholicism in early America. His dissertation will place the French Revolution at the center of an emerging American Catholic identity in the early United States.*



## **"Why We Need the Ballot": The Woman's Christian Temperance Union and Local Involvement in the Fight for Woman Suffrage, 1898-1920**

*Presenter:* Marie A. Pellissier  
*Advisor:* Karin Wulf  
 William & Mary,  
 History

In addition to working for Prohibition and other temperance-related causes, the Woman's Christian Temperance Union spent a considerable amount of time and effort working for woman suffrage. This paper argues that examining the involvement of local WCTUs in the suffrage movement highlights the vital role of the WCTU in the fight for suffrage, and reorients the narrative of woman suffrage away from a few national leaders towards the many, ordinary women across the country who came to support woman suffrage for their own reasons and on their own terms.

*Marie Pellissier is a first-year Ph.D. student in the History Department at William & Mary. She works on early American women's intellectual history, and is particularly interested in cookbooks. She is also interested in digital humanities and public history, and has worked on several digital humanities projects. She received her M.A. in Public History from Loyola University Chicago and her B.A. in History from Boston College.*

## **The Crisis of French Laïcité in Contemporary Pluralistic Republic**

*Presenter:* Hamza Radid  
*Advisor:* Edward Baring  
 Drew University,  
 History

On September 18, 1989, the principal of the College Gabriel-Havez de Creil expelled three girls for refusing to remove their Islamic 'foulard' [headscarf]. The expulsion initiated an explosive debate about questions of Islam, integration, and what the French call 'laïcité,' or secularism. Examining the debate using the tools of intellectual and cultural history, I show the changing meaning and implications of the ideas at its center: 'intégrisme religieux' [religious fundamentalism], 'laïcité', and 'intégration.' The veil debate has gone through two major stages. At first, politicians and intellectuals focused only on its religious nature, relating the foulard to Islam, and understanding Islam in relation to the vexed history of Catholicism in France. Whereas an "intégriste" Islam was incompatible with French Republican values, as an "intégriste" Catholicism had been in the first half of the twentieth century, a "moderniste" version might find a place in the Republic. In the mid 1990s, however, the veil debate came to be considered in cultural and sociological terms instead. This transformation allowed some on the left to emphasize the marginalization of Muslims in France, and thus to argue for social change. At the same time, however, it encouraged politicians on the right to argue that Islam could not be reformed to align it with Republican values. Examining this changing debate helps give a deeper understanding of the challenges facing Muslim immigrants in France, and shows the contingent forces that have helped shape and limit discussions today.

*Hamza Radid (M.A. in Public Policy and International Affairs) is an international student from Morocco. He is a currently a Ph.D. student at the History and Culture graduate program at Drew University. His research interests include the politics of migration, integration, and the assimilation of North African Muslims in France.*

### **A Uniform “Hebrew Invasion” Replacing the “Pagan and Popish”? Naming in the Puritan Anglo-Atlantic in the 16<sup>th</sup> and 17<sup>th</sup> Centuries**

*Presenter:* Kaila Knight Schwartz  
*Advisor:* Karin Wulf  
William & Mary,  
History

Scholars of early New England naming practices long accepted the idea that they resulted from the peculiarities of puritan ideology, even as they questioned claims to a uniform system of New England naming. The consensus that the custom of parent-child name sharing, if not the variable preference for Old Testament names, was uniquely puritan, has remained. Yet, whether or not the onomastic choices of New England's first settlers represent a uniquely puritan practice remains uncertain, as previous analyses of naming in England have focused on the whole population rather than specifically on puritans. By exploring the names chosen by selected members of the British puritan gentry—a group broadly connected to the colonial Anglo-Atlantic world—this study aims to test the extent to which the founders of Plymouth and the Massachusetts Bay Colonies carried over onomastic traditions from England or created something new, and whether that something was English, puritan, both, or neither. Scholarly concern with this supposedly puritan tradition apparently originated with the claims of late nineteenth-century British cleric and antiquarian Charles Wareing Bardsley, who asserted that “the rage for Bible names dates from the decade 1560-1570,” which saw “the rise of Puritanism.” Bardsley also declared that “puritan” names remained more common in the United States than in Britain due to their persistence in New England and its pervasive cultural influence. Challenging Bardsley's claims will necessitate reframing our understanding of puritan identity and New England onomastics.

*Kaila Schwartz is a third-year Ph.D. candidate in the History Department at William & Mary. Her research interests include the social and cultural history of pre-twentieth-century America, historical memory, microhistory, digital humanities, quantitative history, puritans, and New England history. She holds a B.A. (History) from Brandeis University, an M.A./M.L.S. (History/Archives Management) from Simmons College, and an M.A. (History) from William & Mary.*

### **Show Me the Money! Philanthropy, Capitalism, and Public Science Education in Nineteenth-Century America**

*Presenter:* Kasey Marie Sease  
*Advisor:* Charles McGovern  
William & Mary,  
History

The foundations for America's present-day science museums and print publications were laid in the mid-to-late nineteenth century. During that time, public science education, or the communication of scientific information to lay audiences, was primarily institutionalized by philanthropic societies and public-serving corporations. However, the early efforts of these bodies were met with financial difficulties. It was not until these groups forged new relationships with the for-profit world that they succeeded in creating museums and publications capable of reaching wider audiences. By exploring documents chronicling the founding of science societies, Science magazine, and other contemporary sources of science instruction, this paper argues that not-for-profit science institutions aspired to offer Americans educational resources distinct from for-profit popularizers. Yet, to fund their operations, they relied on business donors, linked scientific knowledge with economic progress, and co-opted for-profit infrastructures. Ultimately, philanthropic networks put scientists in conversation with businessmen who used capital to support the creation and dissemination of scientific knowledge to the public. Despite the established body of literature on philanthropy and nonprofit corporations, historians of science museums and publications rarely contextualize their findings within the historiography of American capitalism. This paper demonstrates that public-serving organizations originated, operated, and dissolved within contemporary structures of industrial capitalism.

*Kasey Sease is a fifth-year Ph.D. candidate in the History Department at William & Mary. Her research examines the evolution of American capitalism and public science education in the modern United States. She holds an M.A. in History from William & Mary and a B.A. in History and Government from the University of Virginia.*



**The Language of Liberty: Petitioning  
for Freedom in Revolutionary  
Massachusetts, 1773-1777**

*Presenter:* Grant E. Stanton

*Advisor:* Daniel Richter

University of Pennsylvania,  
History

Throughout most of the seventeenth and eighteenth centuries, the notion in America that slavery was fundamentally wrong was at most an intuition. It was not until the 1760s that this intuition became a sentiment. And it was not until African Americans began tying patriotism to abolition that this sentiment became a movement. Examining how and why African Americans began challenging the institution of slavery as a group in revolutionary America, I use five petitions for freedom made in Massachusetts from 1773 to 1777 to gain insight into the early African American *mentalité*, and as a lens through which we may view how this oppressed group was able to engage with the patriotic dialectic project. Centrally arguing that these petitioners could claim as much ownership over the revolutionary moment and its language of liberty as the patriots, I address how effective these petitioners were, how we might better understand these appeals by situating them in their linguistic, social, and political context, and how we might best understand what discursive work these African Americans and their petitions were doing. By acquiring a more nuanced conception of how they operated in this intellectual milieu, and engaging in a close-textual analysis of these documents, I seek to uncover a key moment in history when African Americans first began seriously challenging their condition under slavery in mass.

*Grant E. Stanton is a first-year Ph.D. student in the History Department at the University of Pennsylvania. His primary research interests focus on early American intellectual history and Atlantic political-legal discourse in the Age of Revolutions. He holds a B.A. in History and Political Science from the University of California-Santa Barbara and an M.A. in the Social Sciences from the University of Chicago.*

## **Magnetic Orders in the Hole-Doped Three-Band Hubbard Model: Spin Spirals, Nematicity, and Ferromagnetic Domain Walls**

*Presenter:* Adam Chiciak  
*Co-Authors:* E. Vitali, H. Shi  
*Advisor:* Shiwei Zhang  
 William & Mary,  
 Physics

The copper-oxygen planes in cuprates have been at the center of the search for a theory of high-temperature superconductivity. We conduct an extensive study of the ground state of the three-band Hubbard (Emery) model in the underdoped regime. We focus on the magnetic and charge orders, and present results from generalized Hartree-Fock (GHF) calculations. The ground-state properties at the thermodynamic limit are challenging to pin down because of sensitivity to computational details, including the shapes and sizes of the supercells. We employ large-scale computations with various technical improvements to determine the orders within GHF. The ground state exhibits a rich phase diagram with hole doping as the charge transfer energy is varied, including ferromagnetic domain walls embedded in an antiferromagnetic background, spin spirals, and nematic order.

*Adam Chiciak is a fifth-year Ph.D. candidate in the Physics Department at William & Mary. His research is in computational modelling of cuprate superconductors using Hartree-Fock and Monte Carlo methods.*

## **Microstructural Engineering of the UV/ Near-UV Photocurrent Production in VO<sub>2</sub> Thin Film Based Detectors**

*Presenter:* Jason Creeden  
*Co-Authors:* S. Madaras, D. Beringer,  
 L. Novikova  
*Advisor:* R. Ale Lukaszew  
 William & Mary,  
 Physics

We sought to optimize the photosensitivity of VO<sub>2</sub> thin films in the near-UV (NUV) and UV regions after recent reports demonstrating it is possible to push the typical IR photoresponse of VO<sub>2</sub> into the visible spectrum via thin film growth on TiO<sub>2</sub>:Nb substrates. By controlling the microstructure of the films via deposition parameters and substrate doping, we optimize VO<sub>2</sub> growth for TiO<sub>2</sub> and TiO<sub>2</sub>:Nb substrates and compare their photocurrent response using 405 nm (NUV) and 254 nm (UV) light. We found that VO<sub>2</sub> on TiO<sub>2</sub>:Nb heterostructure demonstrates greater photocurrent response. By measuring the external quantum efficiency (EQE), we found a dramatic photosensitivity improvement for the VO<sub>2</sub> on TiO<sub>2</sub>:Nb compared to undoped TiO<sub>2</sub> substrates. Notably, we demonstrated greater than 100% EQE for VO<sub>2</sub> on TiO<sub>2</sub>:Nb for both wavelengths and an improvement in the EQE using UV in comparison to the NUV. Finally, we additionally propose a mechanism for this photoresponse which potentially allows for greater than 100% EQE.

