13th Annual Graduate Research Symposium

March 21-22, 2014

The College of
WILLIAM & MARY
Williamsburg, Virginia

Schedule at a Glance

Friday, March 21, 2014 -- Sadler Center

8:00 am - 8:30 am	Registration *Second Floor Lobby*
8:30 am - 5:00 pm	Poster Displays *Second Floor Lobby*
8:30 am - 9:30 am	Concurrent Sessions *Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*
9:45 am - 10:45 am	Concurrent Sessions *Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*
10:55 am - 11:55 am	Concurrent Sessions *James Room and York Room*
11:00 am - 12:00 pm	Poster Presentations with Q&A *Second Floor Lobby*
12:00 pm - 1:00 pm	Luncheon & Welcoming Remarks *Chesapeake A*
1:15 pm - 2:15 pm	Concurrent Sessions *Tidewater A, Tidewater B, Chesapeake C, James Room and Colony Room*
2:30 pm - 3:30 pm	Concurrent Sessions *Tidewater A, Tidewater B, Chesapeake C, James Room and York Room*
3:45 pm - 5:00 pm	STRONG ARTIFICIAL INTELLIGENCE: An Interdisciplinary discussion of “future” technology *Tidewater B*
5:00 pm - 6:30 pm	Evening Networking Reception *Tidewater A*

Saturday, March 22, 2014 -- Sadler Center

8:00 am - 8:30 am	Registration *Second Floor Lobby*
8:30 am - 12:00 pm	Poster Displays *Second Floor Lobby*
8:30 am - 9:30 am	Concurrent Sessions *Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*
9:45 am - 10:45 am	Concurrent Sessions *Tidewater A, Tidewater B, James Room, York Room and Colony Room*
11:00 am - 12:00 pm	Poster Presentations with Q&A *Second Floor Lobby*
12:00 pm - 1:30 pm	Luncheon & Awards Ceremony *Chesapeake A*

The 13th Annual Graduate Research Symposium

The College of William & Mary
Office of Graduate Studies and Research

Dear Members of The College of William & Mary Community and Guests,

It is our pleasure to welcome you to the 13th Annual Graduate Research Symposium! For the first time in three years, the Symposium committee is led by two co-chairs each representing either the Humanities or the Sciences. The Humanities and Sciences truly are better together and for this reason, this year's symposium will emphasize putting the '**&**' back in "Arts **&** Sciences." Our aim is to bridge the divide between departments and encourage interdisciplinary discussion.

To this end, we have instituted a novel approach to creating sessions. Sessions will now feature presentations from Arts **&** Sciences, with groupings according to themes, content, or application rather than strictly by discipline or department. We hope that this will elicit new and unique feedback, with questions from diverse perspectives, and foster broader community togetherness.

As in years past, graduate students from nearly 20 institutions and a variety of disciplines will present their research, adding a larger academic community perspective to our dynamic interdisciplinary discussions. This year's symposium is sure to be a strong and exciting program, aided in no small part by the plethora of talented graduate scholars' presentations.

In keeping with our theme, this year's special event will be an interdisciplinary panel discussion on Strong Artificial Intelligence. No longer relegated to the realms of science fiction, it is necessary to discuss the implications and applications of this 'future' tech. The panel will be moderated by Dr. David Armstrong, Physics Chair. Dr. Michael Green, of the W&M School of Law, and Mr. Ed Watson, of the Graduate Studies Advisory Board, will serve as representatives of the Humanities. The Sciences will be represented by Dr. Cynthia Morton, of the Graduate Studies Advisory Board, and Dr. Mark Hinders, of the Department of Applied Science. The panel will also feature David Ward, a retired Army Colonel and current W&M grad student, who will offer a military perspective on this subject. Participants will be encouraged to engage with the panel, ask questions, both laughable and logical, and promote dialogue across disciplines. We hope you can make it!

Finally, we would like to thank all of the participants and most especially the College's graduate faculty, staff, administration, and the Graduate Studies Advisory Board for their commitment to graduate students and research. We would also like to extend our sincerest gratitude to the members of the Graduate Research Symposium committee for their dedication and earnest endeavors that made this symposium possible.

All the best and Excelsior!

Sarah Mattes
Humanities Chair, Graduate Research Symposium
MA Candidate, Anthropology Department

Brittany St.Jacques
Sciences Chair, Graduate Research Symposium
MS Candidate, Biology Department

CHARTERED 1693

THE COLLEGE OF WILLIAM AND MARY
OFFICE OF THE PRESIDENT
P.O. BOX 8795
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Dear Students and Friends,

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

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

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

Cordially,

W. Taylor Reveley, III
President

2014 Graduate Research Symposium

Program Chairs
Sarah Mattes, *Anthropology*
Brittany St.Jacques, *Biology*

Graduate Student Committee
Jenna K. Carlson, *Anthropology*
Katrina Hoeger, *COR*
David Nguyen, *Computer Science*
Helis Sikk, *American Studies*
Emily Wavering, *Public Policy*

Office of Graduate Studies and Research
Dean Virginia Torczon, *Graduate Studies*
Chasity Roberts
Wanda Carter
Vicki Thompson Dopp

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Graduate Studies Advisory Board
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Session Chairs
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William & Mary Information Technology

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

Humanities & Social Sciences
Mike Hoak, *Graduate Studies Advisory Board*
Dr. Arthur Knight, *American Studies*
Prof. Elaine McBeth, *Public Policy*
Larry McEnerney, *Graduate Studies Advisory Board*
Dr. Neil Norman, *Anthropology*
Dr. Todd Thrash, *Psychology*

Natural & Computational Sciences
Dr. Rex Kincaid, *Computational Operations Research*
Dr. Eugeniy Mikhailov, *Physics*
Dr. Denys Poshyvanyk, *Computer Science*
Dr. Robert Saunders, *Graduate Studies Advisory Board*
Dr. Bill Tropf, *Graduate Studies Advisory Board*
Dr. Matthew Wawersik, *Biology*

Mentoring Awards: Humanities & Social Sciences
Dr. Pam Hunt, *Psychology*
Prof. Elaine McBeth, *Public Policy*
Dr. Neil Norman, *Anthropology*
Dr. Hannah Rosen, *History*
Dr. Robert Scholnick, *American Studies*

Mentoring Awards: Natural & Computational Sciences
Dr. Wouter Deconinck, *Physics*
Dr. Elizabeth Harbron, *Chemistry*
Dr. Pieter Peers, *Computer Science*
Dr. Patty Zwollo, *Biology*

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

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

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

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

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

YUDISTIRA VIRGUS
The College of William and Mary, Physics, Advisor: Dr. Henry Krakauer
"The Stability, Energetics, and Magnetic States of Cobalt Adatoms Adsorbed on Graphene"

********Join Yudistira as he presents his research Friday, March 21, 2014***** from 8:30am-9:30am in Tidewater A***

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

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

KRISTINA POZNAN
The College of William and Mary, History, Advisor: Dr. Scott Nelson
"Austria-Hungary's Emigrant Houses as Transnational Spaces in Turn-of-the-Century New York City"

********Join Kristina as she presents her research Saturday, March 22, 2014 ***** from 9:45am-10:45am in York Room***

The Arts & Sciences Graduate Studies Advisory Board at the College of William & Mary is a proud sponsor of the 2014 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 and Mary. We commend the attendees of the Graduate Research Symposium for their dedication to excellence in research.

The missions of the Graduate Studies Advisory Board are:

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

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

By sponsoring the 2014 Graduate Research Symposium, initiating the Distinguished Thesis/ Dissertation Awards, the Carl J. Strikwerda Awards for Excellence and the S. Laurie Sanderson Awards for Excellence in Undergraduate Mentoring in Arts & Sciences, and providing recruitment fellowships to outstanding entering graduate students, the Graduate Studies Advisory Board is playing a vital role in advancing William and Mary's graduate programs in Arts & Sciences.

Members of the Graduate Studies Advisory Board, 2013-14

President: Diane Alleva Cáceres '87 BA Economics, '89 MA Government
Vice-President: Brian J. Morra '78 BA History
Past President: Cynthia Morton '77 BS Biology
Chair, Student Professional Development Committee: Robert Saunders '00 BS Physics
Chair, Development & Communications Committee: Edwin Watson '68 BA, '70 MA History

Debbie Allison '77 BS Chemistry
John D. Burton '89 MA History, '96 PhD History
Kathryn Caggiano '90 BS Mathematics
Kurt Erskine '92 BA Public Policy
Mike Hoak '02 MA History
David Hood '90 BS Chemistry '92 MA Chemistry '96 PhD Applied Science
Peter Martin '71 MS Physics, '72 PhD Physics
Larry McEnerney '76 BA English & History
George Miller '67 BS Physics, '69 MS Physics, '72 PhD Physics
David Opie '88 MS Physics '91 PhD Physics
Betsy Page Sigman '78 BA Government
Bill Tropf '68 BS Physics
Gail W. Wertz '66 BS Biology

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

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

NICHOLAS ALT
Psychology, Advisor: Dr. Cheryl Dickter
The Intersection of Race and Gender:
Cognitive and Memory Consequences of Intersecting Identities

William & Mary Honorable Mentions

DAVID PRATT
American Studies, Advisor: Dr. Susan Donaldson
REDRUM as the Red Death:
The Shining as Twentieth-Century Gothic Temperance Tale

CHRISTOPHER JONES
History, Advisor: Dr. Christopher Grazzo
In Search of the Land of Liberty:
Methodist Migrations and Antislavery in Virginia, 1780-1810

Visiting Scholar Award for Excellence in the Humanities and Social Sciences

WAFA TARAZI
Public Policy, Virginia Commonwealth University, Advisor: Dr. Lindsay Sabik
Medicaid disenrollment and racial disparities in access to care

Visiting Scholar Honorable Mention

STEPHANIE ROLDAN
Psychology, Virginia Tech, Advisor: Dr. Anthony Cate
Identifying parts and wholes in real-world objects: an application of critical spacing

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

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

YUNHAN LONG
Applied Science, Advisor: Dr. Leah Shaw
Effect of communication on epidemic spreading in adaptive social networks with awareness

YIFAN ZHANG
Computer Science, Advisor: Dr. Qun Li
CacheKeeper: A System-wide Web Caching Service for Smartphones

William & Mary Honorable Mentions

DAVID NGUYEN
Computer Science, Advisor: Dr. Gang Zhou
Smartphone Energy Savings through I/O Path Optimizations

JOSHUA MAGEE
Physics, Advisor: Dr. David Armstrong
The Qweak Experiment: Implications from the First Determination

Visiting Scholar Award for Excellence in the Natural & Computational Sciences

STEVARA CLINTON
Chemistry, VCU, Advisor: Dr. B. Frank Gupton
Continuous Synthesis of Quinolone Analogs

Visiting Scholar Honorable Mention

RAWAN AL-NSOUR
Medical and Nuclear Engineering, VCU, Advisor: Dr. Mohamed Gad-el-Hak
Parameterization of New Force Fields for Polytetrafluoroethylene

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

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

Awards for Excellence in the Humanities and Social Sciences

DAVID NEWMAN
Psychology, MA, Advisor: Dr. John Nezlek
An examination of the daily relationships between prayer and well-being

MEGAN VICTOR
Anthropology, MA/PHD, Advisor: Dr. Neil Norman
Rogue Fishermen and Rebel Miners: Informal Economy and Drinking Spaces in Maine and Montana's Resource Extraction Communities

Award for Excellence in the Natural and Computational Sciences

GHAZI MAHJOUB
Biology, MS, Advisor: Dr. John Swaddle
Excluding pest birds from soci-economically important areas using directional sounds

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

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

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

Awards for Excellence in Undergraduate Mentoring in the Humanities and Social Sciences

NICHOLAS ALT
Psychology Department, PhD

SARAH GLOSSON
American Studies Department, PhD

Award for Excellence in Undergraduate Mentoring in the Natural and Computational Sciences

ANDREW KOTTICK
Applied Science Department, PhD

13th Annual Graduate Research Symposium

Friday, March 21, 2014

8:30 AM

Tidewater A

The Stability, Energetics, and Magnetic States of Cobalt Adatoms Adsorbed on Graphene
Yudistira Virgus

Effect of long-range disorder on competing orders in bilayer graphene
Martin Rodriguez-Vega

Nanomechanical Behavior of Holey Graphene Reinforced Polymer Nanocomposites
John Gardner

Novel Preparation Technique for Graphene-Polymer Nanocomposite
Ryan Shintani

Tidewater B

Towards Dynamic Job Assignment in Vehicular Cloud Computing
Puya Ghazizadeh

An Economic Framework for Right-Sizing the F-35 Joint Strike Fighter Aircraft Program
Kevin Rasmussen

From Theory to Practice: Toward a Telecommunication and Networking Studies “Where do I park?”
Andrew Hutchson

Alerting System to Enhance Two-Way Roads Safety
Ahmed Alhafdhi

James Room

The Soul of Whose South: *Garden & Gun's* New (?) South for a National Readership
Kate Previti

The Timeshare Ghost Hunt: Interpretative Techniques at a Historic House Museum
Mariaelena DiBenigno

REDRUM as the “Red Death”: *The Shining* as Twentieth-Century Gothic Temperance Tale
David Pratt

York Room

Emnity and Alliance: Modeling Colonial Encounter on the Seventeenth-Century Eastern Siouan Frontier
Madeleine Gunter

Rogue Fishermen and Rebel Miners: Informal Economy and Drinking Spaces in Maine and Montana's Resource Extraction Communities
Megan Victor

Science, System, Stance: A Genealogical Analysis of the Concept of Ideology
Erin Schwartz

13th Annual Graduate Research Symposium

Friday, March 21, 2014

8:30 AM
Chesapeake C

Depuration of methylmercury in European starlings and zebra finches
Margaret Whitney

Excluding pest birds from socio-economically important areas using directional sounds
Ghazi Mahjoub

Wood Thrush habitat use at the home range scale: implications for local distribution
Vitek Jirinec

Using Human Landscapes to Predict Species Occurrence
Jessica Pouder

Colony Room

African Diasporic Scholarship in Anthropology
Brittany Brown

900 You Street: The Daily Life of an African American Photography Studio, 1900-1945
William Piper

Race is not Black or White: Racial Categorizations and the Mixed Race Option
Gandalf Nicolas

9:45 AM
Tidewater A

7Li MAS NMR Study of Temperature Dependent Spin-Lattice Relaxation in Cation-Ordered Microwave Perovskites
Rony Kalfarisi

EIT-based quantum memory
Gleb Romanov

Effect of a spin-active interface on proximity-induced superconductivity in topological insulators
Christopher Triola

Ballistic Atom Pumps
Tommy Byrd

Tidewater B

Parameterization of New Force Fields for Polytetrafluoroethylene
Rawan Al Nsour

Examining Crude Oil–Rock Interactions in a Liquid Environment using Atomic Force Spectroscopy
Laura Dickinson

Exploring a Novel Approach to Nuclear Forensics Utilizing Atomic Force Microscopy
Richard Peeke

An inquiry of residential solar photovoltaic deployment in the United States: cost-efficient state-level policy, or circumstance?
Gilbert Michaud

13th Annual Graduate Research Symposium

Friday, March 21, 2014

9:45 AM
James Room

Understanding Hawaiian Barkcloth in Context: The *Kapa* Assemblage from Nualolo Kai, Kauai, Hawaii
Summer Moore

Experiencing the Past in the Present: Community Archaeology on the 19th Century Saltpans of Cayo Sal, Los Roques Archipelago, Venezuela
Konrad Antczak

No One Expects a Spanish Imposition: Understanding Past and Present Cochineal Production in the Canary Islands
Sarah Mattes

York Room

Cruciforms and Cosmograms: A Pipe in Context
Thomas Cuthbertson

"With This Ring I Thee We": Marriage in *The Beau Defeated*
Richard Henkle

Reading Vietnam War Zippos - A Genre Studies Approach
Frank Fucile

Chesapeake C

Mechanical Models to Demonstrate the Influence of Acute Changes in Bladder Shape and Material Properties on Wall Tension During Bladder Filling
Firdaweke Habteyes

Adaptation of *H. pylori* to changing environments based on allelic variation of sensor histidine kinase arsS
Monique Bennett

A sensor-based mechanical model for stretch-induced myogenic detrusor contraction as a single twitch of spontaneous rhythmic contraction
S. Omid Komari

New Insights into Fibrous Body Protein Complexes Involved in *C. elegans* Spermatogenesis
Christopher Uyehara

Expression and Subcellular location of SnRK1.1 in plants
Sarah Phoebe Williams

Colony Room

Effects of Mental Practice and Physical Practice On Physical Performance with Drummers
Nicole Lippman

Towards Infinity: Sun Ra and the Performance of Escape
Brian Jones

"Samba is Power": Dancing through the Diaspora in the Poetic Collaborations of Jayne Cortez
Renee Kingan

13th Annual Graduate Research Symposium

Friday, March 21, 2014

10:50 AM
James Room

Dwelling and Traveling in 17th Century Florida: Linguistic, Historical, and Archaeological Insights into the Timucua
Patrick Johnson

Kashmir: A Land of Never-ending Conflict
Menuka Ban

“The Lying Captain”: William Augustus Bowles and the Diplomatic Utility of an Indian Poser
James Hill

"Who Uses the Old Language?": Linguistic Authority, Language Ideology, and Multi-Purpose Language Documentation
Stephanie Hasselbacher

11:00 AM
Poster Session

1. **Catherine Bianchi**
   Biology
2. **Carolyn Carta**
   Chemistry
3. **Docia Demmin**
   Psychology
4. **Justin Denno**
   Physics
5. **Caitlin Duckett**
   Psychology
6. **Maureen Farrell**
   Biology
7. **Patrick Hauer**
   Public Policy
8. **Ryan Huyck**
   Applied Science
9. **Songhee Kang**
   Psychology
10. **Caroline Kelsey**
    Psychology
11. **Jamie Klein**
    Psychology
12. **Dan Liu**
    Chemistry
13. **Alyssa Moore**
    Biology
14. **Melissa Proffitt**
    Biology
15. **Andrew Pyle**
    Physics
16. **Peter Rosenberg**
    Physics
17. **Xianping Wang**
    Computer Science
18. **Emily Wavering**
    Public Policy
19. **Emily Willroth**
    Psychology
20. **Angela Zappalla**
    Biology