*Jason Creeden is a fourth-year Ph.D. candidate in the Physics Department at William & Mary. His research area is in strongly correlated transition metal oxide materials namely vanadium dioxide. His work includes investigating the growth, epitaxy, microstructure, and photoconductive properties of this material. He holds a B.S. in Physics from Eastern Kentucky University and an M.S. in Physics from William & Mary.*



## Andreev Reflection in Graphene–Superconductor Junctions in the Quantum Hall Regime

*Presenter:* Joseph Jude Cuzzo  
*Co-Authors:* S. Thomas, X. Hu  
*Advisor:* Enrico Rossi  
William & Mary,  
Physics

We investigate the Andreev reflection at an interface between a graphene layer in the quantum Hall regime and a superconductor. In graphene due to the spin and valley degrees of freedom there is an approximate  $SU(4)$  symmetry. The breaking of this symmetry due to interactions and the Zeeman effect leads to a splitting of the Landau levels. In this talk I will discuss the effect on the Andreev reflection of the breaking of the Landau levels' spin and valley degeneracy. I will then show results for the Andreev reflection amplitude, and the Andreev reflection contribution to the interface conductance, for various degrees of transparency of the interface. Work supported by ARO and ONR.

*Joseph Cuzzo is a second-year Ph.D. student in the Physics Department at William & Mary. He is interested in topological systems and the pursuit of topological quantum computing. Specifically, the focus of his research is on Josephson junctions in high magnetic fields, and the role of Andreev reflection in such systems.*

## Tunable Dispersion via Four-Wave Mixing for Enhanced Laser Frequency Response

*Presenter:* Savannah L. Cuzzo  
*Advisor:* Eugeny Mikhailov  
William & Mary,  
Physics

Lasers are used for precision metrology, and by introducing a dispersive medium into the cavity, one can drastically enhance the sensitivity of such devices. We present experimental results demonstrating enhanced and suppressed lasing-frequency response to cavity-length variations in an active ring laser. Pumping on an N-type level scheme in  $^{87}\text{Rb}$ , we tune the cavity dispersion by varying experimental parameters, such as pump-laser frequency, atomic density, and pump power. As a result, we can control the sensitivity of the laser so that the lasing-frequency response to the empty cavity length change is increased greater than a factor of 2 in the enhanced regime and completely eliminated in the suppressed regime.

*Savannah Cuzzo is a second-year Ph.D. student in the Physics Department at William & Mary. She has broad interests in the field of quantum optics, specifically in its applications to precision metrology.*

## Potential Roughness Suppression in Microwave Chip Traps

*Presenter:* Shuangli Du  
*Co-Authors:* A. Rotunno, K. Sullivan  
*Advisor:* Seth Aubin  
 William & Mary,  
 Physics

Atom interferometers are the most precise instruments for measuring potentials and inertial forces, such as gravity and acceleration. We are developing a trapped atom interferometer system based on an atom chip. Unfortunately, magnetic chip trap potentials suffer from roughness due to imperfections in chip wire traces, which may impact interferometer performance. Fortunately, microwave magnetic traps based on AC Zeeman potentials are expected to suppress this roughness with respect to DC Zeeman potentials. We present numerical simulations of trapping potential variations due to chip wire trace imperfections. We model potential roughness with two different methods. In a first approach, we simplify the trace to a thin infinite wire with small current distortions and then compare the AC and DC Zeeman potentials produced by the same magnetic near-field. The second approach investigates the role of the AC skin effect. We construct a microstrip planar transmission line model with a variable conductivity patch and compute its near-field with a commercial electromagnetic simulation software (FEKO): we compare the roughness for high and low frequency fields. In both approaches, we find that the microwave trap suppresses the roughness from wire imperfections significantly. Work supported by NSF and in part by iDISPLA (ARL, Ft. Belvoir). We thank the W&M High Performance Computing group for use of their supercomputer cluster.

*Shuangli Du is a fourth-year Ph.D. candidate in the Physics Department at William & Mary. His research area is trapped atom interferometer.*

## Applications of Local Embedding and Effective Downfolding in the Auxiliary-Field Quantum Monte Carlo Method

*Presenter:* Brandon Kyle Eskridge  
*Advisor:* Henry Krakauer  
 William & Mary,  
 Physics

There has been much recent interest in low-dimensional carbon systems due to their interesting properties and promising applications in emerging technology. Inserting transition metal atoms into these systems alters their magnetic and electronic properties leading to a broad range of possible applications including quantum information processing and alternative energy among others. The study of these systems requires highly accurate calculations of their properties. Transition metal atoms are challenging to treat accurately due to strong electron-interaction effects. Furthermore, such calculations require significant computational resources placing practical limitations on the system size which can be treated. Motivated by the recent successful fabrication of long linear carbon chains (~6000 atoms long) confined within carbon nanotubes, we employ the auxiliary-field quantum Monte Carlo method, which has demonstrated a high degree of accuracy in systems with strong electron interaction effects, in order to study the properties of transition metal capped carbon chains within a 2-Dimensional carbon environment. Due to the high cost of performing such calculations, we have developed and implemented a local embedding and effective downfolding scheme, in which computational effort is focused on the most challenging spatial region within the system, in order to extend the effective system size which can be treated.

*Brandon Eskridge is a Ph.D. candidate in the Physics Department at William & Mary. His research is focused on computational methods for solving the quantum many-electron problem. He graduated summa cum laude with a B.S. in Physics from James Madison University.*

## **Measuring Charged Current Muon Neutrino Cross Sections in the MINERvA Experiment**

*Presenter:* Amy N. Filkins  
*Advisor:* Jeffrey Nelson  
William & Mary,  
Physics

In the field of experimental high energy physics there is a great effort being made to study neutrino oscillations, which is where the small neutral particle spontaneously switches between 3 different types while traveling at near light speeds. In an era of neutrino oscillation experiments based on ever improving technology and with ever improving statistics, it is important to understand the probabilities of neutrino interactions on nuclei at a variety of kinematics. The MINERvA experiment, which utilizes the NuMI neutrino beam at Fermilab, measures cross sections across multiple materials ranging from helium to lead, and is able to compare results to imperfect models of these nuclear effects. I will present a recent double differential cross section measurement of charged current muon-neutrino interactions in hydrocarbon, in variables of the longitudinal and transverse momenta of the muon. This result is advantageous for comparisons with theorists since it is done in well defined easily measurable variables, and is able to highlight various areas in which there are model deficiencies.

*Amy Filkins is a third-year Ph.D. student in the Physics Department at William & Mary. She received a B.A. in Physics from SUNY-Geneseo. She is a collaborator on the MINERvA experiment at Fermi National Accelerator Laboratory in Batavia, Illinois.*

## **Quantum Transport in Gapped Bilayer Graphene in the Presence of Long-Range Disorder**

*Presenter:* Christopher A. Hipp  
*Advisor:* Enrico Rossi  
William & Mary,  
Physics

In this work, we study the electron transport of gapped bilayer graphene in the presence of the long-range disorder due to charge impurities. For each disorder realization, we obtain the spatial carrier density profile of the ground state using a generalization of the Thomas-Fermi theory and then the conductance via a fully quantum mechanical approach. By considering several disorder realizations we obtain disorder-averaged results. We find that the disorder-induced carrier density inhomogeneities strongly affect the nature of the electronic transport. In addition, we find that the quantum mechanical treatment of the scattering problem leads to results that in some cases are qualitatively different from the results obtained via a semiclassical approach.

*Christopher Hipp is a fifth-year Ph.D. candidate in the Physics Department at William & Mary. He has a broad interest in condensed matter physics. One of his current studies is exploring the electron transport of gapped bilayer graphene in the presence of the long-range disorder due to charge impurities.*

## **An Infrared Investigation of the Insulator-to-Metal Transition in a Thin, Epitaxially Strained VO<sub>2</sub> Film**

*Presenter:* David James Lahneman  
*Co-Authors:* P. McArdle, T. Slusar, H. Kim  
*Advisor:* Mumtaz Qazilbash  
 William & Mary,  
 Physics

The insulator-to-metal transition temperature of vanadium dioxide (VO<sub>2</sub>) can be tuned through epitaxial strain induced by lattice mismatch between a thin VO<sub>2</sub> film and the substrate. Here we report infrared and optical measurements on a very thin (~10 nm) VO<sub>2</sub> film on (001) TiO<sub>2</sub> substrate with an insulator-to-metal transition temperature of ~305 K, just above room temperature. We map the transition as it evolves in temperature using near-field imaging at a wavelength of ~10μm from a mid-infrared laser. Using our tabletop home-built argon plasma light source, we obtain the broadband near-field infrared spectra on the pristine substrate and the film-substrate system.

*David Lahneman is a fifth-year Ph.D. candidate in the Physics Department at William & Mary. He is interested in experimental condensed matter physics specializing in nano-scale characterization of strongly correlated materials. He received his B.S. in Physics at Towson University.*

## **Ultrafast Response of Thin Film Vanadium Dioxide Grown on Titanium Dioxide Doped with Niobium**

*Presenter:* Scott Madaras  
*Co-Authors:* J. Creeden, D. Beringer, I. Novikova  
*Advisor:* R. Ale Lukazsew  
 William & Mary,  
 Physics

We have studied vanadium dioxide (VO<sub>2</sub>) films grown on titanium dioxide (TiO<sub>2</sub>) substrates to investigate the properties of the heterojunction that forms at the interface between substrate and film with the purpose of applying it as an UV photodetector. The use of niobium as dopant on TiO<sub>2</sub> substrates has been shown to favorably modify the energy levels at the heterojunction thus promoting photocurrent generation when illuminated with UV light. To further investigate this electronic structure modifications we study the ultrafast dynamics of the insulator-metal-transition (IMT) in such samples by using a pump probe configuration. The samples are pumped with ~150 fs pulses of 400nm wavelength light, and the changes in electronic structure of the heterojunction region are detected via change in relative optical reflectance ( $\Delta R/R$ ) of a 800nm probe light. The VO<sub>2</sub> on TiO<sub>2</sub>:Nb doped samples generate distinctive  $\Delta R/R$  effects compared with the VO<sub>2</sub> films deposited on plain TiO<sub>2</sub> substrates samples that are undoped.