13th Annual Graduate Research Symposium

Friday, March 21, 2014

1:15 PM

Tidewater A

Atom chip-based ultracold potassium for microwave and radio-frequency potentials
Austin Ziltz

Hybrid optical dipole trap for ultracold rubidium and potassium with magnetometry applications
Charles Fancher

An Update on the g_2^p Experiment
Melissa Cummings

Implication of Gauge Symmetries for the Quantum Electrodynamics Vertex
Shaoyang Jia

Tidewater B

Effect of communication on epidemic spreading in adaptive social networks with awareness
Yunhan Long

Effects of multiple benefits in a risk-benefit dynamic epidemic network
Shadrack Antwi

A Population Density and Moment-Based Approach to Modeling Domain Calcium-Mediated Inactivation of L-type Calcium Channels
Xiao Wang

James Room

Adding the patient's voice to our understanding of collaborative goal setting: How do patients with diabetes define collaborative goal setting?
Heather Morris

Medicaid disenrollment and racial disparities in access to care
Wafa Tarazi

The Impact of Medicare Part D on Diabetes Drug Expenditures
Ali Bonakdar

York Room

In Search of the Land of Liberty: Methodist Migrations and Antislavery in Virginia, 1780-1810
Christopher Jones

An examination of the daily relationships between prayer and well-being
David Newman

The Political Theology of European Integration
Mark Royce

13th Annual Graduate Research Symposium

Friday, March 21, 2014

1:15 PM
Chesapeake C – **AMERICAN STUDIES**

American Decadence: Degeneration and Depravity in the 1890s
Nicolette Gable

The Sweet Life: Animated Food Fantasies in the Great Depression
Sarah Adams

Eburnation, Osteometrics, and Oxen: A Pilot Study on the Identification of Draught Cattle in the Archaeological Record
Jenna Carlson

Raising Consumers / Selling Producers: Images of Children in Nineteenth- and Early Twentieth-Century American Advertising and Ephemera
Meghan Bryant

2:30 PM
Tidewater A - **Atomic, Molecular & Optical Physics**

Infrared spectroscopy of rare-earth-doped $CaFe_2As_2$
Zhen Xing

Infrared study of metallicity in vacuum annealed strontium titanate
Peng Xu

The M2 phase of vanadium dioxide: a view from infrared and optical spectroscopy
Tyler Huffman

Metal-based Photocathode Able to Sustain High Currents
Zhaozhu Li

Tidewater B - **Smart Phones**

Improving Storage I/O for Android phones
Jianing Zhao

CacheKeeper: A System-wide Web Caching Service for Smartphones
Yifan Zhang

Smartphone Energy Savings through I/O Path Optimizations
David Nguyen

Ultrasonic Audio Modem as a Replacement For NFC
Ed Novak

13th Annual Graduate Research Symposium

Friday, March 21, 2014

2:30 PM

James Room

Self-Esteem and Aggression Tactics
Joy Wyckoff

Popular Violence: Affective Economies of anti-LGBTQ Hate Crime
Helis Sikk

Pop Culture Meets Rape Culture: The Real Housewives of New Jersey and Marital Rape
Lindsay Fitzpatrick

York Room

Evil Witches or Gentle Practitioners? Examining Prejudice Toward Wiccans as a Function of Exposure to Texts and Religious Orientation
Melissa Gomez

The Salem Witches in mid/late-20th century American Popular Culture
Jenna Simpson

The Shift to Quietism: Male and Female Quaker Perspectives in Political Context
Caitlin McGeever

Chesapeake C

Image Based Editing of Translucent Material in Photographs
Weiyi Zhang

Beyond a Picture's 1,000 Words: The Application of High-Performance Photogrammetry to the Tangible Heritage Fields
Hayden Bassett

Smart Reflectance Editing in Photographs
Kathleen Moore

Scattering Parameters and Surface Normals from Homogeneous Translucent Materials using Photometric Stereo
Bo Dong

Estimate Camera Response Function from Large Photo Collections
Han Li

Colony Room

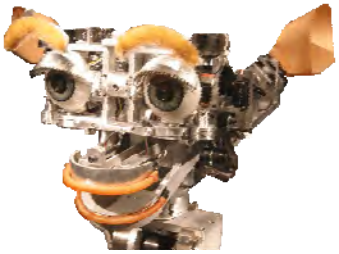
Inter-group Trust Among Different Caste Groups in Nepal
Gagan Atreya

Economic Stress and Child Health: Evidence from the Great Recession in Scotland
David Zirkle

Local Government Decision Making and Funding Decisions to Non-profit Organizations
Stephanie Davis

GRS Special Event:

"Strong Artificial Intelligence"
An Interdisciplinary Panel Discussion of 'Future' Technology



Please join us on Friday, March 21 from 3:45-5:00pm in Tidewater B. Panel members include Michael Green (Law School), Mark Hinders (Applied Science Department), Graduate Studies Advisory Board Members Cynthia Morton and Ed Watson, and David Ward, Colonel Retired, U.S. Army, and current MA/PhD History student. The panel will be moderated by David Armstrong, Chair of the Physics Department.

Immediately following please join us for a Networking Reception in Tidewater A

13th Annual Graduate Research Symposium

Saturday, March 22, 2014

8:30 AM

Tidewater A

Measuring the Weak Charge of the Proton Through Parity Violating Electron-Proton Scattering
Juan Cornejo

The Qweak Experiment: Implications from the First Determination of the Proton's Weak Charge
Joshua Magee

The Qweak Experiment: Simulations for Determining the Møller Electron Scattering Background at Small Angles
Kurtis Bartlett

Simulations of an Atomic Hydrogen Polarimeter for Future Precision Parity-Violating Electron Scattering Experiments
Valerie Gray

Tidewater B

Changes in floristic richness of the College Woods in the last 4 and 2 decades under increasing herbivory by white-tailed deer (*Odocoileus virginiana*)
Caitlin Cyrus

Human Influence on the Invasion of Fennel into Coastal Habitats of Virginia's Eastern Shore
Kathryn MacCormick

Wetlands Oversight in Virginia: A Resource Capability Analysis
Andrea Taylor

James Room

Evolving Representations of Hopi Katsinas and Clowns: Artistic Perspectives on Expressing Continuity and Change
Jaclyn Kuizon

Painting Thanatos: German Expressionism in the Early Weimar Republic
Michael King

Italy and the American West: Representations of Native Americans in *Tex*
Tyler Norris

York Room

Detection of Volatile Organic Compounds in Enclosed Spaces
Kylie Henline

Understanding the mechanism of functional conformational changes in the Hepatitis C virus polymerase
Ester Sesmero

Atom Economical, One-Pot, Three Reaction Cascade to Novel Tricyclic 2,4-dihydro-1H-benzo[f]isochromenes and its derivatives
Yuzhou Chen

Investigation of pygmy sperm whale (Kogia breviceps) populations in the Southeastern United States using stableisotope analysis of teeth
Nicole Montey

13th Annual Graduate Research Symposium

Saturday, March 22, 2014

8:30 AM
Chesapeake C

MindReader: We Can Read Your Mind, Sort Of
Zhengrui Qin

Click Fraud Detection on the Advertiser Side
Haitao Xu

Computing Singular Value Triplets of Large Matrices with PRIMME Eigensolver and Refined Ritz vectors
Lingfei Wu

Micro-Managing Operational Costs in the EC2 Cloud
Jiawei Wen

Colony Room

Indian Removal in the State of Minnesota and the Territory of Colorado
Kelley Smith

Museum Notes Considering Repatriation
Jhari Derr-Hill

Biopolitical Repatriation: Banished Bodies and Political Acts
Jessica Cowing

9:45 AM
Tidewater A

Thickness dependence of superconducting properties in NbN thin films
Matthew Burton

Effect of strain on the dynamics of optically induced metal-insulator transition of VO_2 thin films
Elizabeth Radue

Brown Recluse Spider's Nanometer Scale Ribbons of Stiff, Extensible Silk
Sean Koebley

Tidewater B

Detecting Periodic Breathing in Preterm Infants
Mary Mohr

Synaptic depression mediates inspiratory burst termination in the PreBötzinger Complex
Andrew Kottick

Morphometric properties of Dbx1+ neurons that contribute to respiratory rhythm and pattern in mice
Victoria Akins

Network Effects in Simulated Laser Ablation of Neurons in pre-Bötzinger Complex
Hanbing Song

13th Annual Graduate Research Symposium

Saturday, March 22, 2014

9:45 AM
James Room

Interactions between cholinergic and noncholinergic basal forebrain neurons on attentional performance
Christine Kozikowski

A Brief Neurometric Battery: EEG methods for the detection of age-related changes in brain function
Emily Cunningham

Childhood Maltreatment, Poly-victimization, Psychological Distress in College Males
Rachel Turk

The Relation of Tears to Affect and Personality
Victoria Oleynick

York Room

Exploring Social Conservatism as a predictor of attitudes toward immigrants and immigration
Grant Rissler

Austria-Hungary's Emigrant Houses as Transnational Spaces in Turn-of-the-Century New York City
Kristina Poznan

The Role of Race in United States Asylum Laws, Policies, and Practices: Oppression of Our Most Vulnerable Immigrant Population
Mona Siddiqui

Colony Room

The Intersection of Race and Gender: Cognitive and Memory Consequences of Intersecting Identities
Nicholas Alt

"Quick! Do Something Manly!" - The Super Bowl as an American Spectacle of Hegemonic Masculinity, Violence, and Nationalism
Jan Huebenthal

Who is She? The Epistemology of Ada 'Bricktop' Smith's Identity
James Padilioni, Jr.

11:00 AM Poster Session

1 Katherine Ashford
Psychology

2 Emma Bennett
Psychology

3 Stephanie Chin
Biology

4 Stevara Clinton
Chemistry

5 Chelsea Coffey
Chemistry

6 Tiarra Green
Psychology

7 Amanda Johnson
Anthropology

8 Ekaterina Mastropas
Physics

9 Anne Norrick
Physics

10 Olivia Sadique
Chemistry

11 Brianna Pomeroy
Psychology

12 Stephanie Roldan
Psychology

13 Brittany St. Jacques
Biology

14 Autumn Swan
Biology

15 Nicholas Vayer
Psychology

16 Xin Wang
Physics

17 Jetta Williams
Psychology

18 Nicholas Wright
Chemistry

19 Feng Yan
Computer Science

20 Jibo Zhang
Biology

21 Mi Zhang
Physics

The Sweet Life: Animated Food Fantasies in the Great Depression

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

Though images of serpentine breadlines are powerful visual shorthand for the Great Depression's hardships, American popular culture in the 1930s was also ripe with depictions of edible excess. Nowhere was this abundance better illustrated than in the period's animated films. Throughout the decade, each of three leading American animation studios produced multiple cartoon shorts that depicted confectionery fantasy lands ranging from mythical Cockaignes to parallel realms populated by anthropomorphic desserts. With increasingly sophisticated technology and evolving mastery of technique, animators choreographed vibrant and vivacious worlds devoted to the joyful celebration of indulgence. In this paper I will look at Walt Disney Studio's 1935 short *The Cookie Carnival* and Fleischer Studio's 1936 short *Somewhere in Dreamland* as two examples of the candy-fantasy genre and the different ways in which each film uses jubilant and colorful confectionery landscapes as a backdrop for political and social narrative. The imagined and imaginative candy land, fantastic in every sense, provided Great Depression audiences with a literally palatable framework in which to dream of resolution for their real problems.

Raising Consumers / Selling Producers: Images of Children in Nineteenth- and Early Twentieth-Century American Advertising and Ephemera

Presenter: Meghan Bryant
Advisor: Susan Webster
College of William & Mary,
American Studies

In 1893 Americans reveled in myriad new products debuted at the World's Columbian Exposition in Chicago, witnessing varying conceptions of quality, enjoyable consumption, and the seemingly effortless laboring of those deemed less American due to their racial "otherness." While scholars have studied figures like Cream of Wheat's Chef Rastus, one of the characters who premiered at the Exposition, the children who act alongside him have received little attention. Indeed, the children pictured on trade cards and postcards alike comprise an integral part of the process of picturing Americans as either consumers or producers. My research demonstrates that images of whiteness marketed the assertion--rooted in pseudo-science--that white Americans were naturally superior and deserved only the highest quality products. Advertisements pictured white children especially as beautiful, healthy consumers of American goods and services. African American children, however, are often shown lacking clothing and are usually depicted feasting on watermelons and stealing chickens--they are both vulnerable, unthreatening members of the next generation of American laborers and threateningly obscene and tainted hoodwinks. Such images circulated throughout American market spaces and households, selling racialized definitions of American childhood. My work aims to achieve a nuanced understanding of the ideologies and anxieties implicit within images of children in trade cards and postcards. I consider images that have been too often marginalized in art historical studies of race and nationalism. I urge us to examine the often stereotypical cast of childhood characters, as they narrate crucial conceptions of belonging in American production and consumption.

ARTS & SCIENCES

Biopolitical Repatriation: Banished Bodies and Political Acts

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

The practice of medical repatriation is becoming more common in the United States as hospital administrators deal with rising costs. Understanding hospitals as regulatory sites exposes the tension at the intersection of immigration, disability, and citizenship. This paper argues that the biopolitical state allows for a construction of ableist citizenship through various regulatory practices represented in medical repatriation. Using the work of Giorgio Agamben in *Homo Sacer: Sovereign Power and Bare Life*, this paper explores how the deportation of undocumented patients is an act banishing bodies that are deemed not worthy of citizenship, nor the protection of life. Non-governing institutions like hospitals are in a position to regulate the United States' population and the bare life that becomes politicized in the bodies of undocumented immigrants. Medical repatriation has troubling implications as it perpetuates an ableist citizen/disabled alien binary and allows for a continued othering of the developing world through an association with illness, incapacitation, and disability.

Museum Notes Considering Repatriation

Presenter: Jhari Derr-Hill
Advisor: Alan Braddock
College of William & Mary,
American Studies

This paper argues that contestation of legal action to repatriate sacred objects to their culture of origin is an act of bad faith on the part of cultural institutions like museums. A reluctance to comply challenges the efficacy of the universal museum's ideological mission to serve as a zone of inclusivity and a space where peoples and histories are placed on an equal register to demonstrate the commonness of human experience. Museums that vie to keep their collections intact inadvertently claim the supremacy of their institution's vision of human experience, one which, being universal, cannot contend with the realities of religious difference, particularly given that such institutions occupy real estate in the epicenters of cosmopolitanism. Universal museums have been challenged for harboring an imperialist world-view. I argue instead that the universal museum is a center for secular-numinous experiences. The collecting impulse, whereby the institution and its public collectively impose order on an increasingly inscrutable world, engenders feelings of ownership. Such feelings, shared by the institution and its patrons, for objects in museum collections, as well as the perceived permanency and gravitas of these collections, inspire a collective sense of responsibility to uphold the world-view proffered by the museum, obscuring the alternative use value certain objects might have to those who make contradictory claims of ownership based on their originary status.

The Timeshare Ghost Hunt: Interpretative Techniques at a Historic House Museum

Presenter: Mariaelena DiBenigno
Advisor: Alan Braddock
College of William & Mary,
American Studies

Historic house museums often highlight socially, economically, and racially privileged lives. However, with the implementation of alternative interpretative techniques, like the ghost tour, house museums try to tell the story of marginalized persons. Still, these tellings are problematic, as they operate extra-historically – or even ahistorically - in a liminal space. I plan to consider the Manor House at Powhatan Plantation, located in Williamsburg, Virginia, as an example of how narratives are told (and re-told) about historic homes. The Manor House exemplifies the historic house museum. However, it is only available to guests of an adjacent and proprietary timeshare resort. Its unavailability, which renders the house inaccessible to the public, creates the illusion of quiet plantation life for paying tourists. The Manor House's exclusivity perpetuates historical notions of landed gentry's disconnect from the lower classes; it also provides a pristine version of history that mirrors narratives shared in Colonial Williamsburg. Intrinsic to the Manor House tours are issues of economic viability, visitor interest, and research capability. Drawing on two tours offered at the Manor House, the "Walking History Tour" and "Ghost Academy and Tour," I plan to examine the varying interpretative techniques of historic home museums. I hope to answer a few questions: what types of stories get told, who are they about, and how are they performed? I will argue that the Manor House at Powhatan Plantation both preserves and reveals haunting-yet-familiar American memories via ever-evolving interpretation.

Pop Culture Meets Rape Culture: *The Real Housewives of New Jersey* and Marital Rape

Presenter: Lindsay Fitzpatrick
Advisor: Cara Jones
Towson University,
Women's Studies

A particularly troubling discourse in the discussion of women's sexuality and agency lies in the perpetuation of rape culture. Rape culture excuses, ignores or promotes rape, ultimately normalizing it in a larger social context. While rape is often culturally constructed as a violent act perpetrated by a stranger, marital rape is particularly troubling, especially as it is often overlooked or ignored. Marital rape culture perpetuates the idea that women in monogamous, heterosexual relationships must always engage in sex with their partner. Telling evidence of rape culture in marriage comes in the form of reality television star Melissa Gorga's new self-help book, *Love Italian Style*. Her book promises "the secrets of a hot and happy marriage", but instead advocates near-complete submission to men and their demands. Gorga details her efforts to keep her mate happy and faithful while dispensing marital advice. The language and anecdotes demand further investigation, as her rhetoric implicates her in a marriage that includes rape, intense restrictions and submission. Gorga's packaging of rape culture as a one-size-fits-all marital map is an immensely problematic discourse. Through a content analysis of the book and her appearances on *The Real Housewives of New Jersey*, a compelling rape-laden discourse emerges within the portrayal of her marriage. The disparate power relations within the public portrayal of her marriage can further engrain ideas about rape, women's sexuality as prescribed by men and the dynamics of heterosexual marriage.

Reading Vietnam War Zippos - A Genre Studies Approach

Presenter: Frank Fucile
Advisor: Alan Braddock
College of William & Mary,
American Studies

One of the most iconic and widespread of so-called trench art collectibles in the U.S. is the Vietnam War Zippo. This is a Zippo lighter (or often a Vietnamese or Cambodian knock-off) from the late 1960s or early 1970s that has been engraved with a soldier's name, years served, the name of a battle, an image, and/or any number of "inspirational" messages. Undoubtedly, the vast majority of supposed Vietnam War Zippos are fake for the usual reasons by which so much "trench art" can often be identified as a post-war nostalgia phenomenon. However, the existence of such relics, whether defined as "genuine" or not, clearly says something about the American memory of the war and the power of its representation through a mundane yet iconic American object. Rather than attempting to distinguish the authentic from the fake, this paper will attempt to read Vietnam War Zippos in genre context, defining the most common styles or themes of their engravings and interpreting the meaning and popularity of such styles and themes as indicators of the cultural response to the war.

American Decadence: Degeneration and Depravity in the 1890s

Presenter: Nicolette Gable
Advisor: Chandos Brown
College of William & Mary,
American Studies

This paper will outline the existence of a community of writers, artists and intellectuals calling themselves decadents who resisted the advent of modernity in America. In particular they resisted what they saw as the hegemonic middle class ideology, and resulting mediocrity, of America by affecting European tastes and manners. They also evinced a love of decay, disease, and anything that might shock and offend William Dean Howells and the Victorian morality that he represented to them. Here I examine the theories of Max Nordau, and other theorists of degeneration, and their relationship to decadent culture in America. Instead of resisting their classification by these theorists as diseased and abnormal, decadent writers like James Huneker and Edgar Saltus, among others, adopted these labels proudly. Thus they both upheld and resisted hegemonic discourses of health, race, gender, and sexuality.

Stroll Matters: Delineating Marketplace Culture in Street-Based Sex Work

Presenter: Katie Hail-Jares
Advisor: David Pitts
American University,
Justice, Law, and Criminology

At the most basic level, sex work is commonly demarcated into indoor sex work and street-based sex work. However, little research has been conducted on the role of the market in street-based sex work. Outdoor sex markets, or "strolls," are almost always approached uniformly. This current study draws upon over 400 hours of observation of outdoor sex markets in Washington, DC. Over a four year span, I observed the culture along eight active strolls. Three dominant typologies emerged: identity-associated, drug-associated, and industry-associated. Identity-associated strolls are organized around a common identity shared by the stroll's sex workers, such as being transgender or sharing a particular ethnic or racial heritage. Along identity-associated strolls, sex work is a secondary objective to connecting with a broader social community. Comparatively, drug-associated strolls have little group identity. Drug-associated strolls, which often accompanied open air drug markets, promoted high degrees of competition for substances or fast cash. Since addiction is the driving force, sex workers may be less likely to form a common identity, and therefore often work in isolation. Industry-associated strolls, then, are comprised of women who readily identify professionally as sex workers. Such strolls are more likely to host traveling sex workers, who move from city to city to maximize profits, and sets up a tension between local and visiting sex workers who compete for clients. Each of these typologies is discussed in more detail. Additionally, the unique policy implications of identifying a stroll's typology are also discussed.

"With This Ring I Thee Wed": Marriage in *The Beau Defeated*

Presenter: Richard Henkle
Advisor: Tonya-Marie Howe
Marymount University,
Literature and Languages

In the bifurcated plot of *The Beau Defeated* by Mary Pix, Sir John Roverhead, a Restoration-era libertine rake, attempts to woo three women simultaneously with the intention of marrying the one he determines to have the most money. At the same time, Young Clerimont, a man with title but little money, falls in love with a woman he does not know is rich - Lady Landsworth. Richard Braverman wrote about *Congreve's Way of the World* as a fulcrum, transitioning social thinking from libertinism to mercantilism. Through these relationships, Pix condemns the narcissism of libertinism, and offers the mercantilist view of mutually beneficial relationship as a superior alternative. In my essay, "With This Ring I Thee Wed: Marriage in *The Beau Defeated*," I argue that this play deserves just as much credit for the shift as more oft-read plays by male authors (*Way of the World* included) by looking at the way in which Pix considers the purposes of marriage. I contend that it is not libertinism, per se, that Pix criticizes, but the narcissism that so thoroughly embodied the Restoration-era libertine. Bringing about the failure of the rake and rewarding those who are seeking a marriage that benefits society as well as themselves, *The Beau Defeated* contributes significantly to the ongoing discussion regarding the appropriate perspective on self, and one's relationship to society.

"Quick! Do Something Manly!" - The Super Bowl as an American Spectacle of Hegemonic Masculinity, Violence, and Nationalism

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

This paper explores the theoretical concept of "hegemonic masculinity" as it applies and pertains to the Super Bowl in particular and American football in general. The Super Bowl is a contemporary media spectacle whose hegemonic undertones of misogyny and homophobia communicate to its audience punitive standards of masculinity, gender roles, and the American nation state. The meanings of pain and injury in American football elucidate how football stylizes gender inequality by venerating bodily violence between its hypermasculine players. While the brutality of football visually enacts masculine gender norms on the field, many Super Bowl commercials exercise violence of conformity, pointing to an intertextual and mutually constitutive relationship between the game and the ads. Gender is central to the Super Bowl because the spectacle inculcates masculine gender norms with hegemonic undertones of misogyny and homophobia. By enacting exemplary identity performances in phallic aggressive simulations of war, professional football weds heteronormative and violent masculinity to American nationalism. The visual and strategic similarities between football and warfare allude to the game's history as a training instrument of the American military. The Super Bowl employs images of American nationalism, visually glorifying the American nation state to legitimate masculine and, conversely, degrade female gender performances. A contribution to cultural criticism and masculinity studies, this paper posits that the Super Bowl is a colorful spectacle that unites sports with pop culture while perpetuating misogyny and homophobia.

Towards Infinity: Sun Ra and the Performance of Escape

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

The preeminent jazz trickster known as Sun Ra was a shape-shifting musical pioneer. An intellectual, Sun Ra was an insatiable student of a vast range of information, endlessly studying a wide array of subjects, ranging from astrology, numerology, African history, and the occult - to the works of W.E.B. Du Bois and Booker T. Washington, the Bible, scientific journals, and various theosophical texts. This presentation intends to examine how Sun Ra used this research/musical praxis to devise a unique aesthetic that he employed to escape a subaltern position - in turn becoming racially, culturally, and politically empowered. Utilizing his recorded works, film excerpts, and the collected interviews with Sun Ra and his colleagues, I will demonstrate how Sun Ra's last home, the city of Philadelphia, was the site of his greatest triumphs, as well as the locus of his increased dissatisfaction with the racial climate within the United States. Additionally, I will locate Sun Ra as a free-jazz icon whose musical omniverse was the archetype of Afrofuturism, a synthesis of an esteemed African past and the promise of an intergalactic future located among the (symbolic) constellations of the solar system. Imbued further with notions of science fiction, Egyptology, and an apocalyptic ethos, Afrofuturism - as Ra practiced it - was additionally tethered to an inherent iconoclastic vision of nonconforming invention.

"Samba is Power": Dancing through the Diaspora in the Poetic Collaborations of Jayne Cortez

Presenter: Renee Kingan
Advisor: Kara Thompson
College of William & Mary,
American Studies

From the 1950s until her sudden death in December 2012, Jayne Cortez was a powerful and dynamic voice against oppression across the African Diaspora. Though she worked primarily as a poet, Cortez's activist-art bridged all artistic genres, often forging new territory for expression—especially in her performed collaborations with jazz musicians. Cortez wrote and performed her poem "Samba is Power" as a nuanced expression of the multiple levels on which samba operates as a means of bearing witness, coping, subverting, and ultimately celebrating different aspects of her multi-faceted life and work. This paper provides a framework for looking at the transnational power of samba through a close-reading/analysis of Cortez's performance of "Samba is Power" on her 1994 album Cheerful and Optimistic. The poem's central claim is that "samba is life / samba is friction / samba is power / samba is everything." Thus, by examining Cortez's words and the musicians' interactions with them, this paper argues that Cortez portrays samba as an expression of culture engaged in a Circum-Atlantic dialogue in which music and dance both reflect and disrupt multiple aspects of life across the African Diaspora.

Italy and the American West: Representations of Native Americans in *Tex*

Presenter: Tyler Norris
Advisor: Karin Wulf
College of William & Mary,
American Studies

Tex first came into publication in Italy in 1948. Since then, the comic has embedded itself in Italian popular culture and continues to publish comic books and magazine issues. The comic books follow Tex Willer, a nineteenth-century Texas Ranger who marries a Navajo girl and becomes Chief of the tribe, as he protects the Navajo from bandits. Tex encounters General Custer, fights for the Union in the Civil War, and fights crime with his Navajo sidekick, Tiger Jack. This paper will utilize Giorgio Agamben's concept of the "homo sacer" to interrogate *Tex*'s representations of Native Americans and analyze the comic's depiction of their role in the American West. This will include analyses of Navajo characters, an exploration of the nature of Tex's relationship with the Navajo, and a consideration of the plotlines of select issues. This will bring up questions regarding the significance of international perceptions of Native Americans. Focusing on mid-twentieth-century Italy, this paper will attempt to address the implications of foreign stereotyping of Native Americans and will apply Native American Studies scholarship to argue for its adverse effects.

REDRUM as the "Red Death": *The Shining* as Twentieth-Century Gothic Temperance Tale

Presenter: David Pratt
Advisor: Susan Donaldson
College of William & Mary,
American Studies

Since the temperance fervor of the mid-nineteenth century, American cultural products have participated in a discourse on alcohol as a destructive, addictive substance, rather than one that simply intoxicates or even elevates. During periods in which Americans have been preoccupied with social concerns other than intemperance or alcoholism, the discourse on these issues has waned, and literary traditions of alcohol as an intoxicating substance have resurfaced. In the Vietnam era, amid racial strife, an unpopular war, and a rise in recreational drug use, the cultural dominance of the disease model of alcoholism momentarily faded. Whereas television, film and literature had reflected the influence of the alcoholism movement in post-World War II America, heavy drinking became a sometimes-positive, if countercultural, indicator of character in Vietnam-era American culture. With the conservative cultural turn of the late 1970s and 1980s, writers and filmmakers again took up alcoholism and recovery narratives. Toward the beginning of this return to the alcoholism discourse, Stephen King employed temperance and Gothic literary conventions that would have been familiar to nineteenth-century readers in his novel *The Shining* (1977). However, by explicitly referencing Jack Torrance's disease and frequently quoting Poe's "The Masque of the Red Death" (1842), King reframed both literary traditions in terms of the disease model of alcoholism. *The Shining* portrays Jack's drinking as neither a father's failure of will nor a cultural symbol of rebellion. Rather, his alcoholism is a supernatural force that will either consume him alone or destroy his entire family.

The Soul of Whose South: *Garden & Gun's* New (?) South for A National Readership

Presenter: Kate Previti
Advisor: Susan Donaldson
College of William & Mary,
American Studies

Launched in 2007 just weeks before the Virginia Tech shootings, the Southern lifestyle magazine *Garden & Gun* has evolved from a regional publication with a controversial name into a national publishing phenomenon with nearly half of its subscribers living outside of the South. The magazine struggled initially with its focus on "the sporting life of the South," but flourished upon expanding its ambitions to embody "the Soul of the South" and showcase the "Best of the South." This paper examines *Garden & Gun's* success in rebranding a once "backwards" region into an enviably "exceptional" South for national consumption, which it achieves largely by confining racial and class diversity to the seemingly safe spaces of Southern culture: food, the home, and the hunt. Probing the limitations of *Garden & Gun's* editorial scope, I uncover how the magazine draws specifically on foodways to both define the particular South it's marketing and to gesture toward a more diversified representation of the region. Non-whites and working-class whites make limited yet crucial appearances inside the magazine, photographed in aestheticized aprons, overalls, and work boots, but never featured on the cover. *Garden & Gun* might praise the barbeque from an African American pitmaster or feature his food on the cover, but such inclusion merely offsets the magazine's far more prominent consumer culture that caters to affluent whiteness. This paper investigates *Garden & Gun*'s cursory treatment of racial and class diversity in the creation and packaging of a distinctive not-so New South with national appeal.

Who is She? The Epistemology of Ada 'Bricktop' Smith's Identity

Presenter: James Padilioni, Jr.
Advisor: Hannah Rosen
College of William & Mary,
American Studies

Ada "Bricktop" Smith, whose moniker signaled both red hair and interracial status, embarked upon the journey of her lifetime in 1924, leaving Harlem to take a booking in a Montmartre cabaret as a singer. Within a few years, Smith, who had left her West Virginia home for Chicago, then Harlem, and now Paris, had conquered the Parisian jazz scene, making friends with Cole Porter, Langston Hughes, and Josephine Baker, and opening her own night club, Chez Bricktop. Smith remained in Paris until the 1939 outbreak of WWII. This paper explores the constitution and instability of racial identities through Smith's life story, one that I argue can be interpreted as a process of articulation between differing and overlapping semiotic systems in which her racial categorization remained fluid. Jazz Age Paris looms large in the cultural memory of African-Americans for its perceived liberality regarding race relations relative to the United States. However, as the discussion of Parisian life in Smith's memoir makes clear, racism existed in Paris, though in a distinctively French form. Furthermore, to appreciate fully the experience of Jim Crow-era American blacks in France, it is necessary to understand the American racial habitus, one possessing its own form of fluidity, from which they came. This paper explores the location-specific nature of the construction of Bricktop's identity by beginning with her American experiences, a necessary first step to understanding how the interaction between past and present shaped her ambiguous "race" once she reached the banks of the Seine.

900 You Street: The Daily Life of an African American Photography Studio, 1900-1945

Presenter: William Piper
Advisor: Arthur Knight
College of William & Mary,
American Studies

.As part of a larger work examining African American studio photography businesses, this paper contextualizes the photography of Addison Scurlock in the physical space of his eponymous Washington, DC studio during the early decades of the twentieth century. Scurlock built his practice during a period when segregation-hardened African American entrepreneurs pursued racially-conscious economic development as an assertive political movement. This paper will demonstrate some of the ways that Addison Scurlock negotiated between impulses for capitalism and collectivism while contributing to the District's development into the nation's first black cultural capital. Furthermore, this paper will suggest how the Scurlock Studio, and others like it, served as important sites for the intersection of art, commerce, and cultural politics during the twentieth century black freedom movement. Soon after moving his studio to 900 U Street in 1911, Scurlock's distinct photographs became a standard for black visual culture, associated with ambition and accumulation both locally and nationally. Fully understanding how Scurlock's photographs functioned in the cultural politics of black Washington also requires considering how consumers/viewers encountered his images and moved through his studio. To that end, this paper examines the many uses that African Americans found for the physical space of the photography studio: from political organizing to neighborhood gossip, and from cocktail parties to annual holiday portraits. Looking inside and outside the studio, I consider how Scurlock photographs enabled the performance and production of African American identities in regards to class, gender, and race.

Popular Violence: Affective Economies of anti-LGBTQ Hate Crime

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

The attack against the LGBTQ activist, Eugene Lovendusky on May 24th, 2013, marked him as the ninth victim in just one month in a series of violent acts against the LGBTQ community in New York City. This very particularly styled black-and-white photograph of Lovendusky – rather similar to the image we have settled on Matthew Shepard today– went viral. Since May 2013, there have been a disturbingly high number of homicides of trans women of color outside New York City, but none of those cases have gained a significant level of visibility in popular media discourse. The black-and-white image of a white clean-cut urban gay man is currently the most popular image of anti-LGBTQ violence. It's the image of violence that still seems most "natural" and "unnatural" to us at the same time. How does this fit in with the fact that the cases of anti-LGBTQ violence (e.g., Brandon Teena and Matthew Shepard) that have gained most momentum in popular culture imagination through filmic representations, television, and books, are decidedly "rural?" This paper looks into the media cultures of anti-LGBTQ violence, and explores the complex dynamics of affective economies that hate crimes invoke.

The Salem Witches in mid/late-20th century American Popular Culture

Presenter: Jenna Simpson
Advisor: Arthur Knight
College of William & Mary,
American Studies

Salem, Massachusetts has long been dogged by the memory of the infamous witch trials of 1692/3, a legacy with which the town has a long and conflicted history. Throughout the last century this legacy has increasingly become a part of the national public imagination, with the rise of mass media and depictions of Salem and its witches in popular culture. From the mid-twentieth century on, popular performances on stage and screen have continually played upon the link between Salem and witchcraft – though in varied ways and with varying meanings. This talk will explore the differing uses of Salem in the last sixty years, from serious indictments of the trials and the culture of "witch hunting" (in *The Crucible*) to relatively light-hearted life lessons (in *Sabrina: The Teenage Witch* and *Hocus Pocus*) to pure comic relief (in *Bewitched*.) These examples will show how Salem itself has become a stand-in for generic "witchiness" while still retaining significance as a geographical location (and building upon that significance to become a lucrative tourist attraction.) They will also show that American popular culture shares Salem's ambivalence about the trials themselves, wavering between outright condemnation and comic justification (in plots that imply that either there were witches in Salem but the wrong people were persecuted or that real witches were hanged but even that could not destroy their evil, as the Salem witches return from the dead to terrorize today's children.) We will see, as well, how longstanding tropes about witches and womanhood have continued to be reinforced throughout this period.

Experiencing the Past in the Present: Community Archaeology on the 19th Century Saltpans of Cayo Sal, Los Roques Archipelago, Venezuela

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

The fifth community archaeology workshop was held in June of 2013 on Cayo Sal in the Los Roques Archipelago. The workshop, designed for the students of the secondary school of Gran Roque Island, was the first historical archaeology initiative of the ongoing community archaeology program and the first such initiative in Venezuela. The experience involved group-building activities and lectures by the team on archaeological methods and the history of Cayo Sal. This was followed by two days of excavation on the 19th-century archaeological site of Cayo Sal, located by the saltpans. Students were given the task of excavating, recording and documenting the dig and the materials as they recovered them in their units. An identification guide of diagnostic artifacts was given to each group which facilitated the understanding of what was being excavated in situ. Following the excavation, the students identified and analyzed the recovered artefacts and ecofacts assisted by the archaeologists. Finally, they were encouraged to creatively juxtapose the artifactual evidence and the historical background with their own experiences, to inquire on the quotidian life and work of the 19th-century Cayo Sal salt workers. The schoolchildren empathized with their direct past, identified its similarities and differences with their current realities, and communicated this through lively presentations that were both insightful and transformative for them and the archaeological team.