*Scott Madaras is a fifth-year Ph.D. candidate in the Physics Department at William & Mary. His research area includes experimental testing and modeling of condensed matter, studying the behaviors of strongly correlated materials such as the transition metal oxide, vanadium dioxide. He uses optical techniques such as surface plasmon generation and ultrafast laser testing to explore vanadium dioxide behaviors.*

## **Quantitatively Accurate Numerical Modeling of Amplitude and Phase Contrast in Broadband Near-Field InfraRed Spectroscopy**

*Presenter:* Patrick McArdle  
*Co-Author:* D. Lahneman  
*Advisor:* Mumtaz Qazilbash  
 William & Mary,  
 Physics

Proper modeling of near field infrared spectroscopy data is critical to extracting useful material properties. Current analytical models make underlying assumptions about the probe geometry that makes their use applicable in only limited situations. When strong coupling between probe and sample exists, a more robust solution method must be used. A full-wave numerical method for calculating broadband demodulated near-field amplitude and phase contrast will be presented. Our method captures the probe geometry accurately and is thus essential for obtaining quantitative results free of underlying assumptions and tunable parameters. We will present simulation results on  $\text{SiO}_2$  and  $\text{SrTiO}_3$ , both of which exhibit surface phonon-polariton modes, and will compare the simulation results to experimental data. MMQ acknowledges support from NSF DMR-1255156. The simulation work was performed, in part, using computing facilities at the College of William and Mary which are supported by contributions from the National Science Foundation, the Commonwealth of Virginia Equipment Trust Fund, and the Office of Naval Research.

*Patrick McArdle is a fourth-year Ph.D. candidate in the Physics Department at William & Mary. His research involves numerical modeling of near-field infrared microscopy/spectroscopy.*

## **Phenomenology of 2HDM-Radion Mixing as Probe of a Compact Extra Dimension**

*Presenter:* Marco Antonio Merchand  
*Co-Authors:* C. Carone, T. Claringbold  
*Advisor:* Marc Sher  
 William & Mary,  
 Physics

The principle of Dirac naturalness tells us that, in any effective field theory, the coefficients of the terms appearing in the Lagrangian ought to be dimensionless numbers of order one multiplied by the appropriate power of the UV cutoff. If the Standard Model is valid up to the scale at which quantum gravity effects are important, the Planck scale  $M_P$ , then by naturalness, the Higgs mass is theoretically expected to be  $m_h = c M_P$  where  $c \sim \mathcal{O}(1)$  is a dimensionless number. The fact that the Large Hadron Collider found a Higgs boson with a mass 125 GeV means that there is a theoretical discrepancy of at least 16 orders of magnitude between theoretical expectation and experimental observation. This comes with the name of the Electroweak Hierarchy Problem and stands as one of the central puzzles in theoretical high energy physics. Randall and Sundrum devised a solution this problem by postulating a universe with one compact extra dimension. The extra dimension has two boundaries that are called 4D branes. If we live in the brane sitting at  $y = y_c$ , an exponential hierarchy between the fundamental scale and any mass scale in that brane is generated. By fixing the size of the compact extra dimension appropriately the hierarchy problem can be explained without fine tuning. The model predicts towers of new particles states starting at a few TeV and the stabilization mechanism generically predicts the appearance of a scalar boson, dubbed radion. We study the phenomenology of the scalar sector and use LHC data to constraint the parameter space of the model.

*Marco Merchand is a fifth-year Ph.D. candidate in the Physics Department at William & Mary. His research is in particle phenomenology and physics beyond the Standard Model. His current interests are models of flavor and inflationary dynamics of the early universe.*

## **Correcting Precision Electroweak Nuclear Physics Experiments for Beam Parameter Fluctuations**

*Presenter:* Victoria Owen  
*Advisor:* David Armstrong  
William & Mary,  
Physics

The Lead Radius Experiment (PREX) at Jefferson Lab will use a helicity correlated electron beam to access the nuclear weak interaction and measure a parity-violating asymmetry to extract the neutron skin of lead-208. Because of the high-precision nature of this experiment, understanding and correcting for false asymmetries is crucial. One category of these false asymmetries can arise from fluctuations in the beam's position, angle, and energy parameters. By intentionally modulating these parameters and evaluating the false asymmetries that result, a well understood correction can be subtracted from the main measurement. The beam modulation system's preparation efforts and progress will be discussed.

*Victoria Owen is a third-year Ph.D. candidate in the Physics Department at William & Mary. She specializes in parity-violating experimental nuclear physics happening at Jefferson Lab and is currently participating in efforts to prepare an upcoming experiment.*

## **Beam Particle Tracking for MUSE at PSI**

*Presenter:* Tanvi Patel  
*Co-Author:* J. Nazeer  
*Advisor:* Michael Kohl  
Hampton University,  
Physics

The Muon Scattering Experiment (MUSE) at Paul Scherrer Institute (PSI) is being prepared to resolve the proton radius puzzle—the six-standard deviation discrepancy between proton charge radius measurements with electronic and muonic probes, respectively. MUSE is designed to measure the proton charge radius with elastic electrons and muons scattering simultaneously and with both charge polarities. For an accurate determination of the lepton scattering angle, event-by-event beam particle tracking is required to reconstruct the incoming particle track. A telescope of Gas Electron Multipliers (GEM), exposed to a high flux of beam particles is used to reconstruct the incoming tracks with high spatial resolution while representing minimal material for the beam to pass through. The status of the GEM performance will be reported. This work has been supported by NSF awards HRD-1649909 and PHY-1812402.

*Tanvi Patel is a second-year M.S. student in the Physics Department at Hampton University. Her research is in the nuclear physics area. Her focus is on Muon Scattering Experiment (MUSE) at Paul Scherrer Institute (PSI) in Switzerland to obtain proton charge radius by elastic scattering of electron-proton and muon-proton.*

## Sensitivity Beyond the Shot-Noise Limit Using a Simplified SU (1,1) Interferometer

*Presenter:* Nikunj Kumar Prajapati  
*Co-Authors:* N. Super, R. Lanning, J. Dowling  
*Advisor:* Irina Novikova  
 William & Mary,  
 Physics

We look to show increased signal-to-noise in a simplified SU (1,1) interferometer. While conventional interferometers use beam cubes to separate a beam and recombine it with itself to produce an interference pattern, the SU (1,1) interferometer uses two sets of atoms instead. By passing a probe and pump beam through hot Rb atoms, we can produce an effect known as four-wave mixing (FWM). FWM is a non-linear response to the input beams which results in the amplification of the probe beam and the generation of a new, Stokes, beam. The process adds the probe and Stokes photons as pairs, so they share noise fluctuations. This is advantageous when looking at the differential between the two beams since the shared noises of the beams negate each other which results in a decrease in noise. Taking an additional step, the three beams can be passed through a second set of Rb atoms, where FWM also occurs, to produce an interference between the probe and Stokes beams. Since the photons being interfered here are highly correlated, this results in high resolution phase measurements. Previously, a group had shown that the secondary group of atoms is not necessary for the increased sensitivity, but still required the use of two sets of balanced detectors. We are working to further simplify the interference detection so that a single balanced detector may be used. This will then be used to measure the level of entanglement of our beams. What's more, the experiment sets the stage for generating herald polarization bell states which are entangled states sought after for quantum communication.

*Nikunj (Nik) Prajapati is a fourth-year Ph.D candidate in the Physics Department at William & Mary. His research interests include quantum information technologies. His recent work has addressed the shape manipulation of light, optical quantum memory, and noise sensitivity beyond the shot-noise limit. He is currently working to simplify a SU (1,1) interferometer to use fewer elements.*

## Studying $K_S \rightarrow K^* \rightarrow K\pi$ Transition Form Factors Using Lattice QCD

*Presenter:* Archana Radhakrishnan  
*Advisor:* Josef Dudek  
 William & Mary,  
 Physics

Quantum Chromodynamics (QCD) has been experimentally shown to be the underlying theory of the strong nuclear force. It describes fundamental particles known as quarks and gluons, which bind together to form hadrons, these composite particles, like the proton and neutron, feel the strong nuclear force. In QCD quarks and gluons are strongly coupled to each other, this makes standard techniques used to solve electrodynamics or the weak force ineffective. Thus, understanding QCD theoretically still remains an unsolved problem. Additionally, many of the hadrons are not stable asymptotic states but rather appear as resonances which can be produced but which then decay rapidly into lighter, stable hadrons. A useful tool to understand the quark substructure of hadrons is to consider their electromagnetic transitions. We use the approach of Lattice QCD (LQCD) to understand QCD theoretically. LQCD considers the quark and gluon fields of QCD on a space-time grid of finite volume, solving the relevant equations by sampling possible field configurations. We will study the  $K^*$  resonance in the process  $K_S \rightarrow K^* \rightarrow K\pi$  using LQCD.

*Archana Radhakrishnan is a third-year Ph.D. candidate in the Physics Department at William & Mary. Her research focuses on nuclear and particle physics. She holds a B.Tech in Engineering Physics from the National Institute of Technology in Calicut, India, and an M.S. in Physics from William & Mary.*



## Radiofrequency AC Zeeman Force for Ultracold Atoms

*Presenter:* Andrew P. Rotunno  
*Co-Author:* S. Du  
*Advisor:* Seth Aubin  
 William & Mary,  
 Physics

We report on progress investigating the AC Zeeman force generated by radiofrequency (RF) currents on an atom chip. The alternating current (AC) Zeeman force can target individual spin states with a resonant and bipolar force utilizing the magnetic near-field gradient supplied by atom microchip currents. Such a force is useful in state-dependent atom interferometry, state-specific trapping, and forced sympathetic evaporative cooling. Previous work has confirmed predictions of dressed-atom theory with two-state, inter- hyperfine manifold transitions for Rb-87 at 6.8 GHz. In a recent experiment, we work to quantify this force for transitions using radio frequencies (few MHz) within a hyperfine manifold, in particular the five-state F2 manifold of Rb-87. Advantages of the intra-manifold transition include the potential for higher power efficiency and lower loss for low frequencies, as well as forbidding certain transition polarizations, (i.e.  $\pi$  and  $\sigma^-$ ) allowing only one type ( $\sigma^+$ ), leading to simpler calculations and suppression of unwanted transitions. We present force data, along with unusual features in the data due to other effects, including DC magnetic gradients, imaging techniques, and force accumulation from initial and final frequency sweeps. Alongside force measurements, we look ahead by simulating multiple schemes for RF neutral atom trapping, which requires multiple current traces with controlled phase and power differences. Precise simulations require considerations of the AC skin and proximity effects for RF current in atom chip wires.