Beyond a Picture's 1,000 Words: The Application of High-Performance Photogrammetry to the Tangible Heritage Fields

Presenter: Hayden Bassett
Advisor: Neil Norman
College of William & Mary,
Anthropology

Archaeological, architectural, and other forms of tangible heritage recording are primarily approached through representations of surface geometry. Stratigraphic contexts, building elevations and foundations, landscape features, and artifacts are all typically recorded in their geometric, measurable form. However, limitations of static methods of recording limit the communication of visual representations to single perspectives, and further limit their future utility to research and understanding confined to the perspective of recording. Within many contemporary landscape and mobility approaches, recordable contexts are often obscured, indecipherable, or simply unrecordable in 2-dimensional representation. 3D digital recording methods provide one dynamic solution to this shortcoming, though one that must be weighed against factors of cost, field-portability, and archive sustainability. This research uses high-performance photogrammetry to develop new methodological avenues for archaeological, architectural, and related tangible heritage fields that run parallel to advancing theoretical conversations of landscape and mobility. Using case studies from my fieldwork in Jamaica and local collaborations with the Colonial Williamsburg departments of Research and Conservation, this project reorients field recording to a more inclusive, fluid model of data capture for research, preservation, conservation, and public interaction. To this beginning, this field-based application of photogrammetry gives way to a new and large body of measurable, relational datasets and analytic means for recording spatial/geometric phenomena beyond elements with straightforward geometry.

African Diasporic Scholarship in Anthropology

Presenter: Brittany Brown
Co-Author: S. Winsett
Advisor: Frederick Smith
College of William & Mary, Anthropology

In recent years, African Diasporic Scholars have criticized mainstream anthropology as being uncritical, Eurocentric, and limited in its ability to produce adequate understandings of the complex social, historical, and cultural contexts of the African Diasporic experience. This paper contributes to this critique and argues that African Diaspora Scholarship (ADS) is a more appropriate methodological framework for the investigation of Black life, history, and culture. ADS, as an interdisciplinary, reflexive, political, empathetic, and activist framework, allows African Diaspora research to be critical, dialogical, and non-authoritative. ADS draws theoretical influence from African American literature, oral histories, philosophies, political texts. Since the discipline's beginning, ADS has stood as the antithesis to mainstream anthropology. This paper argues for the integration of ADS within the theoretical and methodological practices of mainstream anthropology. Furthermore, this paper demonstrates ADS as a valid approach to anthropology that can be constructed for, and integrated within mainstream scholarship that focuses on Black and perhaps other minority communities.

Eburnation, Osteometrics, and Oxen: A Pilot Study on the Identification of Draught Cattle in the Archaeological Record

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

The study of draught exploitation in cattle has recently become an important topic in zooarchaeological studies of Old World sites. In the last five years, zooarchaeologists in the New World have realized the potential of methodologies for identifying and analyzing draught cattle in their own assemblages. These methodologies include examining the skeletal remains directly for pathological and arthritic changes associated with draught exploitation as well as quantitative and qualitative methodologies for determining the sex and age of the cattle represented in the assemblages. This research applies these methods to the cattle remains recovered from an eighteenth-century well at Drayton Hall in South Carolina as a means of assessing the potential for identifying draught oxen in faunal assemblages from eighteenth-century plantations in British North America. Cattle metacarpals, metatarsals, and phalanges are macroscopically examined for exotoses, eburnation, and lipping. Additionally, osteometric analysis of the metacarpals and metatarsals indicates possible sexual dimorphism. Results of this research can illuminate sampling and methodological strategies for identifying draught oxen in further assemblages.

Cruciforms and Cosmograms: A Pipe in Context

Presenter: Thomas Cuthbertson
Advisor: Martin Gallivan
College of William & Mary, Anthropology

The Rich Neck Plantation is a mult-component site just over a mile south west of the College of William and Mary's campus. The artifact assemblage from the 17th century component of this site included a tobacco pipe made from the local red clay with a faceted bowl and an incised decoration on the bottom of its spur. This motif has been described has been described by some as a Bakongo cosmogram. The motif present is extremely simple in composition, and to ascribe a specific culture to this artifact, or its decoration, without a thorough investigation of the context that produced it, would be methodologically myopic. In this discussion I wish to identify the groups present at the plantation at, and before, the time of deposition for this pipe, the common symbolism present in these cultures, and what the possible meanings of this pipe and this decoration could be. In addition to the meaning given to the pipe by the user, other individuals would have also interacted with the pipe more casually. The pipe would have meaning to these observers as well. This idea of multi-valency has not been applied as thoroughly as it could be to this artifact type and needs to be explored more fully.

Emnity and Alliance: Modeling Colonial Encounter on the Seventeenth-Century Eastern Siouan Frontier

Presenter: Madeleine Gunter
Advisor: Martin Gallivan
College of William & Mary, Anthropology

Siouan-speaking native communities across the Roanoke River Drainage in Virginia's southern Piedmont occupied a pivotal place on the seventeenth-century Southeastern geopolitical landscape. Between 1650 and 1676, the Siouan-speaking Occaneechi controlled European-Indian trade across southern Virginia. Acting as middlemen, they funneled deerskins from their western trading partners--the Sara--to English colonists in the East. On the periphery of Occaneechi-controlled fur trading networks, the Sara were free to selectively engage in--and avoid--the eastern deerskin trade. Drawing on material evidence from six contact-period sites in the Dan River Basin (the farthest western boundary of the Roanoke River Drainage), this paper examines and models the complex borderland processes that played out across the western Piedmont, with the goal of understanding how native communities on the "Siouan frontier" engaged in, and resisted, emerging deerskin trading economies during the seventeenth century. These analyses serve as a case study for investigating both the direct and indirect nature of colonial encounters at a regional scale.

"Who Uses the Old Language?": Linguistic Authority, Language Ideology, and Multi-Purpose Language Documentation

*Presenter: S*tephanie Hasselbacher
Advisor: Kathleen Bragdon-Brown
College of William & Mary,
Anthropology

Based on several years of language documentation and revitalization work on the Coushatta Reservation outside Elton, Louisiana, this paper describes the influence of competing ideologies regarding linguistic authority on linguistic anthropological methodology. Speakers with linguistic authority -- the socially sanctioned power to make decisions regarding the correctness or appropriateness of language use -- can exert great influence over what constitutes an appropriate contribution to a community-based project. Since one scientific goal of a language documentation is to record as much language-in-use as possible, from a wide variety of speakers in a wide variety of contexts, research in this field faces important questions of what constitutes "representative" language. How can researchers wed locally specific, culturally appropriate ideas of linguistic authority and authenticity with the generalized best practices of language documentation according to academic experts? This paper seeks to explain how this potential conflict was negotiated in the Coushatta context, in hopes of drawing generalizations that may prove useful for future research and other communities.

“Double-Barreled Chimnies”: Discovering an Irish Landscape in Central Virginia

Presenter: Amanda Johnson
Advisor: Frederick Smith
College of William & Mary,
Anthropology

In the 1850s, over 2000 Irish immigrants were brought to an area 20 miles west of Charlottesville, Virginia to construct the tunnels and cuts associated with the Blue Ridge Railroad. The dangerous and lengthly work transformed this transient immigrant population into a semi-settled community for the duration of the decade long project. During the summer of 2013, excavations focused on dry-laid stone platforms above the tracks near the eastern portal of the Blue Ridge Railroad Tunnel. The Irish inhabited impermanent shanty structures on the side of Afton Mountain while constructing the tunnel, changing the landscape to suit their needs. The aim of the project is to examine historical and archeological findings to provide an intimate glimpse into the daily lives and experiences of the Irish laborers and their families and to connect these experiences to the larger diasporic community.

Dwelling and Traveling in 17th Century Florida: Linguistic, Historical, and Archaeological Insights into the Timucua

Presenter: Patrick Johnson
Advisor: Kathleen Bragdon-Brown
College of William & Mary,
Anthropology

In this paper I discuss methods of lexical analysis by exploring Timucua terms related to dwelling, owning, and traveling in Francisco Pareja's 1614 *Arte y Pronunciacion de la Lengua Timuquana*. In doing so, I also make connections to other research into the Timucua based on historical and archaeological evidence as well as to broader anthropological discussions of place-making and authority. Because the Spanish used the Timucua language to communicate to other Spaniards and to Native Americans they contacted, and because so much data exists for the now-extinct Timucua language, this case study also helps address research questions related to Native American negotiation of Spanish colonialism.

Evolving Representations of Hopi Katsinas and Clowns: Artistic Perspectives on Expressing Continuity and Change

Presenter: Jaclyn Kuizon
Advisor: Danielle Moretti-Langholtz
College of William & Mary,
Anthropology

Fine art of the American Southwest calls to mind images of skillfully woven Navajo rugs, intricately crafted pottery and jewelry, and breathtaking paintings of landscapes that many Native cultures have called home for countless generations. Also among such artworks are the Katsina and clown dolls of the Hopi. Carved of cottonwood, these dolls are representations of Katsina dancers, Katsina ancestral spirits, and four clown groups that take up roles of attendants, culture heroes, or mischief-makers. Stemming from pieces described by some as three-dimensional prayers, educational tools, and gifts, these dolls have transformed into objects that also reflect highly collectible "art" and expanding stylistic trends. Although Katsina and clown dolls are still used in Hopi ceremonial contexts, they have undergone shifts in symbolism and genre. Catalysts for such change can be seen in the late nineteenth century through the expansion of Hopi artists into new mediums for consumption by non-Hopis, and in the early twentieth century through Dorothy Dunn's creation of Studio Style painting at the Santa Fé Indian School. Artists and students of Dunn, Geronima Montoya and Fred Kabotie, were harbingers of change for future Hopi and fellow Native artists. Their works and artists' statements showcased a new trend in Hopi creative expression that revitalized the way contemporary communities of practice conceptualize the individual artist and Hopi or Native identity. Their lessons are reflected in adaptation of creative processes and continue to usher in dynamic models for appreciation of cultural heritage and cosmology.

No One Expects a Spanish Imposition: Understanding Past and Present Cochineal Production in the Canary Islands

Presenter: Sarah Mattes
Advisor: Marley Brown
College of William & Mary,
Anthropology

Following Spanish conquest in the late 15th century, a series of commodities were introduced and produced in the Canary Islands and, while the agricultural economy today is much smaller than the tourist economy, many of these colonial products are still produced. One such commodity is cochineal, introduced in the early 19th century. American cochineal was, for centuries, a dominant source of red dyestuff and, for a few decades in the mid-19th century, the Canary Islands were the largest producer of cochineal in the world. Though the people of Lanzarote (the north-easternmost island in the archipelago) were hesitant to adopt cochineal, its impact on the local commodity was so dramatic that it has become a tool through which contemporary farmers on Lanzarote maintain and assert their heritage. Archaeology can help shed light on the material manifestations of the production of cochineal as well as on the physical environment, architecture, and materiality of production. This project therefore investigates the material indices of the political and heritage economy of cochineal within the Atlantic World.

Understanding Hawaiian Barkcloth in Context: The *Kapa* Assemblage from Nualolo Kai, Kauai, Hawaii

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

Bishop Museum archaeologists excavating in cliff-side habitation terraces at Nualolo Kai, Kauai, Hawaii, between 1958 and 1964 investigated four structural features at this location. Nearly 13,500 artifacts, including many exceptionally well preserved perishable artifacts, were recovered. Because archaeological specimens of Hawaiian barkcloth, or *kapa*, are exceedingly rare, the kapa collection from Nualolo Kai is a truly remarkable assemblage. Although Hawaiian *kapa* specimens are held in museum ethnographic collections worldwide, such specimens often lack associated contextual information, and as such, much remains to be understood about the changing context of *kapa* production and use following the arrival of Captain Cook in Hawaii. The archaeological *kapa* curated by Bishop Museum includes over 20 decorated and undecorated fragments recovered from secure excavation contexts. These fragments provide a unique opportunity to anchor *kapa* artifacts in time and space, allowing questions relating to continuity and change in *kapa* use to be addressed. In this presentation, information from artifact catalogs and unpublished report manuscripts is synthesized, and a preliminary description of the *kapa* assemblage is provided. Excavation contexts are compared with published radiocarbon dates and cross-dated with additional artifacts in an attempt to place the *kapa* assemblage in precise chronological context. Finally, implications for understanding Hawaiian life in the early historic period are discussed, with the aim of recognizing possible ways that *kapa* makers may have used barkcloth in negotiating the dynamic and fluid social networks characterizing this period of Hawaiian history.

Science, System, Stance: A Genealogical Analysis of the Concept of Ideology

Presenter: Erin Schwartz
Advisor: Marley Brown
College of William & Mary,
Anthropology

While "ideology" today typically refers to a politically-, economically-, or culturally-oriented worldview, the concept of ideology has ranged from a simple science of ideas to doctrines employed by nations, political parties, and social groups. This examination of ideology uses a Foucauldian-style genealogy, following the shifts and fractures of ideology that have led to the negative connotations generally associated with the word. In exploring the historiography of ideology, I hope to answer particular questions about where ideology's many strains (epistemological, sociological, psychological, cultural, etc.) originated as well as what influenced different writers' conceptualizations of ideology. Research into the abstract, fluid nature of "ideology" involves an equally flexible framework: writers and authorities from a range of subjects, including the French philosopher Antoine Destutt de Tracy and symbolic anthropologist Clifford Geertz, are incorporated to obtain a balanced picture of what "ideology" actually is. In essence, this project seeks to not only trace the complicated lineages of the concept (and the forces behind these changes), but break down notions of truth and neutrality to get a clear (or, at least, clearer) understanding of how human action and error generated "ideology" as we know it. Though this research is theoretical in nature, by providing a succinct overview of this multifaceted and multivalent concept, my aim is to also give direction on how to apply the findings to more practical and concrete subjects.

Indian Removal in the State of Minnesota and the Territory of Colorado

Presenter: Kelley Smith
Advisor: Michael Gray
College of William & Mary,
Anthropology

The Dakota Conflict of 1862 and the Sand Creek Massacre of 1864 were two tragedies that resulted in over 250 American Indian casualties combined. They were the early beginnings to the Indian Wars west of the Mississippi that lasted from 1811-1924, and raged across the Plains as distinct strikes against the encroaching white settlers. Despite the fact that the governors and military officers asserted differing strategies against the natives, the result of both events was the elimination of the Indians. Dakota men responded to their plight with a preemptive strike to protect their way of life, while the Cheyenne were absolute victims of a revolting mutilation. No matter how the chiefs and their warriors responded to the United States' self-interest for land and power, the American Indians scarcely had a chance of preventing the U.S. from accomplishing their goals. Regardless of the differing political agendas of both the state of Minnesota and territory of Colorado, each event resulted in the systematic eradication of the American Indian population in the West.

Rogue Fishermen and Rebel Miners: Informal Economy and Drinking Spaces in Maine and Montana's Resource Extraction Communities

Presenter: Megan Victor
Advisor: Neil Norman
College of William & Mary, Anthropology

I examine the way that frontier spaces shaped their inhabitants' interactions, considering informal economy, trade and exchange, and the negotiation of social capital through commensal politics, as seen in the archaeological record. The processes at work within frontier locales influence inhabitants in such similar ways that they can be examined broadly across time and space. Frontier spaces are central to a more nuanced understanding of the trade networks that spanned the Atlantic and the North America. Studying these spaces can reveal the ways that economic and social capital was negotiated within exchange networks and local regimes of value. I address resource extraction communities in frontier locales across space and time. Specifically, I look at the microeconomics at the Isles of Shoals' fishing station and the mining town of Highland City comparatively. The fishermen deployed their economic gains drawn from marine resources to negotiate social capital and carry out transactions within an informal economy inside the local tavern. Drawing from pilot study excavations this past summer, I hypothesize that the same processes were going on at Highland City, in Montana, where mineral rather than marine resources were at the heart of the negotiations.

Morphometric properties of Dbx1$^+$ neurons that contribute to respiratory rhythm and pattern in mice

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

Breathing is essential behavior for humans and all mammals. The inspiratory phase of the respiratory rhythm is generated by the preBötzinger complex (preBötC), a bilaterally distributed site located in the ventral medullary brainstem. Putatively rhythmogenic neurons in the preBötC are derived from a single genetic line, whose precursors express homeodomain transcription factor Dbx1 (Developing Brain Homeobox-1). To better understand the role of *Dbx1*$^+$ neurons in respiratory network functionality, we performed electrophysiological experiments in vitro which revealed a suite of intrinsic properties that could contribute to rhythm generation; however a physiological analysis alone does not provide a complete understanding of the role of *Dbx1*$^+$ neurons in respiratory rhythm generation. An analysis of the morphological features of *Dbx1*$^+$ neurons, independent of their intrinsic membrane properties, provides insight into how they communicate and contribute to network behavior that cannot be gained via electrophysiology. We performed a morphometric analysis of *Dbx1*$^+$ neurons which determined that *Dbx1*$^+$ neurons have smooth unbranched dendrites, commissural axon projections, and a flat (co-planar) configuration. These morphological features facilitate signal transduction, provide evidence that *Dbx1*$^+$ neurons bilaterally synchronize the preBötC, and demonstrate selective connectivity in recurrent local interneuronal networks respectively.