*Andrew Rotunno is a fifth-year Ph.D. candidate in the Physics Department at William & Mary. In Seth Aubin's Ultracold Atom Lab, he uses cold rubidium atoms to probe the quantum nature of atoms. This work was supported by the National Science Foundation.*

## Searching for Exotic Mesons in the Five-Pion Decay Mode at GlueX

*Presenter:* Amy Marie Schertz  
*Advisor:* Justin Stevens  
 William & Mary,  
 Physics

A key goal of nuclear physics research is to understand how quarks and gluons, the fundamental components of nuclear matter, come together to form the hadrons we observe experimentally, such as protons and neutrons. The behavior of quarks and gluons is governed by the theory of strong interactions called Quantum Chromodynamics (QCD). Hadrons are generally observed as either bound states of three quarks (baryons), or as bound quark-antiquark pairs (mesons). However, theoretical QCD calculations predict the existence of more exotic states. One type of exotic state is a hybrid meson, which contains an excited gluonic field as well as the traditional quark-antiquark pair, which allows it to have combinations of quantum numbers that are not accessible to a quark-antiquark pair. The Gluonic Excitation (GlueX) experiment at Jefferson Lab is searching for exotic states and will map the pattern of the light-quark meson spectrum. This pattern will enable us to make a much stronger statement on the existence of hybrids than previous studies, and will give new insight into how quarks and gluons bind themselves into the states that we observe in nature. My research focuses on the  $\gamma p \rightarrow \pi^+ \pi^+ \pi^- \pi^- \pi^0 \pi$  channel in the GlueX data, where a hybrid candidate, the exotic  $\pi_1(1600)$  meson, is predicted. A partial-wave analysis of the five-pion data will reveal the quantum numbers and decay properties of the resonances contributing to that final state, which will be key entries in GlueX's map of the light meson spectrum.

*Amy Schertz is a fourth-year Ph.D. candidate in the Physics Department at William & Mary. Her research area is experimental nuclear physics, where she is involved in the search for exotic mesons at GlueX. She holds a B.S. in Physics from the University of Puget Sound and an M.S. in Physics from William & Mary.*

## Phase Diagram of the Two-Dimensional Hubbard Model

*Presenter:* Hao Xu

*Advisor:* Shiwei Zhang

William & Mary,  
Physics

My research uses the Auxiliary Field Quantum Monte Carlo (AFQMC) method to compute the two-dimensional hubbard model, which is very important in condensed matter physics. Using the independent particle self-consistent method, we can get a very accurate result. I also study the spin and charge gap of the model to determine if the phase is metal or insulator.

*Hao Xu is a fourth-year Ph.D. candidate in the Physics Department at William & Mary. His research area is computational condensed matter physics. He got his bachelor's degree in Physics at the University of Science and Technology of China in 2015.*



### Effects of an Orexin-2 Receptor Agonist on Attention Following Loss of Cortical Cholinergic Inputs

**Presenter:** Sarah Anne Blumenthal  
**Advisor:** Josh Burk  
 William & Mary,  
 Psychological Sciences

Deterioration to the basal forebrain cholinergic system is linked to age-related cognitive impairment, specifically to the pathology of Alzheimer's disease. Animals with basal forebrain cholinergic damage or deterioration perform poorly on learning, memory, and attention tasks, indicating cognitive deficits. The orexin neuropeptide system, comprised of two neuropeptides (orexin A and orexin B), has also been implicated in the cognitive decline associated with aging, likely due to the role of orexins in promoting attention. Two orexin receptor subtypes exist, orexin 1 (Ox1R) and orexin 2 (Ox2R). Studies have examined the effects of stimulation and blockage of both receptors together and Ox1R alone on attention; but no studies have examined the role of Ox2Rs in attention through the use of Ox2R agonists. Ox2Rs may be implicated in attentional processes and the loss of orexin neurons seen in age-related cognitive decline, such as Alzheimer's disease. In order to examine the role of Ox2R in attention, the present study used the Ox2R agonist, YNT-185, in a rodent model of basal forebrain cholinergic system deterioration as seen in Alzheimer's disease. Rats were placed in an attention task following infusions of YNT-185 (0, 1, 10, or 100 nM) to the lateral ventricle and their attentional performance assessed. Data collection is ongoing, but YNT-185 is expected to improve attentional performance in rats with deterioration of cortical cholinergic inputs.

*Sarah Blumenthal is a second-year M.S. candidate in the Psychological Sciences Department at William & Mary. Her research applies behavioral neuropharmacological approaches to assess attention in rodent models. Her interests include the neural mechanisms underlying cognition, reward-processing, and aging. She received her B.A. in Psychology and German from Wake Forest University.*



### Large-Scale Evaluation of Infants' Looking Patterns to Dynamic Audiovisual Displays

**Presenter:** Madeleine D. Bruce  
**Co-Author:** T. McFayden  
**Advisor:** Robin Panneton  
 Virginia Tech,  
 Psychology

Social attention during infancy has important implications across developmental domains. Research has shown that when looking at static faces, infants typically attend more to the eyes than to other facial areas (e.g., the mouth). However, static faces are limited in their ability to represent the everyday interactions infants naturally encounter. Thus, our primary objective was to examine infants' social attention patterns using dynamic presentations of speakers. Methods: A meta-analysis of scanning patterns across studies involving 103 infants (11-15 months) was conducted. Each infant observed visually dynamic presentations of a female speaker in an infant-directed style (using a Tobii-T60 eye-tracker). Infants experienced trials where the voice track a) aligned with the speakers' movements (congruent), b) did not align with the speakers' movements (incongruent), and c) was not played (silent). The areas of interest (AOIs) included the eyes and the mouth regions. Results: During congruent trials, infants looked significantly more at the mouth ( $F(1,102)=7.33$ ,  $p=.008$ ;  $\eta^2=.07$ ); 62% showed more attention to the mouth region. During silent trials, no differential attention to eye v. mouth region was seen ( $F(1, 35)=.79$ ,  $p=.38$ ;  $\eta^2=.02$ ), and for incongruent trials, infants attended more to the eyes ( $F(1,11)=13.25$ ,  $p=.004$ ;  $\eta^2=.55$ ). Conclusion: In normal interactions, attention to the mouth is high and not driven purely by movement. We interpret this pattern as indicative of infants' emergent sensitivity to social cues and their relevance for directing/maintaining attention.

*Madeleine Bruce is a second-year Ph.D. candidate in the Psychology Department at Virginia Tech. She holds a B.S. (Psychology) from Indiana University and an M.S. (Marriage and Family Therapy) from Northwestern University. Her research centers around the study of infancy and early childhood, with an emphasis on language, attention, and social development among socioeconomically diverse populations.*

### **The Chills As a Unique Sensational Response to Inspiration**

*Presenter:* Yi Cui  
*Advisor:* Todd Thrash  
William & Mary,  
Psychological Sciences

Evocation, transcendence and approach motivation are three core characteristics of inspiration (Thrash & Elliot, 2003, 2004). Research suggested that activated positive affect was the strongest correlate of inspiration. As evidenced by the Positive and Negative Schedule, the inspired state was nested within positive affect. In order to provide additional evidence in supporting the discriminant validity of inspiration and activated positive affect, we aim to identify the unique chill sensations of inspiration. Previous research explored the content universe of chills and identified two factorially distinct clusters of chills: goosetingles (goosebumps and tingling) and coldshivers (coldness and shivers). Notably, goosetingles was correlated strongly ( $r = .84$ ) with self-actualization. The manifestation of inspiration in self-actualization is twofold. First, self-actualization transcends basic physiological and psychological needs (transcendence). Second, self-actualization involves the motivation to fulfill one's potential (approach motivation). Moreover, self-actualization was proposed to be functionally dependent on creativity; the creative process was found to be the unique consequence of inspiration. Taken together, there exist potential associations among self-actualization, inspiration and goosetingles. We hypothesize that controlling activated positive affect, inspiration would be associated positively with goosetingles; controlling inspiration, activated positive affect would be unrelated to goosetingles.

*Yi Cui is a first-year M.S. student in the Psychological Sciences Department at William & Mary. He graduated from University of Rochester in 2017 with B.A. in Psychology and Financial Economics. His research interests in Social Psychology include personality traits, motivation and inspiration.*

### **Estimation of the Correlation via the Bootstrap: Non-Normal Distributions**

*Presenter:* John Mart Vergara DelosReyes  
*Advisor:* Miguel Padilla  
Old Dominion University,  
Psychology

Replication of results is a critical aspect of scientific research. However, a collaboration of researchers attempted to replicate 100 studies and found a 36% - 47% replication rate; an issue that threatens scientific credibility. A way to address this issue suggested in the literature is to use effect sizes in addition to hypothesis testing. The correlation is an excellent candidate given its popularity and ability to be used as an effect size. However, research on the correlation's properties in this capacity is limited and contradictory. It is widely accepted that the correlation is robust to the normality assumption. However, that conclusion is based on previous research that focuses on controlling Type I error when the correlation is zero. It is well known that the correlation is normally distributed when it is zero. What is unknown is how well the correlation is estimated when it is not zero. To address this gap, the bootstrapped correlation at multiple nonzero values and its corresponding confidence intervals will be investigated for non-normal distributions via a Monte Carlo simulation. These bootstrapped correlations will be assessed for bias, precision, and coverage probability. It is expected that the bootstrapped correlation will perform well in all but the most skewed and kurtotic distribution conditions. If this is the case, then the correlation and its confidence interval can be used as an effect size.

*John Mart DelosReyes is a Ph.D. student in the Psychology Department at Old Dominion University. He has a broad interest in quantitative methodology and its application to psychological research. He is currently exploring the application of statistical simulations to determine the limitations of current statistical methods in order to improve upon them.*

### **Automatic Approach and Avoidance Tendencies to Healthy and Unhealthy Foods in Food Neophobic Children**

*Presenter:* Repairer Etuk  
*Advisor:* Catherine Forestell  
William & Mary,  
Psychological Sciences

Food Neophobia (fear of eating new foods) in children has been associated with a lack of a balanced diet, especially in regard to fruit and vegetable consumption. Previous research has found that unfamiliar foods may induce feelings of threat or anxiety, which in turn may cause children to avoid these foods. We will use the Approach-Avoidance task (AAT) to measure children's automatic behavioral approach and avoidance tendencies to unfamiliar and familiar fruit, vegetables, and desserts in young children (age 7-10 years). Dessert items will be included in the AAT to test if neophobic children are quicker to avoid only the unfamiliar healthy food items (fruit and vegetables) or are faster to avoid all types of unfamiliar food items. We hypothesize that during the AAT, neophobic children will be quicker to avoid and slower to approach the novel healthy foods in comparison to children who are not food neophobic. Additionally, we hypothesize that during the AAT, all children will be faster in approaching dessert food items regardless of their familiarity.