Parameterization of New Force Fields for Polytetrafluoroethylene

Presenter: Rawan Al-Nsour
Co-Authors: B. Hinderliter, J. Hackett
Advisor: Mohamed Gad-el-Hak
Virginia Commonwealth University,
Mechanical and Nuclear Engineering

Polymers continue to be a critical component in numerous materials across wide range of manufacturing and industrial applications. Of special interest to the present research is polytetrafluoroethylene. A review of the literature on PTFE reveals two research approaches, experimentally and analytically. Recently, molecular dynamics simulations emerged as a new modeling approach for studying PTFE's important features and significant properties, thereby allowing for a comprehensive understanding of PTFE structural and mechanical behavior. Molecular dynamics simulations rely on the force-fields parameters, which represent the interactions between atoms and molecules. Due to the scarcity of polytetrafluoroethylene force-fields research, this work will add to the current body of knowledge by generating a new set of perfluoroalkanes parameters. We used perfluorobutane C_4F_{10} as a reference molecule in the parameterization process. In addition, we utilized the automated frequency matching method for intramolecular parameters optimization. Ab initio and quantum chemistry calculations were based on Density Functional Theory and on obtaining the restrained electrostatic potential point charges at DFT level of theory using Northwest Computational Chemistry NWCHEM software. In the developed optimized potentials for liquid simulations, PTFE all-atom parameters were tested using molecular dynamics simulations. The simulations were performed using NAMD package to assess polytetrafluoroethylene condensed phase properties: density and heat of vaporization. The simulated results were in agreement with experimental findings.

Effects of multiple benefits in a risk-benefit dynamic epidemic network

Presenter: Shadrack Antwi
Advisor: Leah Shaw
College of William & Mary,
Applied Science

The network of contacts (links) between people (nodes) forms the pathways for communicable diseases. Individuals may differ in their intrinsic desirability as a contact (e.g., physical attractiveness). These differences may result in different numbers of social contacts. The effect of an infectious disease such as HIV may therefore be different on nodes with different attributes. We model a network of nodes that form connections based on a tradeoff between benefit (desirability) of the connection and risk of infection. Building on earlier work where we considered that all individuals have the same intrinsic benefit value, we study the case of a non-uniform population with nodes having one of multiple possible benefit values. Without knowledge of each others' infection status, as in HIV, a node's risk of being infectious is assumed to depend on its number of contacts. A payoff function captures the tradeoff between risk and benefit. We simulate this dynamic network model and compare the results to an analytical approximation. We characterize the resulting network structure and infection prevalence.

Examining Crude Oil–Rock Interactions in a Liquid Environment using Atomic Force Spectroscopy

Presenter: Laura Dickinson
Advisor: Hannes Schniepp
College of William & Mary,
Applied Science

Oil, undoubtedly one of the most precious resources in the world economy, is currently extracted by techniques that leave a significant amount of the crude in the reservoir. This inefficiency is partly due to oil trapped in mineral pores and adhered to surrounding mineral surfaces. One method that seeks to address the problem and increase production is water injection, which increases pressure and pushes oil to the surface. Our research aims to enhance this method by modifying the injected liquid to reduce adhesion and increase repulsion between the oil and the reservoir minerals. Our eventual goal is to find a predictive method to determine which reservoirs would benefit most from specific injection solutions. To address this challenge, we use atomic force microscopy and a custom-developed probe to measure electrostatic and van der Waals interactions at the oil/mineral interface in a liquid environment. Our innovative approach allows us to select oil, liquid and grains from an individual reservoir. By varying the liquid composition and observing the effect on the forces, we work to elucidate the individual effects of different components. These experiments provide valuable information on the force interactions between reservoir materials and inform our suggestions to enhance oil recovery techniques.

Nanomechanical Behavior of Holey Graphene Reinforced Polymer Nanocomposites

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

The advanced mechanical properties of graphene make it an excellent candidate as a reinforcement material in polymer based nanocomposites. An increased surface area between the matrix and reinforcement in these nanocomposites give it the potential to surpass the mechanical properties of other common composite materials. However, due to factors including poor load transfer at the graphene-polymer interface, such properties have not yet been achieved. Recently, holey graphene nanosheets (hG), single-layer graphene with meso-sized holes, have been developed using a scalable process, which allows for control of hole size. When these hG sheets are used to create a nanocomposite, the resulting material shows improved mechanical properties over those reinforced with pristine graphene. It is expected that the structure of the hG sheets makes a significant contribution to the superior properties of the hG-polymer nanocomposite. To understand the improvement in mechanical properties after the addition holes, we study the structural and interfacial behavior of hG sheets in a hG-polymer nanocomposite under tensile loading using atomic force microscopy (AFM) techniques. The study involves scanning a polymer in both relaxed and strained states with hG nanosheets imbedded into the surface. Images are collected with an AFM technique know as force modulation mode, which reveals changes in the modulus of elasticity of the sample surface. By comparing the relaxed and strained hG sheets, conclusions are drawn about both the hG nanosheet's reaction to loading and the stress transfer at the polymer-hG interface.

From Theory to Practice: Toward a Telecommunication and Networking Studies "Where do I park?"

Presenter: Andrew Hutchson
Co-Authors: M. Hess, R. Spinosa, B. Campbell
Advisor: Samy El-Tawab
James Madison University,
Integrated Science and Engineering

Parking availability and parking locators are two famous applications in Vehicular Networks. At James Madison University, we use technology to minimize the traffic on campus by using smart gates that control the access of students/faculty traffic flow at certain locations. Our goal is to extend the use of the vehicular resources with cellular networks technology to help drivers find a parking lot with available spots on campus near their destination in "near" real-time fashion. Our idea is to build a prototype system that can test the capability of our system. Our test scenario can be implemented in JMU-parking lots where vehicles will be equipped with Radio Frequency IDentification (RFID) tags that replace normal parking decals. The RFID reader can be installed in the parking lot to count the number of vehicles that are entering or leaving the parking lot. We divide our system into three tiers. The backend tier: the communication between the RFID reader installed in the beginning of the parking lot and the vehicles. The center tier: A database that keeps track of number of available spots in each parking lot. The frontend tier: The software app that runs on smart phones and presents the user with the best parking lot. Our idea can be generalized to malls or stadium parking lots where events restrict parking depending on decals and permits. In this project, we will identify some security challenges that also need to be addressed.

Xenopus laevis as a Model For Methylmercury Toxicity During Neurodevelopment

Presenter: Ryan Huyck
Co-Authors: M. Nagarkar, N. Olsen
Advisor: Margaret Saha
College of William & Mary,
Applied Science

Methylmercury (MeHg) is the most common form of mercury found in the food chain, and a ubiquitous environmental toxin. Poisoning cases in human populations have shown MeHg to be particularly disruptive to the developing nervous system; however the mechanisms of this embryonic toxicity remain poorly understood. To investigate how MeHg exerts its effects, we have chosen to use the model organism *Xenopus laevis* for its well characterized developmental stages and ease of manipulation. Exposing early *X. laevis* embryos to a range of physiologically relevant MeHg concentrations, we found markers of neural progenitor gene expression, such as Sox2, did not show a change as a result of MeHg exposure. However, we observed dose and density dependent embryonic defects – such as failure to close the anterior neural tube – which coincided with downregulation of proliferating cell nuclear antigen, a marker of cell proliferation, and an increase in programmed cell death (apoptosis). Thus, these results suggest that an increase of apoptosis in the embryo, along with a decrease of compensatory cell proliferation, rather than failure to correctly specify neural tissue formation, may play a role in the deleterious effects of MeHg on the developing nervous system.

Brown Recluse Spider's Nanometer Scale Ribbons of Stiff, Extensible Silk

Presenter: Sean Koebley
Co-Author: F. Vollrath
Advisor: Hannes Schniepp
College of William & Mary,
Applied Science

Spider silk, a protein-derived polymer with the strength of steel, has tremendous potential to inspire the next generation of engineering and biomedical devices. Orb-weaving spiders have served as the models for silk studies to date, as the cylindrical, fibrillar silk strands that constitute the archetypal orb web possess tremendous mechanical properties and are relatively simple to extract. Alternatively, the cobweb silk from the Brown Recluse spider features a ribbon-like morphology unlike that of any other spider silk or synthetically spun polymer fiber. We report extraction of this fiber from the spiders under controlled conditions and a first structural and mechanical analysis. The Recluse ribbons are essentially free-standing polymer films with a thickness of 40–80 nm, corresponding to only a few molecular layers of protein. This extreme thinness allows the fiber-films to conform tightly to substrates of varying topography. Furthermore, the thinness and flatness of the silk makes it ideal for study by atomic force microscopy (AFM), which revealed a fibrillar surface structure (similar to that of orb-weaving silk) dotted by 6–8 nm protrusions, or "nanopapillae", hitherto unobserved on the surface of any other silk. We carried out a stress–strain analysis of individual fibers by indenting them with a blunted AFM probe, yielding a stiffness of 20±6 GPa and a maximum extensibility of 25–30%. These values assert that Brown Recluse silk possesses mechanical properties equivalent to or even surpassing those of orb-weaving silks, while simultaneously exhibiting the thinness and flexibility of a free-standing thin film.

Synaptic depression mediates inspiratory burst termination in the PreBötzinger Complex

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

The breathing rhythm is produced by the PreBötzinger Complex – a group of interneurons in the ventral lateral medulla, which activate motor neurons that innervate respiratory musculature. Despite the physiological significance of this behavior, the mechanism by which PreBötzinger Complex neurons form a network and generate inspiratory activity is incompletely understood. The breathing rhythm relies heavily on glutamate acting on non-NMDA receptors, which indicates that initiation of a synchronous burst is produced by recurrent excitation. How this burst is terminated is presently unknown. Using a neonatal mouse medullary slice preparation in conjunction with optogenetics and patch-clamp recording, we tested the hypothesis that synaptic depression mediates burst termination and determines the refractory period between inspiratory cycles.

Effect of communication on epidemic spreading in adaptive social networks with awareness

Presenter: Yunhan Long
Co-Author: T. Gross
Advisor: Leah Shaw
College of William & Mary,
Applied Science

The spread of an epidemic is affected by the network of social connections and how individuals adaptively change their social connections to protect themselves or their neighbors. We model an adaptive network with simultaneous spreading of an epidemic and the awareness of individuals (nodes) of the need to protect themselves. The classical Susceptible-Infectious-Susceptible (SIS) model for epidemic spread is extended, where susceptible and infectious nodes are differentiated into aware and unaware types. Awareness is interpreted as knowing the need to avoid disease by rewiring their network connections, and node-to-node communication is the main source of awareness in the network. The impact of network adaptation and node-to-node communication on the dynamics of epidemic spreading, awareness spreading and the network structure is explored, and compared with the results from a previous study where public media information is the source of nodes' awareness. Stochastic simulations are compared with a mean field model. Depending on parameter values, network adaptation can generate steady state behavior or periodic oscillations of infection and/or awareness levels, and the mean field approach predicts similar dynamics. Our results indicate that node awareness can play a significant role in minimizing disease spread.

Exploring a Novel Approach to Nuclear Forensics Utilizing Atomic Force Microscopy

Presenter: Richard Peeke
Advisor: Hannes Schniepp
College of William & Mary,
Applied Science

The collapse of the Soviet Union, proliferation of nuclear materials, and threat of international terrorism propelled the emerging field of Nuclear Forensics to the forefront as an international security priority. Nuclear forensics leverages a multidisciplinary approach, involving law enforcement, intelligence, scientific assets, and the military to perform timely and accurate source attribution through the analysis of nuclear materials interdicted prior to an attack or collected shortly after. Of utmost importance is the ability to identify and employ specific markers or signatures that differentiate these materials and reveal details implicating the perpetrators. The purpose of this research is to explore a novel approach to Nuclear Forensics and demonstrate the use of Atomic Force Microscopy (AFM) for pre- and post-detonation analysis of these materials by conducting a comparative *ex-situ* nanoscale morphological and topographical characterization of three specifically selected samples. "Trinitite" and "Kharitonchik" are low-level glassy materials formed during the first nuclear weapons tests by the United States and Soviet Union, respectively. They are composed of crater material as well as weapon and test site infrastructure, all consumed and evaporated in the intense heat of the fireball, eventually re-condensed and fallen to ground. However, Fulgurite, the third sample, is naturally formed by lightning strikes of the earth's surface. Employing AFM, it is possible to determine the micro-structural properties, geometries, surface roughness, and chemical surface homogeneity of these samples. This initial study intends to lay the groundwork for future research demonstrating the speed, accuracy, and precision of AFM in the determination of provenance.

Novel Preparation Technique for Graphene-Polymer Nanocomposite

Presenter: Ryan Shintani
Advisor: David Kranbuehl,
Co-author: H. Schniepp
College of William & Mary,
Applied Science

Polyamide-11 (PA11) is a polymer that is widely sought after in a number of industries for its useful properties of high stiffness and durability. In recent years, polymer-graphene nanocomposites have emerged as a promising approach to further increasing the stiffness of these materials without sacrificing the light weight of the polymer. We report on novel techniques for preparing nanocomposites of PA11 matrices embedded with graphene oxide as the filler material. Graphene oxide is a nearly two dimensional form of carbon with high tensile strength that has been functionalized with oxygen containing groups in order to tune its interaction with its chemical environment. Our processing methods result in improvements with high potential for industrial applications: in situ polymerized PA11-GO composites show increased stiffness and resistance to permeation by liquids and gases.

Network Effects in Simulated Laser Ablation of Neurons in pre-Bötzinger Complex

Presenter: Hanbing Song
Advisor: Christopher Del Negro
College of William & Mary,
Applied Science

The mammalian breathing rhythm originates from a functionally and anatomically defined site in the medulla dubbed the pre-Bötzinger complex (preBötC), consisting of a core rhythmogenic network whose constituent interneurons are derived from Dbx1-expressing progenitors. Experimentally it was shown that after cumulative deletion of a small fraction (14%) of the Dbx1+ preBötC neurons, the respiratory rhythm was irreversibly terminated. This project seeks to explain the sensitivity of rhythmogenic function to deletion of a small fraction of its constituent Dbx1+ neurons. We hypothesize that network function depends on a subset of neurons whose properties may be key rhythmogenic elements. We sought to identify that putative critical subset of neurons and their characteristic properties. In numerical simulations of the preBötC, we discovered a sub-network of neurons with a strong intrinsic inward current (dubbed Ican), such that deleting this subset of neurons would terminate the respiratory rhythm with a lower tally than when neurons were deleted randomly. One key feature for neurons in this Ican-subnetwork is high in-degree (i.e., a large number of incoming excitatory synapses). This work provides a new way to analyze dynamically evolving networks (such as neural networks) where the properties of the network constituents vary based on the dynamics of network constituents and the connections among them. The results suggest that neurons in the rhythm-generating network can have greater or lesser importance in network functions, where importance depends on connectivity.

A Population Density and Moment-Based Approach to Modeling Domain Calcium-Mediated Inactivation of L-type Calcium Channels

Presenter: Xiao Wang
Co-Authors: K. Hardcastle, S. Weinberg
Advisor: Gregory Smith
College of William & Mary,
Applied Science

We present a population density and moment-based description of stochastic domain calcium-mediated inactivation of L-type calcium channels. Our approach accounts for the effect of heterogeneity of local calcium signals on whole cell calcium currents; however, in contrast with prior work by Sherman et al. [Biophys J. 58(4):985, 1990], we do not assume that calcium domain formation and collapse are fast compared to channel gating. We demonstrate the population density and moment-based modeling approach using a 12-state Markov chain model of an L-type calcium channel [Greenstein and Winslow, Biophys J. 83(6):2918, 2002]. Simulated whole cell voltage clamp responses yield an inactivation function for the whole cell calcium current that agrees or disagrees with the classic result of Sherman et al. when domains dynamics are fast or slow, respectively. We analyze the voltage-dependence of calcium inactivation that occurs via slow heterogeneous domains and find that when channel permeability is held constant, calcium inactivation increases as the domain time constant increases. However, when this parameter study is repeated for fixed maximum domain calcium concentration, inactivation decreases as the domain time constant increases. Comparison of simulation results using population densities and moment equations confirms the computational efficiency of the moment-based approach, and enables the validation of several distinct methods of truncating and closing the open system of moment equations. In general, a slow domain time constant requires higher order moment truncation for agreement between moment-based and population density simulations.

Adaptation of *H. pylori* to changing environments based on allelic variation of sensor histidine kinase arsS

Presenter: Monique Bennett
Advisor: Mark Forsyth
College of William & Mary,
Biology

Helicobacter pylori is a Gram-negative bacterium that infects the human stomach and can cause illnesses ranging from gastric ulcers to gastric cancer. To survive in the stomach, *H. pylori* must adapt to this environment and sense and respond to changing acidities. It does this in part through two-component systems, in particular, ArsRS. The histidine kinase, ArsS, exists as variant isoforms due to a hypermutable, homopolymeric cytosine tract that lies near the 3' terminus of arsS. The resulting three ArsS isoforms may differentially affect adaptation to the changing stomach environment. We hypothesize that the persistence of *H. pylori* infection may be furthered by its ability to generate variant populations with cells expressing different isoforms of this critical sensory protein. I am studying the effects of these isoforms through freeze frame *H. pylori* arsS mutants which can express one isoform at a time. I am using qRT-PCR to quantify expression of different target genes regulated by ArsRS between the arsS mutants. In another set of experiments, ArsS protein decay will be assessed by performing western blots at intervals after RNA and protein synthesis is experimentally halted. The half-life difference between the mutants will then be determined. Finally, I will compare the growth of the arsS mutants in media of different pH value and plot their growth curves. The varied pH values mimic the conditions of the stomach and will indicate whether one isoform might be better adapted to a particular pH than another in a changing stomach environment.

Investigating the Mechanisms of Recovery from Notch-Perturbation in *Xenopus laevis*

Presenter: Catherine Bianchi
Co-Authors: B. Rabe, C. Williams
Advisor: Margaret Saha
College of William & Mary,
Biology

Plasticity in development remains one of the most distinctive characteristics of the developing embryo. Early embryos are capable of overcoming environmental and genetic perturbations in order to develop normally, but the mechanisms of recovery from a disturbance during development are poorly understood. My research focuses on the specific instance of cell type recovery following genetically-induced disturbance in the Notch signaling pathway in the developing nervous system of the African clawed frog, *Xenopus laevis*. Notch is a highly conserved signaling pathway activated by direct contact between adjacent cells. In nervous system development the pathway controls the populations of neural precursor cells and neurons. When Notch signaling is over- or under-expressed, the proportion of differentiated neurons to neural stem cells significantly decreases or increases, respectively. Over time, however, the embryos regain an appropriate balance of cell types. This research attempts to uncover the mechanism of this compensation by investigating a number of candidate genes suspected to play a role in the response process. Candidate genes were shown to be differentially expressed between control embryos and Notch-perturbed embryos using microarray analysis. Basic expression in normal and perturbed embryos will be determined using quantitative reverse transcription PCR and *in situ* hybridization. Gene function will be determined through overexpression and knockdown experiments using morpholinos or TALENs and RNA constructs, respectively. These studies will determine what role, if any, these genes have in the process of regaining normal neuronal patterning in the developing *Xenopus* nervous system following genetic perturbations of the Notch signaling pathway.