*Repairer Etuk is a second-year M.S. candidate in the Psychological Sciences Department at William & Mary. His research areas include eating habits in children and adults. He is currently exploring food neophobia and its effects on children's food consumption. He holds a B.A. (Psychology) from the University of Texas at Austin.*

### **The Use of Behavior Skills Training and Behaviorally Based Interventions in Memory Care**

*Presenter:* Claire Noel Gallagher  
*Co-Authors:* T. Stokes, T. Zinn  
*Advisor:* Daniel Holt  
James Madison University,  
Psychological Sciences

The current study examines the effects of using Behavior Skills Training (BST), an evidenced-based practice for teaching, to train direct care staff members in a Memory Care Community to employ a multi-component, behaviorally-based intervention with residents that have a memory impairment. This study utilizes single case methodology with a stacked AB design replicated across three staff members, three residents, and three transition environments. The design is comprised of a baseline condition, training with BST, a post-training condition with in-vivo coaching, and a maintenance probe. Anticipated results include an increase in the percent independence with which staff participants accurately complete the task analysis of interaction behaviors, as well as an increase in the percent occurrence of resident participants engaging in pro-social skills, such as answering questions, complying with demands, and attending community activities with zero instances of problem behavior. It is the expectation of the researcher that the results of this study will add to the paucity of literature on the use of Applied Behavior Analysis in the field of Behavioral Gerontology and with aging individuals who have dementia and, furthermore, expand upon growing evidence of the use of Applied Behavior Analysis in novel environments as a method of increasing the efficacy of service provision across varying populations.

*Claire Gallagher is second-year M.S. student in the Psychological Sciences-Applied Behavior Analysis program at James Madison University. Her applied work is with children with intellectual and developmental disabilities and her research includes Organizational Behavior Management, PCIT, and the application of ABA in novel settings including in consort with biofeedback technology and as an evidenced-based treatment for the behavioral symptomatology of dementia.*

### **How Paternal Contact Affects School Success in Children with Incarcerated Mothers**

*Presenter:* Daryl Rosenblum Hesse  
*Advisor:* Danielle Dallaire  
William & Mary,  
Psychological Sciences

Parental involvement provides advantages for children in school. It is related to educational attainment, as it improves language and social development (Barnard, 2004; Grolnick & Slowiaczek, 1994). Specifically, paternal involvement predicts success because it reduces emotional and behavioral problems in children (Jeynes, 2015; King, 1994). Children with incarcerated parents face unique challenges in school. Teachers expect greater behavior problems from these students (Wildeman, Scardmalia, Walsh, O'Brien, & Brew, 2017). Children with incarcerated mothers struggle with school attendance, as home environments are more volatile (Dallaire, Ciccone, Wilson, & 2010; Dallaire, 2007). Research has yet to investigate the importance of paternal relationships in the academic success of school-aged children with incarcerated mothers. The current study addresses this subject. Seventy-two children, their incarcerated mothers, caregivers, and teachers participated. Paternal contact was reported by incarcerated mother and caregiver. Academic performance was assessed using the Teacher Report Form (TRF; Achenbach, 1991). Children with paternal contact had higher TRF academic performance scores than children without contact. This difference was significant for mother-reported contact with father,  $t(71) = -2.29$ ,  $p = .025$ . It was marginally significant for caregiver-reported contact with father  $t(71) = -1.90$ ,  $p = .062$ . Results suggest that contact with fathers, even in the absence of cohabitation, may serve as a protective factor for school success in children with incarcerated mothers.

*Daryl Rosenblum Hesse is a first-year M.S. student in the Psychological Sciences Department at William & Mary. Her research interests include social and emotional development, parent-child communication, and attachment theory. She is currently investigating individual, relationship, and social factors that influence school performance in children with incarcerated parents. She holds a B.A. in Psychology from the University of Notre Dame.*

### **When Your (Social) World Changes: Exploring the Role of Relational Mobility in Social Adjustment**

*Presenter:* Lauren C. Howard  
*Advisor:* Joanna Schug  
William & Mary,  
Psychological Sciences

How much does the social environment around us influence our well-being and our ability to form relationships? We approached this question using the socio-ecological construct of relational mobility. Relational mobility, or the amount of fluidity in interpersonal relationships, differs based on the society, influences interpersonal behaviors, and affects how relationships are best formed and maintained. In our initial research, we explored the influence of relational mobility on marginalized groups in the US and Japan and found that the social environment played a role distinct from individual capability of forming relationships. Next, we ask the question: what happens when the social environment changes? In this study, we seek to elucidate the roles relational mobility, personal mobility, and social efficacy play in adaptive and maladaptive social adjustment.

*Lauren Howard is a second-year M.S. candidate in the Psychological Sciences Department at William & Mary. Her research areas include well-being in cross-cultural contexts, psychopathology within ethnic minority groups, and social ecology. She is currently exploring the influence of individual factors on adjustment in environments with high relational fluidity. She holds a B.S. (Psychology and Asian Studies) from the University of North Carolina at Chapel Hill.*

### **A Daily Diary Investigation of the Effects of Stress on the Eating Behavior of Adolescents**

*Presenter:* Ti Hsu  
*Advisor:* Elizabeth Raposa  
William & Mary,  
Psychological Sciences

Unhealthy eating behaviors, such as intentionally restricting food intake to control body weight, or consuming more calories to satisfy emotional needs, are associated with risk for a variety of health problems, including obesity and eating disorders. One mechanism which has been extensively linked to these unhealthy eating behaviors is stress. Most past studies have relied on laboratory simulations of acute stress and their effects on eating behavior, or self-report, retrospective surveys on stress and eating. These studies have also tended to focus exclusively on adults who are diagnosed with or at risk for eating disorders, or those who are obese. Few studies to date have examined the relationship between unhealthy eating behaviors and stress in healthy adolescents. The current study utilized within-person longitudinal data from daily diary surveys to investigate the associations between daily perceived stress, negative daily events, and unhealthy eating behaviors in a sample of 69 adolescents. Hierarchical linear models showed that higher than usual perceived stress results in an increased likelihood of endorsing emotional eating acts. Findings indicate the influence of perceived stress on unhealthy eating behaviors, with implications for interventions in community populations of adolescents.

*Ti Hsu is a first-year M.S. student in the Department of Psychological Sciences at William & Mary. Her research interests involve the effects of cultural influences on developmental processes and outcomes, especially the development of internalizing disorders such as anxiety and depression. Her current research focuses on the effects of stress on eating and learning in adolescents.*

### **First Generation Study: Stress, Depression, and Academic Success**

*Presenter:* Bendu Jackson  
*Advisor:* Chris Conway  
William & Mary,  
Psychological Sciences

First generation undergraduate students are on average at a disadvantage when it comes to their family support, socioeconomic background, knowledge about college, being academically prepared (Jenkins, Belanger, Connally, Boals, & Durón, 2013). They are more likely to have higher levels of stress, depressive symptoms, and lower ratings of belonging (Stebbleton, Soria, & Huesman, 2014). Universities need to conduct more research in hopes of understanding the needs of these students and helping them succeed academically and in their future endeavors after college. Data collection is underway and thus far the sample is three hundred high school seniors who have been accepted to a 4-year college/university as first-generation college students. Data collection is expected to be complete by the time of the grad research symposium. Our main aim is assessing stress, demographic variables, and depression in first-generation students in relation to their academic success. We hypothesize that first-generation racial/ethnic minority students will have higher stress levels than first-generation white students. We also hypothesize that stress causes depression and that social/familial/financial support will be moderators of the predictive association between stress and depression. An ANOVA, T-test, and HLM will be conducted. We anticipate that first-generation racial/ethnic minority students will have higher stress levels than first-generation white students, and social/familial/financial support in first-generation college students will be moderators of stress and depression.

*Bendu Jackson is a first-year M.S. student in the Psychological Sciences Department at William & Mary. Her research interest include well-being, depression, anxiety, and racial/ethnic minority issues. She holds a B.S. (Psychology with a Concentration in Clinical Psychology) from George Mason University.*

### **Be a Friend to Meet a Friend? The Role of Relational Mobility and Extroversion on Friendship Formation**

*Presenter:* Caroline Jordan  
*Advisor:* Joanna Schug  
William & Mary,  
Psychological Sciences

Although interpersonal relationships are universally vital to social adaptation, socio-ecological contexts may heavily influence the perception, experience, and number of friendships. We utilize the socio-ecological measure of relational mobility, or the amount of perceived opportunity in one's environment to dissolve old relationships and form new ones to address the question: to what extent do culture and personality together influence the frequency of meeting a new friend? Relational mobility differs between societies, and predicts cross-cultural differences in interpersonal relationships, such as level of perceived self-friend similarity. On an individual level, perceived relational mobility moderates the relationship between motivation to form new friendships, and the number of relationships formed. In this current study, we seek to explain the interaction of relational mobility and trait level extraversion in predicting the frequency of meeting new friends.

*Caroline Jordan is a first-year M.S. student in the Psychological Sciences Department at William & Mary. Her research interests include socio-ecological approaches to cross-cultural psychology and interpersonal relationships. She holds a B.A. in Psychology from the University of Virginia.*

### **Predicting Bias Against ASD Individuals in the University Environment**

*Presenter:* Joshua Lipson  
*Co-Authors:* C. Taylor, C. Borja  
*Advisor:* Cheryl Dickter  
William & Mary,  
Psychological Sciences

**Background:** An increasing number of young people with an Autism Spectrum Disorder (ASD) diagnosis are entering the university population, but little research has examined bias that these individuals may experience in the university setting. **Objectives:** This study assessed bias against ASD individuals, by examining whether interacting with an individual students believed to be autistic would influence their judgments of and behaviors toward the individual. We also measured both explicit and implicit bias, as well as the relationship between bias and interaction behavior. **Methods:** The participants were 112 William and Mary undergraduates. In Part 1 of the study, participants completed an explicit measure of attitudes toward ASD, as well as a test to measure implicit biases against individuals with ASD. During Part 2 of the study, participants spent 3 minutes interacting with a trained confederate who displayed behaviors consistent with or inconsistent with ASD. Depending on the condition, the participant was led to believe that either the confederate belonged to a fictitious ASD Club or a non-ASD club. **Conclusions:** We found an overall negative implicit bias against ASD individuals but overall positive explicit attitudes towards ASD individuals. Implicit attitudes were also associated with non-verbal behavior, but this relationship differed as a function of whether participants thought they were interacting with an ASD individual or not. This work has implications for the experience of college students on the Autism Spectrum.