The effect of dietary methymercury on parental care of a model avian species

Presenter: Stephanie Chin
Advisor: Daniel Cristol
College of William & Mary,
Biology

Mercury (Hg) is a heavy metal contaminant of major ecological concern. Because Hg is prevalent in aquatic ecosystems, effects of Hg on aquatic birds are well studied. Mercury has been documented to impair reproduction of avian species, specifically by reducing hatching success and fledging success. However, the mechanisms for how Hg impacts reproductive processes or behaviors are not well understood. We propose that Hg may be impairing reproduction by negatively affecting the stages of parental care, since parental care, which includes incubation and provisioning of young, is essential for producing viable offspring. The objective of this study is to determine how dietary methylmercury exposure influences avian parental care and resulting reproductive success, using zebra finches *(Taeniopygia guttata)* as a model species. Specifically, incubation behavior, incubation temperature, and provisioning behavior of parents will be examined, as well as reproductive success and offspring phenotype. Exposed parents will be dosed with 1.2ppm Hg via feed. We expect to see reduced parental care ability in pairs exposed to Hg in comparison to control parents receiving 0ppm Hg, and that these lower parental care measures correlate with decreased hatching and/or fledging success. This study will provide novel insight into how Hg affects avian reproductive behavior. In addition, little information exists for the effects of Hg on terrestrial birds, despite recent evidence that Hg can move into terrestrial food chains. This study will also further our understanding of how exposure to Hg impacts songbirds inhabiting terrestrial parts of contaminated areas.

Changes in floristic richness of the College Woods in the last 4 and 2 decades under increasing herbivory by white-tailed deer (*Odocoileus virginiana*)

Presenter: Caitlin Cyrus
Advisor: Martha Case
College of William & Mary,
Biology

The College Woods, located in Williamsburg, Virginia, supports six distinct plant communities containing unusually high local species diversity, which makes it a conservation concern at the state level. Gaining a comprehensive understanding of the plant species located in the Woods as well as the possible factors threatening their extirpation is required in order to inform future conservation policy at the College and state levels. The flora of the College Woods has been threatened in the past 25 years by the exponential increase in the population of white-tailed deer *(Odocoileus virginiana)*, which are known to quickly shift herbaceous layers of mature forests towards low-diversity, homogenized communities. This study aims to conduct a floristic analysis of vascular plant species richness and general abundance in the College Woods and compare these data to floristic studies in the College Woods 43 and 24 years ago, respectively. Changes in the composition and abundance of the herbaceous flora will be compared to key predictions regarding the effects of heavy deer browse. In addition, species' combined life history traits will be analyzed in declining versus non-declining species to better predict which plant characteristics put species at the greatest risk.

Exploring unexpected sex ratios in the nematode *Rhabditis* sp. SB347

Presenter: Maureen Farrell
Co-Authors: P. Sadler, P. Ordonez
Advisor: Diane Shakes
College of William & Mary,
Biology

The *Caenorhabditis elegans* germline is a well-characterized model for research on epigenetic control of cell fate, chromatin remodeling, and cellular divisions. However, recent work in both the Shakes laboratory and others suggests that some questions are better studies in other nematode species. *Rhabditis* sp. SB347 is quite similar to *C. elegans* in that it can be cultured in the laboratory, produces large broods, and has a transparent body wall, but it exhibits two forms of remarkably skewed sex ratios. More specifically, XO males sire >95% XX feminine offspring rather than the expected 50% (Shakes et al., 2011), and self-fertilizing XX hermaphrodites produce up to 10% XO male progeny rather than producing exclusively XX "daughters". The cellular mechanism by which males sire almost exclusively "daughters" involves asymmetric partitioning of essential sperm proteins to X-bearing sperm (Shakes, et al., 2011). However, the cellular mechanism by which self-fertilizing hermaphrodites produce males remains unknown. My studies focus on the cellular mechanisms that generate skewed sex ratios in self-fertilizing hermaphrodites. In one study, we are conducting brood studies to determine when and under what conditions males are produced within the brood. In addition, we are analyzing chromosome segregation patterns using a variety of immunofluorescent markers to determine how and when XO gametes are generated during the hermaphrodite meiotic divisions.

Mechanical Models to Demonstrate the Influence of Acute Changes in Bladder Shape and Material Properties on Wall Tension During Bladder Filling

Presenter: Firdaweke Habteyes
Co-Authors: O. Komari, A. Klausner, P. Ratz
Advisor: John Speich
Virginia Commonwealth University,
Mechanical and Nuclear Engineering

Tension-sensitive nerves in the bladder wall are responsible for providing bladder fullness information that is interpreted as urgency. Bladder wall tension, and therefore nerve output, is a function of bladder volume, shape and material properties. Studies have shown that the bladder wall exhibits acutely regulated detrusor compliance, or "regulated compliance". In addition, bladder shape throughout filling depends on intra-abdominal forces and material properties of the bladder wall, such as regulated compliance. The present study models the influence of acute changes in bladder shape and material properties on wall tension during filling. Laplace's Law was used to demonstrate how wall tension can vary significantly with geometry in a vessel with uniform internal pressure and constant volume. A finite deformation model of the bladder was previously used to show that wall tension can increase significantly during filling with relatively little pressure change. In the present study, published experimental data were used to determine ranges for regulated compliance, and the finite deformation model was expanded to illustrate the potential effects of regulated compliance on filling pressure and wall tension. Also, a geometric model was used to demonstrate that constraining a perfectly spherical bladder to fill as an oblate sphere increases wall tension, and therefore nerve output, for a given volume. Together, these models demonstrate that defects in regulated compliance and/or acute or chronic changes in bladder shape due to changes in material properties or intra-abdominal forces could contribute to changes in wall tension for a given volume that could lead to urgency.

Wood Thrush habitat use at the home range scale: implications for local distribution

Presenter: Vitek Jirinec
Advisor: Matthias Leu
College of William & Mary,
Biology

Following the trend of many migratory birds, populations of the Wood Thrush have experienced long-term range-wide population declines over the last few decades. Due in part to its conspicuous, flute-like song, the Wood Thrush is a charismatic and well-known species that became a symbol of declining Neotropical birds and a focus of conservation and management plans in many areas. A number of studies indicate that nest parasitism, which tends to be prevalent in smaller forest patches, is a significant threat to Wood Thrush nesting success. However, little is known about the suite of habitat characteristics that may lead birds to use a potentially unsuitable area in the first place. This knowledge is vital for targeting proper areas for conservation purposes. The objective of this study is to identify and quantify habitat characteristics that correlate with high Wood Thrush use at two scales. For the broad scale analysis, we used avian point count surveys over three years along with remote sensing datasets. For the fine scale analysis, we radio-tagged 20 Wood Thrush males in summer of 2013 and will mark an additional 20 in 2014. Telemetry data provided home range size and use intensity within, which allowed us to separate home ranges into core and noncore areas, where both vegetation and prey samples were collected. We hypothesize that a) core areas will differ in vegetation structure from noncore areas, and b) core areas will have a higher concentration of invertebrate prey.

A sensor-based mechanical model for stretch-induced myogenic detrusor contraction as a single twitch of spontaneous rhythmic contraction

Presenter: S. Omid Komari
Co-Authors: A. Klausner, P. Ratz
Advisor: John Speich
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Mechanical and Nuclear Engineering

Introduction: Spontaneous rhythmic contraction (SRC) of detrusor smooth muscle (DSM) can be described as a continuous train of low-amplitude transient twitches. SRC is elevated in individuals with overactive bladder (OAB), but the mechanism remains unknown. We showed that quick-stretch (QS) stimulates a single myogenic twitch with an amplitude and duration similar to an isolated SRC twitch. Our experimental studies indicate that a common mechanism is responsible for QS-induced contraction and SRC. The objective of the present study was to develop a biomechanical model for DSM contraction that incorporates a single mechanism for these two types of contraction. Methods: A spring-dashpot model was implemented as mechanical sensor to regulate the amplitude of QS-induced contraction based on the stretch amplitude, rate, and delay between QSs as in our previous experimental study. A single population of cross-bridges was modeled to produce both SRC and QS-induced contraction. All of these crossbridges were active (inactive) at the peak (trough) of each SRC cycle and a QS imposed during SRC was modeled to activate any remaining crossbridges. Results: This model is consistent with previous experimental data showing that QSs imposed throughout the SRC cycle produced a myogenic contraction with greater (less) nadir-to-peak tension when the QS was imposed near the trough (peak) of the cycle, suggesting more (fewer) crossbridges were available to be activated. Conclusion: This SRC and QS-induced contraction model suggests that a simple QS protocol could be used to study the regulation of a single SRC twitch and the alteration of SRC in OAB.

Human Influence on the Invasion of Fennel into Coastal Habitats of Virginia's Eastern Shore

Presenter: Kathryn MacCormick
Advisor: Matthias Leu
College of William & Mary,
Biology

As exotic species spread around the world and contribute to the extinction of native species, ecologists struggle to gain a better understanding of the biotic and abiotic factors driving invasion success. In the plant invasion process, establishment is an important phase in which an exotic species may escape cultivation and begin to survive and reproduce, becoming naturalized and potentially invasive in a new range. One of the earliest plants cultivated by humans, sweet fennel *(Foeniculum vulgare Mill.)* currently has a global distribution due to historical and current anthropogenic mediated dispersal, altering the habitat by forming dense stands and threatening invasion into coastal shrub and grassland habitats around the world. By investigating the distribution of fennel at the Eastern Shore of Virginia National Wildlife Refuge, I hope to learn about the dispersal mechanisms and environmental conditions that contribute to its establishment. In order to do so I will conduct field surveys of fennel stem density with a stratified sampling design which will take into account the distance to roads and the local management methods. Using a spatially applied statistical model, I will estimate the relative influence of multiple environmental and site variables to explain fennel presence. Preliminary observations suggest that proximity to roads and certain mowing methods may be important factors which could have implications for future roadside mowing programs and refuge habitat management decisions.

Excluding pest birds from socio-economically important areas using directional sounds

*Presenter: G*hazi Mahjoub
Co-Authors: M. Hinders, E. Skinner
Advisor: John Swaddle
College of William & Mary,
Biology

Invasive avian species are responsible for considerable economic, social, conservation and resource damages totaling approximately $1.9 billion every year in the United States alone. In this study we focus on limiting the distribution of the European starling *(Sturnus vulgaris)*, which is the most destructive invasive pest bird in the US. Starlings cause tremendous crop losses and pose significant risks to airplanes through bird-aircraft strikes. The goal of our project is to develop an effective system to control the spatial distribution of starlings at socio-economically important locations. Previous technologies used to deter pest birds have generally failed as birds quickly habituate to the scare regimes. Using ultrasonic parametric arrays, we broadcasted a directional sound that was contained in specific areas creating a “net” that we hypothesized will block communication channels among starlings. If starlings cannot communicate previous studies indicate that birds will vacate the area and feed elsewhere. Using wild-caught starlings in a large aviary, we deployed a “sonic net” over one food patch leaving another food patch unaltered. We measured the vigilance and feeding behaviors of flocks of starlings over several days of treatment and our results indicated that the “sonic net” effectively deterred starlings from food sources by up to 90%. Results have also shown that the “sonic net” effectively blocked communication among birds thus supporting the idea that birds that are unable to communicate will be displaced to acoustically more suitable environments, which has implications for protecting crops and deterring this species from sensitive area of airports.

Effects of DEHP on the maturation of B cells in rainbow trout *(Onchorhynchus mykiss)*

Presenter: Alyssa Moore
Advisor: Patty Zwollo
College of William & Mary,
Biology

Knowledge on the effects of marine pollutants on the immune system of salmon is limited. To begin uncovering information associated with marine pollutants and salmon, we first focused on the interaction between phthalates, a ubiquitous marine pollutant and the immune cells involved in acquired immunity. Di(2-ethylhexyl) phthalate (DEHP), one of the most common phthalates was used at various concentrations to determine its effect on B cells. We predicted that cells would undergo less proliferation, and that three different regions of the kidney (anterior, mid-region and posterior) would exhibit different levels of sensitivity to DEHP due to differences in developmental stages of B cells in each region. B cells were removed from the three regions of the kidney and dosed with various concentrations of DEHP for 24 and 48 hours. Cells were fixed and permeabilized and analyzed using flow cytometry. Preliminary results suggest 1) that the anterior and posterior kidney exhibit different levels of sensitivity to DEHP and 2) cells that were exposed to DEHP for 48 hours have a more pronounced pattern with regards to response than cells exposed to DEHP for 24 hours.

Using Human Landscapes to Predict Species Occurrence

Presenter: Jessica Pouder
Advisor: Matthias Leu
College of William & Mary,
Biology

Transformation of landscapes and land cover for human use underlies most conservation problems. Human land modification is widespread and occurs throughout every habitat type in the United States. How a species responds to human land modification varies; human-dependent species thrive in human habitats, while human-sensitive species tend to avoid habitats dominated by humans. Which human stressor (ex., agriculture, highways, urban areas, etc.) that are avoided varies across species and is poorly understood. My study proposes to compare how different human stressors influence species occurrence. My study will assess whether certain human stressors better predict a species' occurrence over others. I will extract human stressor features from various spatial data sets and land cover from USGS Landfire (2010) datasets. I will derive species occupancy from Breeding Bird Survey (BBS) for the entire conterminous United States. The BBS data will provide an indication of where each species has been observed in the United States over the past seven years. I will use statistical analyses to compare intensity of human stressors to species occurrence for a human dependent species, the European starling and to species that avoid human habitats including, northern parula, Swainson's thrush, ovenbird, marsh wren, hermit warbler, Townsend's warbler, and grasshopper sparrow. My research provides crucial information to manage birds in increasingly human dominated landscapes.

Natural variation in winter fertility and GnRH neurons in a population of white-footed mice, *Peromyscus leucopus*

Presenter: Melissa Proffitt
Co-Author: A. Flores
Advisor: Paul Heideman
College of William & Mary,
Biology

Gonadotropin releasing hormone (GnRH) is considered the master hormone of reproduction because of its regulatory role in reproductive pathways, but we know little about normal variation in the GnRH neuronal system in natural populations. A high percentage of individuals in many rodent populations undergo seasonal suppression of reproduction, but others do not. This study will examine if there is a correlation between GnRH neuron number and reproductive status in wild mice in a population near Williamsburg (VA, USA). This relationship is unknown in any wild population. Immunocytochemistry was performed to count the number of immunoreactive GnRH neurons present to compare both subsets of the wild population. We predicted a difference in GnRH neuron number between the seasonally repressed mice and the mice that remain reproductively active. Preliminary data suggests individuals with lower testis mass have more stained immunoreactive GnRH neurons on average than do the reproductively active individuals in this wild, natural population.

Flow Cytometric Analysis of the Immune Response of BCWD Resistant and Susceptible Rainbow Trout

Presenter: Brittany St.Jacques
Co-Author: J. Ray
Advisor: Patty Zwollo
College of William & Mary,
Biology

Bacterial Cold Water Disease (BCWD) is one of the most important bacterial diseases affecting rainbow trout (*Oncorhynchus mykiss*) aquaculture in the United States and is responsible for rearing difficulties and substantial economic losses. A successful breeding program was initiated at the National Center for Cool and Cold Water Aquaculture (NCCCWA) in which rainbow trout were selectively bred for resistance and susceptibility to *Flavobacterium psychrophilum* infection, the causative agent of BCWD. The goal of this research is to characterize immunological differences between the selectively bred rainbow trout. Response to *in vitro* Flavobacterium LPS induction on B cell development and maturation will be compared between resistant and susceptible strains using flow cytometry. As markers of B cell development, expression of immunoglobulin heavy chain mu (HCmu), early B cell factor-1 (EBF1), and interleukin-1 beta (IL-1β) will be analyzed to assess differences in onset and intensity of the immune response between strains. Initial results, using in vitro LPS activation, indicate that resistant strains respond more strongly to *F. psychrophilum* LPS than susceptible strains. Results of this study will increase understanding of disease resistance mechanisms and allow for the development of biomarkers useful for selective breeding.

Effect of Noise on the Social Structure of European Starlings *(Sturnus vulgaris)*

Presenter: Autumn Swan
Advisor: John Swaddle
College of William & Mary,
Biology

Birds who live in groups benefit from having an organized social structure. The formation and maintenance of a stable social structure depend upon individuals' abilities to effectively communicate with one another. Noise can mask a bird's vocal communication if it overlaps with the frequency range of vocalizations. Birds might respond to blocking of their vocal channel by relying on other forms of communication, such as visual signals. If birds are unable to effectively compensate for loss of vocal communication, their ability to form or maintain social structures may be compromised. My research will investigate whether noise exposure affects the formation and/ or maintenance of social structure in groups of European Starlings, *(Sturnus vulargis)*. I will expose groups of birds to noise frequencies that mask vocalizations while they undergo a series of trials testing social interaction. I will test groups of familiar birds (social structure already established) and unfamiliar birds (social structure not established). I hypothesize that starlings exposed to noise will use more visual signals, as well as exhibit more instances of aggressive behaviors, reflecting a decrease in social structure stability. I also hypothesize that unfamiliar groups of starlings exposed to noise will take longer to establish social structures relative to unfamiliar groups not exposed to noise. This research will provide insight into the role of vocal communication in avian social structure.