*Josh Lipson is a first-year M.S. student in the Psychological Sciences Department at William & Mary. He works with Professors Cheryl Dickter and Josh Burk at the William & Mary Autism Lab. He holds an A.B. from Harvard in Near Eastern Languages and Civilizations.*



### **A Longitudinal Examination of the Effects of Parental Emotion Socialization on Adolescent Anxiety**

*Presenter:* Molly Elizabeth Miller  
*Advisor:* Janice Zeman  
William & Mary,  
Psychological Sciences

Children learn to regulate their emotions based on different social cues, particularly through emotion socialization practices from their parents. Children who suffer from anxiety often experience difficulties managing intense feelings of worry (Suveg & Zeman, 2004). Research indicates relations between parent emotion socialization and child anxiety such that mothers of children with anxiety often express less emotion, exhibit more controlling behaviors, and encourage maladaptive coping strategies (Suveg et al., 2004). To our knowledge, research has not investigated the direction of effects between emotion socialization of worry and child anxiety. The current study examined relations between parental emotion socialization of worry and child anxiety at three time points over 4 years. Participants were 96 youth (M age = 13 years) who completed anxiety and depression measures. Parents reported on socialization responses to their child's worry. Results from regression analyses indicated parental distraction predicted less Time 2 anxiety. Parental magnification of worry predicted more anxiety whereas validation of worry predicted less Time 3 anxiety. When examining the opposite direction of effects, childhood anxiety was a nonsignificant predictor of parental worry socialization. These results provide evidence that the relation between parental worry socialization and child anxiety may not be bidirectional. Additionally, results highlight potential harmful effects of unsupportive emotion socialization responses and the positive impact of validating worry in decreasing anxiety.

*Molly Miller is a first-year M.S. student in the Psychological Sciences Department at William & Mary. Advised by Dr. Janice Zeman, Molly investigates the relationship between parent and peer emotion socialization and its effects of adolescent anxiety. Upon completion of her M.S., she plans to continue this line of research in a Child Clinical Psychology doctoral program.*

### **Mentoring Characteristics in a Bi-National Sample**

*Presenter:* Nyx Robey  
*Advisor:* Elizabeth Raposa  
William & Mary,  
Psychological Sciences

Research suggests that volunteer motivations can influence the impact of volunteer experiences (Dwyer et al., 2013; Hynes & Nykiel, 2004). The current study explored how volunteer mentors' expectations and motivations at baseline influenced the quality of mentor-youth relationships, given the importance of a genuine, caring mentor-youth relationship in these interventions. Participants included 1240 college student mentors randomly assigned to youth grades 3-8 in nationwide mentoring programs in the United States and Mexico. Mentors provided baseline information about their mentoring motivations and expectations about the relationship. Both youth and mentors completed follow-up surveys about relationship quality (Fraley et al., 2011; Rhodes et al., 2014) after one academic year of mentoring. Linear regression analyses were used covarying for demographics and baseline statistics. We looked across samples in the U.S. and Mexico. Preliminary results found that certain mentoring expectations, goals and motivations to volunteer and to mentor had a negative impact on relationship satisfaction as reported by both the mentor and the youth. Our findings have strong implications for training mentors and understanding what factors mentors bring into a relationship from the very beginning.

*Nyx Robey is a first-year M.S. student in the Psychological Sciences Department at William & Mary. Her research interests include dissemination and implementation science in psychological research, including the systems and organizational factors that ensure an intervention's success, particularly within diverse populations of youth. She holds a B.A. from the University of California-Berkeley.*

### **Age-Related Differences in Inhibition: Investigation of Simon and Flanker Conflicts in ERPs**

*Presenter:* Rachel Scrivano  
*Advisor:* Paul Kieffaber  
William & Mary,  
Psychological Sciences

It is unclear whether or not older adults have more difficulty inhibiting distracting stimuli as compared to younger adults. Age effects regarding inhibition and attention have been studied using many tasks, including the Stroop task, the Go/No-Go task, the Simon task, and the Flanker task. However, there are inconsistent findings to support age-related differences in inhibition in both behavioral and EEG data for the Simon and Flanker tasks specifically. It has recently been suggested that inhibitory processing is not a unitary mechanism, meaning that these two tasks may activate different brain regions, despite both eliciting inhibitory processes. However, studies have not extensively evaluated the relation between these two tasks, nor have they combined them to measure interaction effects in young and older adults. Therefore, the present study seeks to investigate age-related differences between brain activity during a combined Simon and Flanker task. It is hypothesized that older have an increased reaction time in both conflict types, increased errors, and generally reduced ERP amplitudes as compared to younger adults.

*Rachel Scrivano is a second-year M.S. student in Psychological Sciences Department at William & Mary. She has a broad interest in adult development and aging, particularly understanding the mechanisms behind decline and its associations to other factors. Rachel is currently investigating age-related inhibitory function by measuring cognitive processes via ERPs.*

### **Measuring Social Value**

*Presenter:* Kelsey A. Shaffer  
*Advisor:* Joanna Schug  
William & Mary,  
Psychological Sciences

When interacting with another person, how do we decide what to do? In our decision, there are the properties of the situation and the properties of the other person to consider. My research focuses on how the attributes of the other person impact what we should do and how we are able to make these types of social decisions instantaneously. In social decision-making contexts, welfare tradeoff ratios (WTRs; Tooby, Cosmides, Sell, Lieberman, & Sznycer, 2008) are used as a measure of how individuals weigh what is good for them with what is good for the other person and actually predict their social decision-making. While we have an instrument to measure WTRs, our current instrument may be limiting how we study welfare tradeoffs and social value more generally. The present research tests a new model of measurement for WTRs; we expect to find that this modified measure does not produce WTRs that differ significantly from those produced by the original measure. This work has implications for many fields that seek to understand social decisions (psychology, economics, etc.) as well as a wide domain of human behavior including generosity, forgiveness, anger and aggression, and gratitude.

*Kelsey Shaffer is a second-year M.S. student in the Psychological Sciences Department at William & Mary. Her research interests broadly encompass evolutionary psychology and the study of close relationships.*

### **Overlapping Maps: Exploring the Geographical Interplay of Personality Profiles and Political Orientation**

*Presenter:* Tianfang Yang

*Advisor:* Xiaowen Xu

William & Mary,

Psychological Sciences

Previous research has found systematic regional differences in Big Five personality traits among the US population. Specifically, Big Five personality among the 50 US states can be clustered by region into three types of personality profiles: Friendly & Conventional (Midwest/South), Relaxed & Creative (West/Mid-Atlantic) and Temperamental & Uninhibited (Northeast/Texas). Our study aims to expand the scope of these findings by 1) Examining the regional differences in Big Five personalities at the aspect-level, and 2) Exploring whether there are regional differences in personality profiles due to the general political leaning of the region. A sample of  $N = 3218$  US residents were recruited online, who completed self-report measures of Big Five personality and political orientation, and indicated their states of residence. The 50 states will be categorized as Highly Republican, Moderately Republican, Neutral, Moderately Democrat, and Highly Democrat, based on the statewide results from the past four presidential elections. Cluster analyses will be conducted to determine the personality profiles for each region category. These personality profiles will be compared with each other, as well as with regional scores on the political orientation measures. This exploratory study will help us better understand how regional political orientation is related to variation in residents' personality profiles.

*Tianfang Yang is a first-year M.S. student in the Psychological Sciences Department at William & Mary. His research areas include cross-cultural psychology, personality traits and political psychology. He graduated from Reed College in 2018 with a B.A. in Psychology.*

### **High-Skill Emigration: Is Willingness to Leave a Country Linked with its Government Performance?**

*Presenter:* Anniete Cohn-Lois  
*Advisor:* Robert Bednarzik  
Georgetown University,  
Public Policy

High-Skill Emigration, also called “Brain Drain”, is among the most debated migration policy issues. While origin countries lose talent, many destination countries gain highly skilled human capital. Such Brain Drain has occurred in part because developed countries have often adopted migration policies targeted to attract highly skilled migrants. Although many studies of this issue have focused on the relationship between labor markets and motivation to migrate, much less research has been done on the relationship between a sending country’s governance and emigration, especially emigration of the highly-skilled. In an attempt to fill the existing gap in the literature by focusing on those that are highly-skilled, this paper will use micro-level data from 18 Latin-American countries to analyze whether poor governance -- specifically corruption as measured by bribes are necessary to access public services -- influences people’s willingness to stay or leave.

*Anniete Cohn-Lois is a second-year M.P.P. candidate in the McCourt School of Public Policy at Georgetown University. Her research areas include governance, high-skill emigration, and gender. She holds a Master of Social Entrepreneurship and Bachelor of International Relations from Hult International Business School, London, United Kingdom. She has work experience in government, academia and negotiations of U.N. multilateral agreements, such as the Paris Agreement.*

### **Examine Chronic Absenteeism Using Systemic Questioning**

*Presenter:* Danielle R. Gilmore  
*Advisor:* Kathryn Newcomer  
George Washington University,  
Public Policy

Chronic absenteeism (CA) is any absence from any cause that results in students missing 10% or more of school year. CA is a primary predictor of academic success, including achievement, grade retention, and drop out rates. Low income and minority students are more likely to be chronically absent, contributing to academic achievement gaps. Daily attendance rates mask CA and the lack of reporting systems for CA and hinder the ability to study the issue in depth. The Systemic Questioning (SQ) framework is specifically designed to examine hidden problems and enables researchers critically assess CA's: primary drivers, perceptions, mechanisms, and effects. SQ serves as a tool to critically examine CA to change assumptions, as well as communication and behavior patterns surrounding CA, necessary steps in developing interventions to combat CA.

*Danielle Gilmore is a first year Ph.D. student in Public Policy and Administration in the The Trachtenberg School of Public Policy and Public Administration George Washington University. She has a broad interest in program evaluation and education policy, especially in mechanisms to reduce chronic absenteeism and race-based academic achievement gaps. She holds M.P.P. from Johns Hopkins University and a B.S. in Community/Public Health from the University of Central Oklahoma.*

### **Changes in the Security Environment and Its Effects on Emerging Leadership Skills**

*Presenter:* Ali Kucukozyigit

*Co-Author:* O. Poyraz

*Advisor:* Charles Daniels

Old Dominion University,

Engineering Management and Systems

Engineering

Leadership is probably one of the most sought processes that countless number of studies done. Today, the security environment is more complex than yesterday necessitating a fresh look at the traditional tools and techniques that we use for any processes including the leadership process. The primary research question for this submission is "what are the changes in security environment that affects leadership applications and what are the emerging skills that leaders need to have?" The research design is mixed since both qualitative and quantitative methods are used. The first part of the research is qualitative in which an extensive literature review is carried out to explore and operationalize the changes taking place in security environment and come up with possible implication for the leadership that contemporary leaders should have. The second part of the study is the quantitative part where we explore and analyze further on how salient identified emerging skills are in various security environments and organizational levels. The analysis is done using the primary data that is collected first hand. The preliminary analysis suggests that not all the leadership skills are equally important for the leaders in different organizational levels and security environments. Some of the skills are more salient than others in different levels and environments. The research is critical for upper-and-out organizations i.e military and law enforcement due to mission variety and dynamic security environments. The results will contribute to leadership development of such organizations.