New Insights into Fibrous Body Protein Complexes Involved in *C. elegans* Spermatogenesis

Presenter: Christopher Uyehara
Advisor: Diane Shakes
College of William & Mary,
Biology

Spermatogenesis is a dynamic process that requires the coordination of multiple, distinct cellular pathways. During spermatogenesis, spermatocytes must undergo meiotic divisions, produce proteins required for motility and undergo extensive cellular remodeling in order to produce small, motile, fertilization-competent cells. In the nematode *C. elegans*, sperm locomote using a pseudopod whose protrusion and retraction is driven by polymerization dynamics of a cytoskeletal protein unique to nematodes, Major Sperm Protein (MSP). Although MSP is needed for motility, it's synthesized early in meiosis and initially sequestered into large protein complexes, called Fibrous Bodies (FBs). However, the mechanisms that govern MSP assembly into FBs and the mechanisms that constrain FB size have yet to be elucidated. Previous work done by the Shakes' lab identified SPE-7 as an essential protein for FB assembly. In recent studies, we discovered that MSP and SPE-7 localization are disrupted in spe-26 mutants, which produce abnormal FBs, some of which are up to three times longer than wildtype. Furthermore, we have identified additional proteins that co-localize with MSP within FBs, such as MFP2, a protein previously shown to promote MSP polymerization within crawling sperm. Overall, our data suggests that FBs are dynamic structures that possibly function to sequester both MSP and various accessory proteins. Because of this, our work has important implications for providing a model for how protein complexes are formed and controlled.

Depuration of methylmercury in European starlings and zebra finches

Presenter: Margaret Whitney
Advisor: Daniel Cristol
College of William & Mary,
Biology

Mercury (Hg) is a global pollutant known to negatively impact a wide variety of animals including birds. Little is known about the kinetics of Hg in body tissues, or how molt impacts Hg depuration. Growing feathers accumulate high Hg levels, therefore serving as a depuration route when the feathers are shed during molt. We maintained European starlings (*Sturnus vulgaris*) on a diet containing 0.75ppm or 1.5ppm Hg for 14 months, at which point they began to molt and half of the starlings in each group were sacrificed. Blood was sampled weekly to monitor depuration of Hg. After 27 weeks, the remaining starlings were sacrificed. Flight muscle, brains, livers, and kidneys were sampled from all birds. In order to compare the depuration rate between species with different molt patterns, we repeated the experiment with zebra finches (*Taeniopygia guttata*) on diets containing 0.6ppm or 1.2ppm Hg. One third of the finches were sacrificed prior to depuration, half the remaining finches will be sacrificed after 27 weeks, and the remaining finches will be sacrificed at a time to be determined. To compare depuration rates within species, a second group of finches was maintained on a 1.2ppm Hg diet. At the time the weekly blood sample is obtained, flight feathers are plucked to simulate a heavy molt like the starlings undergo. A second group of starlings is currently being fed a diet containing 1.5ppm Hg and will depurate while not molting. Preliminary results indicate that molting expedites depuration at different rates across species.

Expression and Subcellular location of SnRK1.1 in plants

Presenter: Sarah Phoebe Williams
Co-Author: P. Rangarajan
Advisor: Glenda Gillaspy
Virginia Tech
Biochemistry

myo-Inositol signaling is an important mechanism for plants to sense and adapt to environmental stress. A key enzyme in this pathway is 5-phosphatase (5PTase), which dephosphorylates the second messenger Inositol(1,4,5)P3 to form Ins(1,4) P2, thus terminating the signal. We have identified SnRK1.1 (Sucrose non-fermenting Related Kinase) as an interactor of 5PTase13. SnRK1, a homolog of yeast Snf-1 (Sucrose non-fermenting-1) and human AMPK (AMP Kinase), is a kinase involved in energy sensing and metabolic homeostasis. The interaction between 5PTase13 and SnRK1.1 indicates a potential interplay between nutrient stress response and inositol signaling. In Arabidopsis, SnRK1 has three isoforms, SnRK1.1, SnRK1.2 and SnRK1.3. In this study, we have characterized two splice variants of SnRK1.1 and one of SnRK1.2 with respect to transcriptional profiling and subcellular localization. Using promoter:GUS analysis, we have examined the spatial expression pattern of SnRK1.1 and SnRK1.2 at various developmental stages and in seedlings grown on various carbon sources. SnRK1.1 expression is ubiquitous, while SnRK1.2 is spatially restricted. We have found a distinct pattern of subcellular localization for the two splice variants of SnRK1.1 and SnRK1.2, by examining SnRK1:GFP fusion proteins both transiently expressed in N. benthamiana and stably transformed Arabidopsis lines. Given the unique spatial expression pattern and subcellular localization for the SnRK isoforms and splice variants, we hypothesize that each of them plays a distinct role in the cell in regards to carbon response.

Importance of nectar availability in the selection of habitat for *Papilio glaucus* (eastern tiger swallowtail)

Presenter: Angela Zappalla
Advisor: Matthias Leu
College of William & Mary,
Biology

Mixed eastern deciduous woodlands are by nature heterogeneous and provide a number of different ecological services. The heterogeneous distribution of resources influences the distribution of plants and animals on a larger, metapopulation scale by driving habitat selection. My research will focus on the population dynamics of the eastern tiger swallowtail *(Papilio glaucus)* sampled on 500-m transects throughout the Virginia Peninsula. The objective of this research is to define how the subpopulations of *P. glaucus* are interacting with local habitats and how the quality of these habitats affects their distribution. Preliminary data analyses show a significant increase in abundance from 2012 to 2013, which provides insight into how this species uses the landscape and which types of habitat they might prefer. The goal of my research is to define habitat as either preferred, intermediate, or unsuitable for *P. glaucus*. To do this, I will assess nectar and host plant availability on and around transects and will continue to monitor adult presence of *P. glaucus*. For preferred habitat, I predict higher number of nectar plants in association with host plants, while intermediate habitat will have less nectar plants and possibly no host plants. I predict that poor habitat will have neither host nor nectar plants. Continued research into habitat preference could help to expand the body of research on *P. glaucus* and help to support populations in altered landscapes.

The effects of importins 4, 5, 8, 13 knockdown on thyroid hormone receptor's nuclear import

Presenter: Jibo Zhang
Advisor: Liz Allison
College of William & Mary,
Biology

Thyroid hormones have important effects on maintaining homeostasis and regulating genes responsible for metabolism. They enter the cells and function via binding to thyroid hormone receptors (TRs) in the nucleus. Research has found that although TRs are primarily localized to the nucleus, they shuttle between the nucleus and the cytoplasm. TRs are transported into the nucleus by transport factors called importins. TRs are directed by two nuclear localization signal (NLS) motifs to importins. Importins are classified in three families, α, β, and transportin. Each importin imports specific target proteins. But many proteins such as TRs use multiple importins for transport. In order to know which importins transport TRs, we will use green fluorescent protein-tagged TRα1 (GFP-TRα1) as the model protein and focus on four β family importins' effects on TRα1 nuclear import, as well as which NLS recognizes which importin. Importins 4, 5, 8, 13 are included in our experiment based on their structural similarities and differences with importin β and importin 7, which have been shown to have significant effect on TR transport. Using shRNA expression vectors to knockdown these importins' expression will show us how down regulation of different importins affects GFP-TRα1 localization patterns. Importin knockdown will be confirmed by Western blot.

Chemistry of dye-polymer-light Interactions

Presenter: Carolyn Carta
Advisor: Elizabeth Harbron
College of William & Mary,
Chemistry

Fading studies of rhodamine dyes in various polymer substrates, including poly(methyl methacrylate), polystyrene, poly(vinyl chloride), polycarbonate, and poly(ethylene terephthalate), will be presented. Polymer films doped with the highly colored and fluorescent dyes are exposed to ultraviolet light, and the dye fading is monitored as a function of light exposure time. The dependence of dye fading rate and extent on host polymer structure will be discussed. The transparent polymers studied here have been used as components of contemporary art. Understanding how polymer structure affects dye appearance can inform conservation efforts aimed at preserving artworks that incorporate these materials. This model study eliminates extraneous components to focus on dye-polymer-light interactions.

Atom Economical, One-Pot, Three Reaction Cascade to Novel Tricyclic 2,4-dihydro-1H-benzo[f]isochromenes and its derivatives

Presenter: Yuzhou Chen
Co-Author: S. Lewis
Advisor: Robert Hinkle
College of William & Mary,
Chemistry

The synthesis of complex molecules usually requires multiple reactions and purification protocols for each step of the sequence. In efforts to reduce the formation of toxic byproducts, increase atom economy as well as efficiency of overall synthetic processes, we developed a one-pot, multi-component reaction cascade to rapidly form novel tricyclic molecules in which only water is generated as a byproduct. A minimum of 72% average yields were obtained for reactions involved in the cascade. In order to further understand the details of the reaction mechanism, we have introduced electron donating and electron withdrawing groups into the portion of the molecule involved in the third, intramolecular trapping step. Since literature precedence indicated that a side reaction resulted from the rearrangement of an intermediate related to one in our system, several different Lewis acid (activator), as well as secondary reactants have been examined in CH_2Cl_2 solvent. Additional studies of optimization efforts, solvent and structural effects, as well as NMR spectroscopic and GC analyses of products will also be described.

Continuous Synthesis of Quinolone Analogs

Presenter: Stevara Clinton
Advisor: B. Frank Gupton
Virginia Commonwealth University, Chemistry

The purpose of this research is to develop a synthetic route for the continuous preparation of quinolones. Quinolones are of great interest because of their antibacterial properties. *Ciprofloxacin* in particular is widely recognized and marketed worldwide. We aim to develop a system in which antibacterial agents such as this can be synthesized using flow technology. Flow systems allow high throughput chemistry to take place continuously (in flow) combined with the use of immobilized reagents or catalysts under highly controlled conditions. Developing new synthetic routes in flow towards such compounds as Cipro and others like it is an attractive option for obtaining quantities with higher purity and in less time. We have synthesized the quinolone backbone in order to obtain a basic structure to perform the a carbonylation step at the C3 position via CH activation. Carrying out the carbonylation step is key in the total synthesis of these compounds. If the carbonylation step is successful then the next synthetic variable would be to try a similar synthesis that can be used toward synthesis of many other antibacterial analogs. Achieving the carbonylation step is an novel process that could greatly spark the interest of the pharmaceutical industry and change the way these drugs are currently being made.

Investigation of Protein Carbonylation in Human Plasma/Serum

Presenter: Chelsea Coffey
Advisor: Scott Gronert
Virginia Commonwealth University, Chemistry

Oxidative stress can result in changes to many biomolecules and also affect their activities. My research group is interested in protein oxidation, which has been associated with numerous disease states, such as Alzheimer's and Parkinson's disease, and is also a consequence of the natural aging process and trauma. Identifying sites and mechanisms of protein oxidation with mass spectrometry is of great current interest and is also a common goal among the projects of this study. In our work, we are investigating many proteins at once using a single sample preparation instead of the more traditional approach where one biomolecule is targeted. Thus, the main goal of our work is to understand where and how these various proteins are being modified. In particular, we are studying oxidized plasma/serum proteins. Not only do we hope to improve our overall analysis techniques involving biological systems, but we also endeavor to distinguish unique modification patterns and correlate these patterns with disease progression to ultimately learn more about the relationship between certain disease states and the aging process. The overall goal is to understand the nature of oxidative damage to plasma/serum proteins specific to the particular conditions and to develop assays for monitoring oxidative damage during clinical interventions.

Detection of Volatile Organic Compounds in Enclosed Spaces

Presenter: Kylie Henline
Co-Author: C. Wang
Advisor: Robert Pike
College of William & Mary,
Chemistry

Volatile organic compounds (VOCs), detrimental to human health, are present in many household environments, necessitating novel methods of detection. Copper(I) iodide (CuI) is an inexpensive, commercial, air-stable salt that spontaneously reacts with a variety of VOCs to produce luminescent adducts, making CuI a good prospective detector material. Microcrystalline films of CuI have been cast from solution onto glass. As cast, the films show almost no visible emission; however, upon exposure to VOC amines and sulfides, the films form surface adducts that display a variety of visible emission colors. Chemically related VOCs produce remarkably different CuI-adduct emission colors in some cases. The films are reusable due to facile removal of the VOC. The surface of CuI films have been characterized using optical microscopy, scanning electron microscopy with energy dispersive spectroscopy, and powder X-ray diffraction. Limits of detection have been studied for specific VOCs by exposing CuI films and measuring their emission using an LED/fiber-optic fluorimeter. Tetrahydrothiophene (THT) produced a variety of luminescent adducts with CuI films. As a result, the CuI-THT system was studied more closely. Five new CuI-THT phases, four of which are luminescent, were structurally characterized using X-ray diffraction. These phases were further characterized using thermogravimetric and chemical analysis.

Nickel Complexes for the Electrocatalytic Reduction of Protons

Presenter: Dan Liu
Co-Author: C. Wise
Advisor: William McNamara
College of William & Mary,
Chemistry

Artificial photosynthesis (AP) is of crucial importance for taking advantage of solar energy and converting it into H_2, a form of chemical fuel with no threat of pollution to the environment. Usually, the catalyst used in AP is platinum based, which gives rise to the problem of scarcity of noble metals on the earth. Thus, noble metal free catalysts with high efficiency are needed to assemble practical devices for AP. We present a new type of nickel catalyst to reduce H+ into H_2 in aqueous solvent mixtures. The Ni complexes have demonstrated high catalytic ability to reduce protons to dihydrogen. The catalysis occurs at -1.15 V vs. SCE in CH_3CN. The Ni complex is estimated to have high efficiency to reduce H+ into H_2 and a high turnover frequency (> 1000 s-1). It is stable in water with a large ic/ip, corresponding to high catalytic activity. Thus Ni based catalyst represents a new group of catalyst for the reduction of H+ into H_2.

Investigation of pygmy sperm whale *(Kogia breviceps)* populations in the Southeastern United States using stable isotope analysis of teeth

Presenter: Nicole Montey
Advisor: Wayne McFee
College of Charleston,
Environmental Studies

While the pygmy sperm whale *(Kogia breviceps)* is currently the second-most commonly stranded cetacean in the Southeastern United States, information concerning their population structure is unknown. Due to the elusive behavior of this species, studying stranded animals is the only practical way to obtain new information. This study aims to provide insight into the population structure and movements of *Kogia breviceps* along the Southeastern United States and Gulf of Mexico by analyzing $\delta^{13}C$, $\delta^{15}N$, and $\delta^{18}O$ stable isotopes from teeth of stranded animals. Isotopes are capable of providing information on latitudinal movements, feeding trophic levels, and aquatic habitat of marine mammals. While stable isotope analysis has recently become popular for studying marine mammals, reports conducted on pygmy sperm whales are very limited. The few that have been done are dietary studies and have a small sample size. This is the first to analyze the population structure of *Kogia breviceps* through analysis of teeth. Teeth are metabolically inert structures that accrue new layers of dentine every year providing historical dietary records. Teeth were collected from 50 stranded *K. breviceps* along the Southeastern United States and the Gulf of Mexico. The dentin will be drilled to create a powder that will be analyzed using elemental analysis coupled with isotope ratio mass spectrometry (EA-IRMS) at Skidaway Institute of Oceanography in Savannah, GA. It is believed the *Kogia breviceps* populations of South Carolina, Georgia, Florida, and the Gulf of Mexico do not migrate and are isolated; thus showing distinct isotope ratios.

An Electrochemical Investigation of Quantum Phenomena and Density of States of Hyperbolic Metamaterials

Presenter: Olivia Penrose-Sadique
Co-Authors: Y. Barnakov, S. Prayakarao, M. Noginov
Advisor: Carl Bonner
Norfolk State University,
Materials Science

The motivation of the research is to understand the quantum phenomena of charge transfer characteristics of hyperbolic metamaterials, materials in which the dielectric constant is different in different directions and negative in one direction. The research will observe the rate enhancement of optical processes dependent on the density of states. An enhancement for electronic density of states such as for chemical reactions is expected. Electron transfer in which the rate of the density of states as described by the Marcus theory will be observed using Cyclic Voltammetry (CV) and Electrochemical Impedance Spectroscopy (EIS) of electron transfer at the surface of the electrode in our electrochemical cell. Our system consisting of a reference electrode with FeCl3 redox couple, a counter electrode of Pt, and a working electrode of SAM coated Au on In-doped SnO2 will be used to observe distance dependence on electron transfer rate. The electron transfer rates of our redox couple on bare Au, Au layers coated with self-assembled monolayers (SAM), and Au on top of metamaterial will be compared. Metamaterials composed of alternating layers of MgF2 and Au will be deposited in several layers on top of the working electrode. The electron transfer rates on bare Au and SAM coated Au will be internally compared then compared to the rate of ET at the Au electrode on the metamaterial substrate. CV and EIS data will be examined to understand the mechanism of reduction of the redox couple and to extrapolate ET kinetic and diffusion coefficients and thermodynamics.

Understanding the mechanism of functional conformational changes in the Hepatitis C virus polymerase

Presenter: Ester Sesmero
Advisor: Ian Thorpe
University of Maryland Baltimore County, Chemistry and Biochemistry

Hepatitis C virus (HCV) is a wide spread health concern for which there is no vaccine available HCV contains a single-stranded RNA genome and replicates with the aid of the NS5B enzyme that is an RNA-dependent RNA polymerase. NS5B samples at least two different conformations: open and closed. Transitions between these two conformations play a crucial role in NS5B function. Our goal is to understand how the transition between these two states occurs, how this change impacts enzyme activity and how it is affected by the presence of inhibitors. This knowledge may be useful in identifying novel and more effective ways to inhibit the enzyme. To accomplish this goal we employ Molecular Dynamics (MD) simulations in conjunction with Temperature accelerated Molecular Dynamics (TAMD). TAMD is an enhanced sampling technique that allows us to more effectively study the conformational transition by applying increased temperature to specific collective variables in the enzyme. Our simulations reveal the free energy landscape explored by the enzyme as it interconverts between the open and closed conformations. The barrier between these two conformations seems to be relatively low. Our observations suggest that both conformations are sampled by the free enzyme in isolation and do not only occur when it is bound to RNA.