*Ali Kucukozyigit is a fourth-year Ph.D. candidate in the Engineering Management and Systems Engineering Department and Old Dominion University. His research areas include leadership, culture and risk management. His dissertation topic is engineering future leaders in complex security environment with emerging leadership skills. He holds an M.S. in Systems Engineering from the Naval Postgraduate School and M.A. in International Security Studies, Strategic Management and Leadership.*

### **Globalization and Non-Profit Organizations: Effective Service Delivery Dependency on the Use of Information and Technology**

*Presenter:* Taiwo Christianah Oguntuyo

*Advisor:* Meagan Jordan

Old Dominion University,

Public Administration and Policy

The world is increasingly changing for non-profit organizations. Economies have become more integrated. This has created national, international and transnational affiliations spurred by the improvements in communication and transportation. Hence, nonprofit organizations from around the world are now targeting the donors, volunteers and clients which local nonprofits organizations considered their own due to the similar local jurisdictions shared with them. Subsequently, non-profit organizations, ranging from small to large ones, are increasingly pressured to sustain their capacities in service provisions. These pressures demand the need for the enhancement of nonprofit organizations' information technology, with the aim of improving their expertise and capacity in order to meet the increasing stakeholders' expectations for service delivery. This study focuses on the importance of the strategic use of information and technology for opportunities maximization and sustainability of service delivery by nonprofits organizations, using Norfolk, Virginia as a case study. The premise of the study specifically falls on the rationale for the strategic use of Information technology, such as IT planning. The research question will hence be: Why do Non-profit Organizations need to employ the strategic Use of Information Technology? The study uses the Leavitt Diamond model to elucidate upon the significance of the strategic use of information technology in this era of globalization. With the use of survey design as methodology for inquiry, the research seeks to know how many nonprofit.

*Oguntuyo Taiwo is a first-year Ph.D. candidate in the Public Administration and Policy Department at Old Dominion University. Her research areas include, public policy, nonprofit, multisector administration, and ethics. She is currently exploring on the factors that contribute to the swift delivery of mission-based goals of nonprofit organization in Norfolk, Virginia, especially considering the use of information technology.*

### Association Between Physician Fees and Quality of HIV Care

*Presenter:* Zhongzhe Pan

*Co-Author:* L. Sabik

*Advisor:* April Kimmel

Virginia Commonwealth University,  
Health Behavior and Policy

**Background:** Sub-optimal quality of care for people living with HIV is a national challenge and could be influenced by policies regarding physician fees. **Objective:** We examined the association between physician fees and quality of HIV care. **Methods:** We integrated person-level demographic information and outpatient claims (Medicaid Analytic eXtract, 2009-2012), state Medicaid-to-Medicare physician fee ratios, and other county and state factors for 17 Southern states. The sample has 52,239 non-elderly adults living with HIV, with continuous Medicaid enrollment for >1 year. Multivariable logistic regression with state fixed effects assessed the association between physician fees and three annual quality measures: retention in care (>2 physician visits, antiretroviral prescriptions, or HIV lab tests), receipt of >1 antiretroviral prescription, or receipt of >2 HIV RNA tests monitoring antiretroviral response. **Findings:** Most enrollees were retained in care (90.9%) or received >1 antiretroviral prescription (88.5%); fewer received >2 HIV RNA tests (57.7%). Physician fees are significantly and positively associated with retention in care (odds ratio (OR) 2.02, 95% confidence interval (CI) [1.30, 3.14]). There is no significant association with receipt of antiretroviral prescriptions (OR 0.75, 95% CI [0.50, 1.12]) or HIV RNA tests (OR 0.76, 95% CI [0.53, 1.09]). **Conclusion:** Higher physician fees are associated with higher retention in care but not other quality measures. Understanding how physician fees also impact HIV health outcomes is an important area of future study.

*Zhongzhe Pan is a second-year Ph.D. student in the Health Behavior and Policy Department at Virginia Commonwealth University. She has a broad interest in HIV-related health policy, women's health, and decision analytic modeling. She is currently exploring structural barriers to improve quality of HIV care, particularly focusing on physician reimbursements. She holds a B.S. (Insurance and Risk Management) from China and M.H.S. (Health Economics) from Johns Hopkins University.*

### The Association of Provider Experience and Adherence to Colonoscopy Practice Guidelines on Polyp and Adenoma Detection Rates

*Presenter:* Muloongo Simuzingili

*Co-Authors:* S. Salehian, B. Dahman,  
Y. Deng

*Advisor:* Askar Chukmaitov

Virginia Commonwealth University,  
Health Behavior and Policy

**Introduction:** Gastroenterologists expertise in providing procedures may affect the quality of colonoscopy which improves health outcomes. **Objective:** To examine the association of gastroenterologists experience and adherence to practice guidelines on polyp and adenoma detection rates. **Method:** We collected 4961 colonoscopy and pathology reports from electronic medical records (EMR) of an academic outpatient clinic (2010–2012). We developed individual and composite quality scores based on American Society for Gastrointestinal Endoscopy guidelines: complete information, bowel preparation, cecal intubation (CIR), bowel cleaning and patient comfort. We extracted gastroenterologists' role in procedure and volume of procedures from EMRs. Gastroenterologists academic experience and position were obtained from Virginia Board of Medicine. Multivariable logistic regressions assessed associations of detection rates, quality scores and provider characteristics. **Results:** Lower scores on bowel preparation and CIR are associated with lower likelihood of polyp detection, OR 0.47 (95% CI[0.24,0.9]) and OR 0.72 (95% CI[0.56,0.95]) respectively. Low CIR scores are associated with lower likelihood of adenoma detection (OR 0.6, 95% CI[0.39,0.92]). The composite score is positively associated with polyp detection (OR 1.02, 95% CI [1.01,1.03]). Provider experience was not significantly associated with the detection rates. **Conclusions:** Following practice guidelines of colonoscopies improve detection rates. Understanding the predictors in improving the quality is an important area of future study.

*Muloongo Simuzingili is a second-year Ph.D. student in the Health Behavior and Policy Department at Virginia Commonwealth University. Her research interests are in healthcare financing, quality of care, health equity, and maternal and child health. She holds a Bachelor of Economics from the University of Namibia and a Master's in Applied Economics from the University of Cape Town.*



### **Lessons from Buenos Aires: Natural Disasters and Electoral Outcomes**

*Presenter:* Kylie McKee Wheeler

*Advisor:* Eric Arias

William & Mary,

Public Policy

How do natural disasters affect the way voters vote? There is vast literature examining the effects of rainfall and flooding on voter turnout and participation, but the literature covering the motivations underlying government responses to natural disaster and voters reactions to those responses is less robust. This paper seeks to fill that gap by analyzing the impact of the floods of August 2015 on presidential elections in Buenos Aires Province. Argentina provides an interesting test case in endeavoring to understand voter behavior because 1) voting is mandatory for all citizens between the ages of 18 and 72, and 2) August primary elections serve as mock elections for the general October race. Between the primary elections on August 9, 2015, and general elections on October 25, parts of Buenos Aires province experienced above average rainfall and catastrophic flooding. Utilizing electoral and rainfall data aggregated to the municipal level and a combination of linear and logistic regression models, I exploit the extreme rainfall and subsequent government response between the primary and general elections to explain the reasons behind the shift in vote share for certain municipalities within the province. Findings suggest that partisanship plays a significant role in the distribution of government response to natural disaster. Rainfall alone does not an electoral upset make.

*Kylie McKee Wheeler is a second-year M.P.P. student at William & Mary. Her research interests include child and family development, education policy, Latin American studies, and refugee policy. She earned a B.A. in Government and International Relations from Regent University in 2013 and has since worked in Hinche, Haiti, studying subjective well-being of orphans and vulnerable children.*

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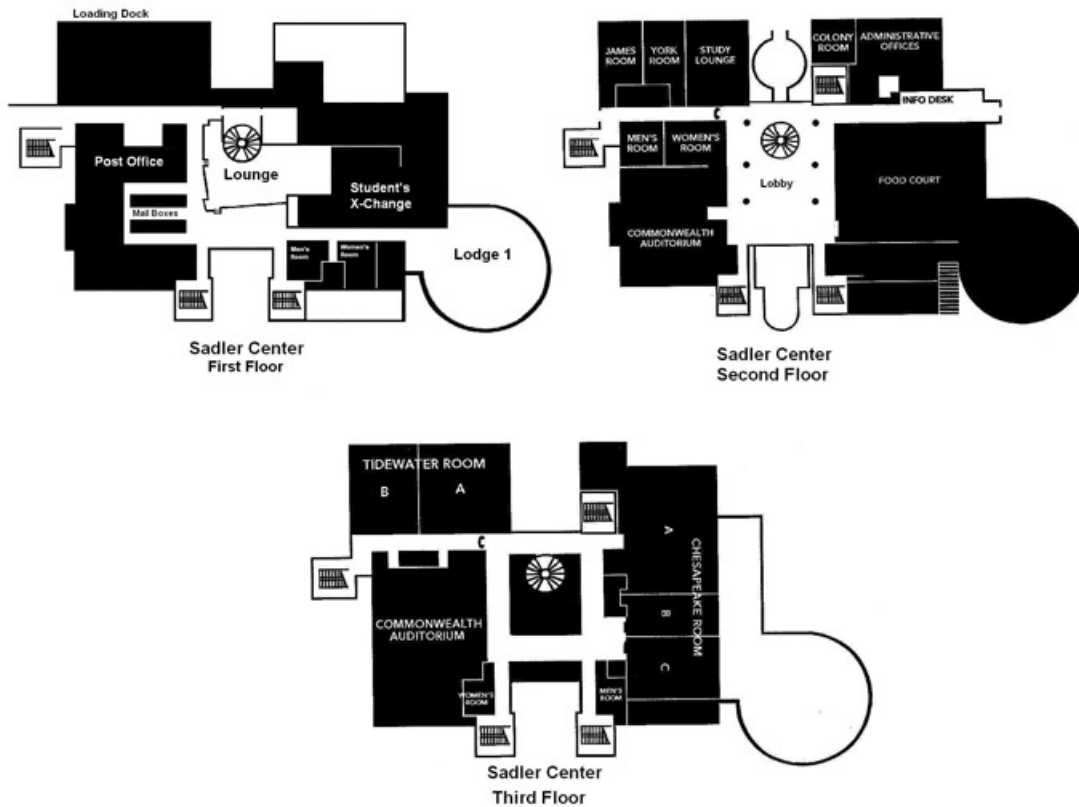
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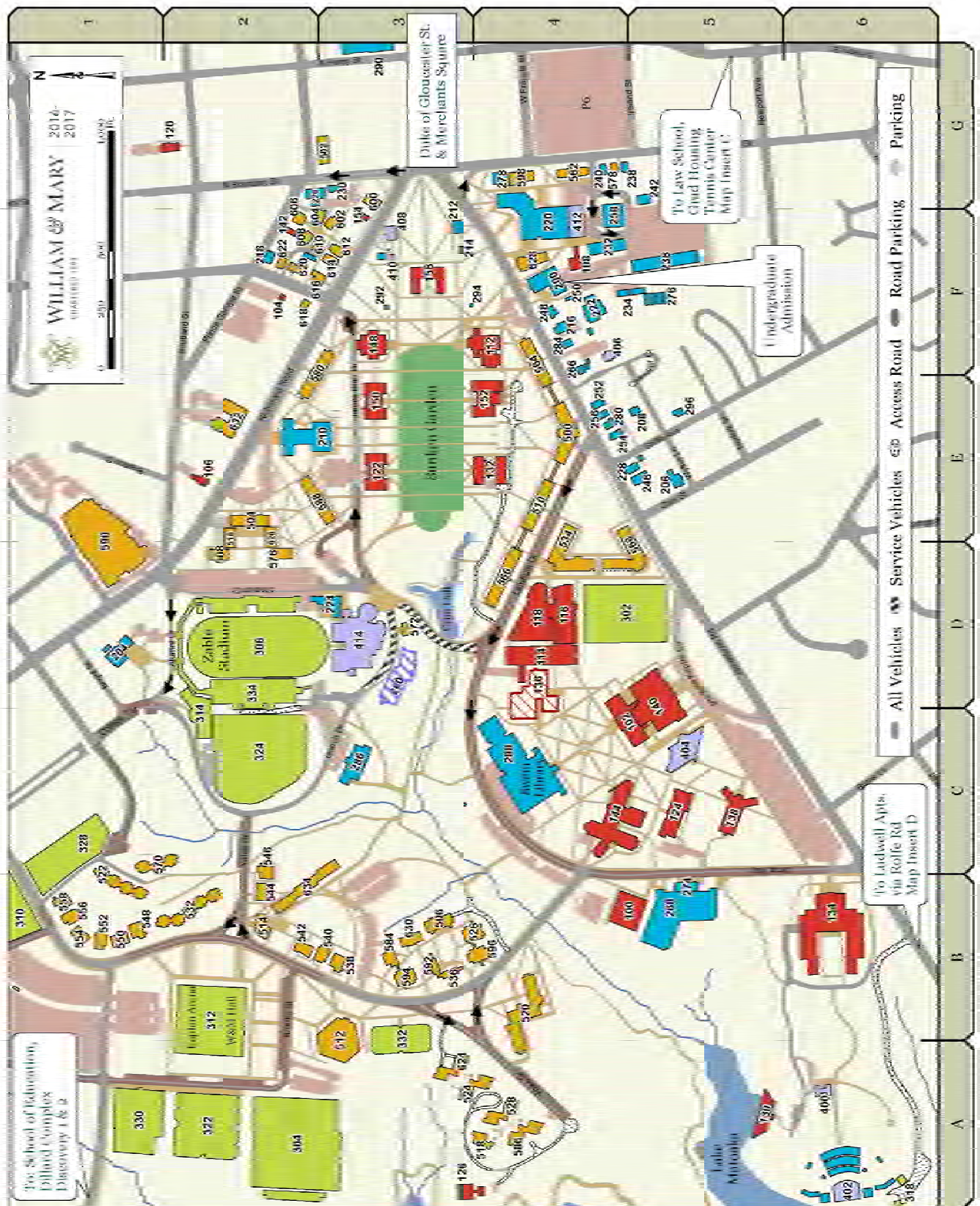


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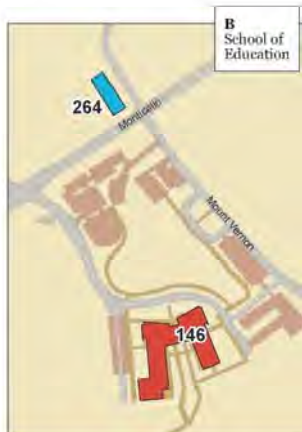
William and Mary's Sadler Center







## Map Insets



MAP#	BUILDING	GRID	MAP#	BUILDING	GRID	MAP#	BUILDING	GRID
<b>ACADEMIC</b>								
100	Adair Hall	B4	260	McLeod-Tyler Wellness Center*	D3	524	Fauquier	A4
102	Andrews Hall	C5	262	Minson Galt	Ins A	526	Giles	B4
104	Bozarth Garage	F2	264	Mount Vernon Complex	Ins B	528	Gooch	A4
106	Ctr. for Archaeological Res.	E2	266	Murray House	F4	530	Graduate Housing	Ins C
108	Ceramics Studio	F4	268	Parking Deck	B5	532	Griffin A-E	B2
110	Endocrinology (Pop) Lab	Ins C	270	Patrick Galt	Ins A	534	Hardy	D4
112	Ewell Hall	F4	272	Patrick Galt Annex	Ins A	536	Hammon	B3
114	ISC I	D4	274	Police and Parking Services	B5	538	House 620	B3
116	ISC II	D4	276	Quonset Huts	F5	540	House 630	B3
118	ISC III	D4	278	Reves Center	G4	542	House 640	B2
120	ITPIR	G2	280	Rowe House	E4	544	House 660	B2
122	James Blair Hall	E3	282	Savage House	D1	546	House 670	B2
124	Jones Hall	C5	284	Stetson House	F4	548	House 710	B1
126	Kock Env. Field Lab	A3	286	Student Health Center	C3	550	House 720	B1
128	Law School	Ins C	288	Swern Library	C4	552	House 730	B1
130	Matoaka Art Studio	A5	290	W&M Bookstore	G3	554	House 740	B1
132	McGlothlin-Street Hall	E4	292	Wren Outbuilding North	F3	556	House 750	B1
134	Alan B. Miller Hall	B6	294	Wren Outbuilding South	F3	558	House 760	B1
136	Millington Hall*	C4	296	Young House	E5	560	Hughes	Ins A
138	Morton Hall	C5				562	Hunt	G4
140	Phi Beta Kappa Mem. Hall	D5	<b>ATHLETICS &amp; ATHLETIC EVENTS</b>			564	Jefferson	F4
142	Prince George House	F2	300	Albert-Daly Field	Ins A	566	Landrum	D4
144	Small Hall	C4	302	Barksdale Field	D4	568	Lemon	D4
146	School of Education	Ins B	304	Busch Field	A2	570	Lion K-M	B1
148	Tucker Hall	F3	306	Cary Field	D2	572	Lodge 2 (Daily Grind)	D3
150	Tyler Hall	E3	308	Dillard Practice Fields	Ins A	574	Ludwell Apts. (100-700)	Ins D
152	Washington Hall	E4	310	Intramural Fields	C1	576	Madison	D2
154	Western Union Building	F3	312	Kaplan Arena at W&M Hall	B2	578	Mendian Coffee House	G4
156	Wren Building	F3	314	Laycock Football Center	C2	580	Monroe	E3
			316	Martin Family Stadium	Ins A	582	Munford	Ins A
			318	Matoaka Boat House	A6	584	Nicholas	B3
			320	McCormack-Nagelsen Tennis Ctr.	Ins C	586	Nicholson	A4
200	Admission (undergraduate)	F4	322	Millie West Tennis Facility	A2	588	Old Dominion	E3
202	Alexander Galt	Ins A	324	Montgomery Field	C2	590	One Tribe Place	D1
204	Alumni House	D1	326	Plumeri Park	Ins A	592	Page	B3
206	Bell Hall	E5	328	Stimson Throwing Events Area	B1	594	Pleasants	B3
208	Blank House	E5	330	Student Recreation Center	A1	596	Preston	B4
210	Blow Memorial Hall	E2	332	Tennis Courts	B3	598	Reves	G4
212	Brafferton	F3	334	Zable Stadium	D2	600	House 1	G3
214	Brafferton Kitchen	F3				602	House 2	F3
216	Bridges House	F4	<b>ARTS &amp; EVENTS</b>			604	House 3	F3
218	Bull House	F2	400	Amphitheatre Ticket Office	A6	606	House 4	F3
220	Campus Center	F4	402	Martha Wren Briggs Amphitheatre	A6	608	House 5	F2
222	Child Care Center	F4	404	Muscarella Museum of Art	C5	610	House 6	F3
224	Cohen Career Center	D3	406	Plumeri House	F4	612	House 7	F3
226	College Apartments	G2	408	President's House	F3	614	House 8	F3
228	Corner House	E5	410	President's Guest House	F3	616	House 9	F3
230	Davis House	G3	412	Trinkle Hall	F4	618	House 10	F2
232	Facilities Mgmt. Admin.	F4	414	Sadler Center	D3	620	House 11	F2
234	Facilities Management Annex	F5				622	House 12	F2
236	Facilities Management Shops	F5	500	Barrett	E4	624	Spotswood	A3
238	Facilities Safety 1	G4	502	Brown	E2	626	Stith	E2
240	Facilities Safety 2	G4	504	Bryan	E2	628	Taliaferro	F4
242	Facilities Supervisors	G5	506	Cabell	B3	630	Tazewell	B3
244	Gabriel Galt	Ins A	508	Camm	D2	632	Tribe Square	E2
246	Griggs House	E5	510	Chandler	E4	634	Yates	B2
248	Hoke House	F4	512	Commons Dining Hall	A3			
250	Hoke House Annex	F4	514	Community Building	B2			
252	Holmes House	E4	516	Dawson	E2			
254	Hornsbey House	E4	518	Dinwiddie	A4			
256	Lambert House	E4	520	DuPont	B4			
258	Main Power Plant	F4	522	Eagle F-J	B1			

\*denotes under construction

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