Potential Lithium-ion Battery Anode Materials from Diatoms

Presenter: Nicholas Wright
Advisor: David Wright
Vanderbilt University, Chemistry

New and innovative materials are needed to develop more effective batteries. Nanoscale materials such as graphite have unique properties only seen in the nano-regime that allow them to be used in the production of lithium-ion batteries. For example, because of its ability to conduct electricity, nanoscale graphite has been used in the anode of lithium-ion batteries, which has revolutionized the long-term use of medical devices, such as pacemakers and defibrillators. Interestingly, the graphite anode has a relatively low specific capacity per gram of ~372 mAh g-1, which limits the rate of charge available to these devices. The specific capacity of silicon, however, is ~11 times greater than that of graphite at ~4200 mAh g-1, which makes it a better choice as an anode material. Silicon is not presently used because of its fragility during the lithiation process. In this work, we demonstrate a robust nanoscale material synthesis inspired by the biomineralization process that the ocean-dwelling unicellular phytoplankton, diatoms, that they use to form their porous silicon structure. By maintaining the porous structure of diatoms from the conversion of silica to silicon, using a magnesiothermic reduction process, their structure can be used to enhance silicon's strength during the lithiation process allowing the use of silicon's higher specific capacity. This approach has the potential to implement silicon as an anode for lithium-ion batteries to enhance the longevity of present day applications.

Alerting System to Enhance Two-Way Roads Safety

Presenter: Ahmed Alhafdhi
Co-Author: S. El-Tawab
Advisor: Stephan Olariu
Old Dominion University,
Computer Science

The main contribution of this work is to integrate traffic flow information collected by the ubiquitous lane delimiters (a.k.a. cat's eyes) from passing vehicles to enhance road safety. For example, a direct application of our work is to alert drivers on two-lane roads about on-coming vehicles. This is one of the major sources of accidents in conditions of low visibility due either to the topology of the roadway or to the existence of smoke, fog and other imponderables. A more comprehensive application is to use the collected information to anticipate traffic buildup and other trends that are likely to have a serious impact on traffic conditions. As it turns out, under current state of the art, the cat's eyes are used simply as reflectors to delimit traffic lanes at night. Our main vision is that by endowing cat's eyes with a modest power source, detection and communication capabilities they will play an important role in collecting, aggregating and disseminating traffic flow conditions to the driving public. The physical component of our system collects traffic flow-related data from passing vehicles. The collected data is used by the system's inference engine to build beliefs about the state of the traffic, to detect traffic trends, and to disseminate relevant traffic flow-related information along the roadway. The cyber components of the system processes the information collected by the physical component and builds beliefs that are, subsequently, updated using Bayesian inference. Conducted simulation results confirm our theoretical predictions.

Scattering Parameters and Surface Normals from Homogeneous Translucent Materials using Photometric Stereo

Presenter: Bo Dong
Co-Authors: K. Moore, W. Zhang
Advisor: Pieter Peers
College of William & Mary,
Computer Science

This paper proposes a novel photometric stereo solution to jointly estimate surface normals and scattering parameters from a flat homogeneous translucent object. Similar to classic photometric stereo, our method only requires as few as three observations of the translucent object under directional lighting. Naively applying classic photometric stereo results in blurred photometric normals. We develop a novel blind deconvolution algorithm based on inverse rendering for recovering the sharp surface normals and the material properties. We demonstrate our method on a variety of translucent objects.

Towards Dynamic Job Assignment in Vehicular Cloud Computing

Presenter: Puya Ghazizadeh
Co-Author: R. Mukkamala
Advisor: Stephan Olariu
Old Dominion University,
Computer Science

Statistics show that most vehicles spend many hours per day in a parking garage, parking lot, or driveway. At the moment, the computing resources of these vehicles are untapped. Inspired by the success of conventional cloud services, a group of researchers have recently introduced the concept of a Vehicular Cloud. The defining difference between vehicular and conventional clouds lie in the distributed ownership and, consequently, the unpredictable availability of computational resources. As cars enter and leave the parking lot, new computational resources become available while others depart creating a dynamic environment where the task of efficiently assigning jobs to cars becomes very challenging. Our main contribution is a job assignment strategy, based on redundancy and checkpointing, that mitigates the effect of resource volatility of resource availability in vehicular clouds. We offer a theoretical analysis of the expected job completion time and show, by extensive simulation, that our theoretical predictions are quite accurate.

Estimate Camera Response Function from Large Photo Collections

Presenter: Han Li
Advisor: Pieter Peers
College of William & Mary,
Computer Science

Internet photo collections provide snapshots of the world recorded at different times and locations. Data-mining such photo collections for reconstructing the shape and appearance of the world is hindered by the inherent non-linear transformation of physical radiance into perceptual brightness values preferred by human viewers. This non-linear transformation, the camera response function, differs between cameras models and which is often unknown. We propose an approach for recovering the camera response functions of different camera models from large internet photo-collections. Our method exploits re-occurrence of famous landmark scenes in large photo-collections to infer the camera response functions. Our method accounts for differences in view and lighting conditions present during recording. We demonstrate the effectiveness of our method by reconstructing high dynamic range photographs of such landmark scenes from the information in the photo collections. The estimated scene radiance can also be as a basis for future computer vision and computer graphics algorithms.

Smart Reflectance Editing in Photographs

Presenter: Kathleen Moore
Advisor: Pieter Peers
College of William & Mary,
Computer Science

Photographic post-processing has evolved greatly in recent years. Using graphics editors like Adobe Photoshop, users can now make a variety of edits to photographs with virtually seamless results. These edits are often the result of a combination of mathematical algorithms and a certain amount of computational inferring on behalf of the user. As yet, there has not been an application that enables the user to realistically edit the surface orientation of an object in a photograph because the subsequent change in the object's reflectance would be unknown. We present an application that, with minimal input, allows the user to "massage" the surface of an object in a photograph while simultaneously solving for the novel reflectance information. Solving for novel reflectance information for an object in an arbitrary photograph, illuminated with unknown, distant lighting is a non-trivial problem. Reflectance is the result of the convolution of an object's bidirectional reflectance distribution function (BRDF) and the incident lighting in the scene. When an object's surface changes, so does reflectance. We must solve for missing information through interpolation, but this operation is hindered by the presence of geometrical self-shadowing, interreflectance, and the degree of gloss or specular reflection on an object's surface. We strive to enable the user to make surface orientation changes while asking for minimal user assistance. In this way, we keep photographic editing powerful, user-friendly, and smart.

Smartphone Energy Savings through I/O Path Optimizations

Presenter: David Nguyen
Advisor: Gang Zhou
College of William & Mary,
Computer Science

In this work, we present an experimental study of how storage techniques impact energy consumption in smartphones. We design and implement a system that tracks I/O activities of smartphones in real-time and dynamically changes storage configuration by matching I/O patterns in order to reduce energy consumption. Our system is evaluated on the 20 most popular applications from Google Play, and our results show that the optimal configurations save from 23% to 52% of battery life. We believe that they highlight a new and interesting direction in which the topic of smartphone energy consumption can be further evaluated and expanded upon.

Ultrasonic Audio Modem as a Replacement For NFC

Presenter: Ed Novak
Co-Author: H. Han
Advisor: Qun Li
College of William & Mary,
Computer Science

Cellphones have become ubiquitous in the modern world and smartphones are rapidly gaining ground. As a result, the world has seen a transformation in many key aspects of daily life. Sharing information such as pictures, contacts, and videos has been radically influenced by these devices. Users are now even able to make electronic payments using their mobile phones at the point of sale. Applications like these, which assume physical proximity, are cumbersome to implement over traditional network technology like 3g/4g connections or WiFi due to NAT routing. As a result, it is common for cell phone manufacturers to include alternatives such as Bluetooth or NFC radios. However, to date, these alternative radios are only included in high end devices. Our paper proposes the use of ultrasonic audio tones to transmit information from device to device. There are several benefits to this approach including easy deployment, user proximity guarantees, lower cost for manufacturers, and minimal impact to users. In this paper we examine and implement several modem schemes on Android smartphones and using the Matlab programming environment. An extensive evaluation is presented, which shows that our system can achieve 3.5kbps with a BER of 0.3% before error detection coding. With error detection coding we can achieve an effective transmission rate of 3.1kbps with a PSR of 90%.

MindReader: We Can Read Your Mind, Sort Of

Presenter: Zhengrui Qin
Co-Author: S. Yi
Advisor: Qun Li
College of William & Mary,
Computer Science

Brain-Computer Interface (BCI), a direct communication between the brain and an external device, plays an important role in medical systems for patients with motor disability. For instance, a BCI application can assist a person who cannot type a keyboard due to injury or disease to ``type'' by thinking to type. In the past, SSVEP-base BCI has drawn much attention due to its high-bit-rate advantage. Most SSVEP-based BCI systems, however, are laboratory-oriented and expensive, and thus not suitable for personal use. In this work, we aim to investigate the feasibility of building high-bit-rate BCI using cheap and portable devices. We have built a prototype of our BCI system, which only consists of an EEG headset and a laptop. We have carefully designed the system and conducted intensive experiments. After overcoming several challenges, we have managed to reach an appealing performance, which is half of the best from laboratory-oriented and expensive systems and the best so far with such cheap devices.

Strategies for Sensor Data Aggregation for Emergency Situations

Presenter: Xianping Wang
Advisor: Stephan Olariu
College of William & Mary,
Computer Science

Imagine a number of sensors that, having witnessed an event, have collected relevant data. In emergency situations, where a determination needs to be made in a timely manner and where a false alarm is prohibitively expensive, the task of intelligently aggregating sensor data is of paramount importance. The aggregation problem is complicated by the fact that the perceived value of the data collected by the sensors decays, often quite rapidly, over time. At every moment, individual sensors have the choice to report an emergency event or else to defer reporting to a later time in the hope that by aggregating the data they hold with that collected by neighbouring sensors, their confidence in the occurrence of an emergency event worth reporting has been enhanced. However, aggregation takes time and the longer they wait, the lower the value of the aggregated information. Our main contribution is a formal look at various novel aggregation strategies. Our model relates aggregation decisions to the ensuing value of the resulting information and suggests natural thresholding strategies for the aggregation of the information collected by sets of sensors. Extensive simulation results have confirmed the theoretical predictions of our model. Our results find applications to emergency management and other similar homeland security application domains where there is a strong need to model not only timely aggregation of data collected by individual actors, but also the dynamics of this aggregation. In many of these applications, the failure to aggregate data in a timely fashion may have catastrophic consequences.

Micro-Managing Operational Costs in the EC2 Cloud

Presenter: Jiawei Wen
Co-Authors: L. Lu, G. Casale
Advisor: Evgenia Smirni
College of William & Mary,
Computer Science

Micro instances (m1.micro) are a class of Amazon EC2 virtual machines (VMs) that offers the lowest operational costs for applications with short bursts in their CPU requirements. As processing goes further, EC2 limits the resource capacity of micro instances in a complex, quite unpredictable, manner. This makes it difficult to fully harness the potential of this instance class. This research aims at making micro instances more predictable and more efficient to use. First, we present a characterization of EC2 micro instances using multiple benchmarks, aimed at improving the understanding of this VM class and the complex interactions between costs, delays, and CPU throttling by the host. Next, we propose adaptive management algorithms that learn at runtime the workload characteristics to manage CPU consumption. For CPU intensive workloads, we observe that a significant (up to 65%) portion of the jobs can have end-to-end times that are even four times less as those of the more expensive m1.small class and comparable average job response times. In addition, our algorithms reduce the long tails (and associated unpredictability) of job execution times on the micro instances, allowing for the first time, favorable performance comparisons with small instances. If cost is of primary importance and the customer does not mind an occasionally long in the the response time distribution of jobs, then the proposed algorithms make the case for gaining more for your money on the m1.micro class.

Computing Singular Value Triplets of Large Matrices with PRIMME Eigensolver and Refined Ritz vectors

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

The Singular Value Decomposition (SVD) is widely used in diverse applications such as search engines, Big Data, and signal processing. The computation of a few smallest singular values and singular vectors of a large sparse matrix A presents challenges both on the speed of convergence and the accuracy that iterative methods can accomplish. An iterative eigensolver can be applied either to work on the augmented matrix B = [0 A^T; A 0] or on the normal equation matrix C = A^TA. The augmented matrix accurately computes singular values but suffers from slow convergence. In contrast, the normal equation matrix achieves smoother and faster convergence but is limited by its accuracy. We present a new algorithm to combine the merits of these two approaches to speed up computations without compromising accuracy. In addition, we propose to utilize the refined Ritz vectors to offer a smooth and monotonic convergence when working on the augmented matrix. The proposed algorithm incorporates the eigensolver software PRIMME and utilizes existing preconditioners to further speed up computations of the singular value triplets. Our initial experiments demonstrate significant performance increases compared to currently available algorithms. Our method is up to four times faster than the MATLAB's svds() which is based on ARPACK, an established eigensolver. With a preconditioner, our method sometimes achieves 1000 times speed up when seeking one singular value. Without a preconditioner, our method achieves 40% and 25% improvement compared to the JDSVD algorithm when one singular value and ten singular values are required respectively.

Click Fraud Detection on the Advertiser Side

Presenter: Haitao Xu
Co-Authors: D. Liu, A. Koehl, A. Stavrou
Advisor: Haining Wang
College of William & Mary,
Computer Science

Click fraud---malicious clicks on the online advertisements at the expense of pay-per-click advertisers---is posing a grave threat to the Internet economy. Although click fraud has attracted much attention from security community, as the direct victims of click fraud, advertisers still lack effective defense to detect click fraud independently. In this paper, we propose a novel approach for advertisers (e.g., Progressive Car Insurance) to detect click frauds without the helps from ad networks (e.g., Google) or publishers (e.g., CNN). Our key idea is to proactively test if visiting clients are full-fledged modern browsers and passively scrutinize user engagement. In particular, we introduce a new functionality test scheme and develop an extensive characterization of user engagement. Our detection can hardly be evaded by clickbots (i.e., malwares or automated scripts which aggressively click on the victim's advertisements) and is transparent to users. Moreover, our approach requires little effort to be deployed at the advertiser side. To validate the effectiveness of our approach, we implement a prototype and deploy it on a large production website; and then we run 10-day ad campaigns for the website on a major ad network. The experimental results show that our proposed defense is effective in identifying both clickbots and human clickers (i.e., persons hired to click on ads), while incurring negligible overhead at both the server and client sides.

Heterogeneous Multi-core Processors for MapReduce Processing: Opportunity or Challenge?

Presenter: Feng Yan
Co-Authors: L. Cherkasova, Z. Zhang
Advisor: Evgenia Smirni
College of William & Mary,
Computer Science

To offer diverse computing capabilities, the emergent modern system on a chip (SoC) might include heterogeneous cores. The current SoC design is often constrained by a given power budget that forces designers to consider different decision tradeoffs, e.g., to choose between many slow cores, fewer faster cores, or to select a combination of them. In this work, we design a new Hadoop scheduler, called DyScale, that exploits capabilities offered by heterogeneous cores for achieving a variety of performance objectives. It enables creating virtual resource pools based on the core types for multi-class priority scheduling. A typical MapReduce workload contains jobs with different performance goals: large, batch jobs that are throughput oriented, and smaller interactive jobs that are response-time sensitive. By creating different compute capabilities virtual Hadoop clusters (based on slow cores versus fast cores) one can effectively support different performance objectives of MapReduce jobs that cannot be achieved in the Hadoop cluster with homogeneous processors. These virtual clusters have access to the same data stored in underlying distributed file system. This enables sharing the spare resources (slots) between the different resource pools. By utilizing spare resources and migrating the map/reduce tasks from slow to fast cores (and vice versa), the DyScale scheduler increases the overall cluster utilization and improves the job completion time, while achieving the specified jobs' service level objectives. Extensive measurements and experiments verified the correctness and robustness of our approach.

Image Based Editing of Translucent Material in Photographs

Presenter: Weiyi Zhang
Advisor: Pieter Peers
College of William & Mary,
Computer Science

Altering the appearance of translucent objects is a very common image editing operation. While seemingly a straightforward task, it requires significant effort and artistic expertise to produce realistic results. Alternatively, one could acquire the full description of the lighting, shape, and material properties, then apply the desired changes to the material properties, and recompute the scene by simulating the light transport ensuring a physically plausible result. However, the effort required for acquisition seems excessive for the task at hand. Furthermore, changing material properties changes the appearance indirectly (via a rendering process) and therefore does not provide an intuitive interface for altering the appearance. In this project, we seek to bridge the gap between the two - minimizing the efforts to characterize the scene while still maintaining the flexibility to edit the appearance of translucent objects directly in a physically plausible manner. Our technique only acquires the information necessary to make the desired appearance editing operations. Our acquisition scheme is designed to be orthogonal to the appearance effects of light transport phenomena not affected by the editing operation. We envision a broad spectrum of application, ranging from virtual make-up to restoring the appearance of (formerly translucent) archaeological artifacts.

CacheKeeper: A System-wide Web Caching Service for Smartphones

Presenter: Yifan Zhang
Co-Author: C. Tan
Advisor: Qun Li
College of William & Mary, Computer Science

Efficient web caching in mobile apps eliminates unnecessary network traffic, reduces web accessing latency, and improves smartphone battery life. However, recent research has indicated that current mobile apps suffer from poor implementations of web caching. In this work, we first conducted a comprehensive survey of over 1000 Android apps to identify how different types of mobile apps perform in web caching. Based on our analysis, we designed CacheKeeper, an OS web caching service transparent to mobile apps for smartphones. CacheKeeper can not only effectively reduce overhead caused by poor web caching of mobile apps, but also utilizes cross-app caching opportunities in smartphones. Furthermore, CacheKeeper is backward compatible, meaning that existing apps can take advantage of CacheKeeper without any modifications. We have implemented a prototype of CacheKeeper in Linux kernel. Evaluation on 10 top ranked Android apps shows that our CacheKeeper prototype can save 42% networks traffic with real user browsing behaviors and increase web accessing speed by 2x under real 3G settings. Experiments also show that our prototype incurs negligible overhead in most aspects on cache misses.

Improving Storage I/O for Android phones

Presenter: Jianing Zhao
Advisor: Peter Kemper
College of William & Mary, Computer Science

Computers are expected to safely and quickly reboot from a system crash without loss of data. It is common practice to use journaling to make file systems resilient to system failures. Smart phones as a particular architecture are no exception to this. Android phones use the ext4 journaling file system on a hardware storage device built with flash memory. This is problematic as journaling produces small write operations with high frequency which is known to be detrimental to the expected life span of flash memory. We propose a new approach to buffer the journaling activities in main memory to reduce the number of write operations on flash. This significantly prolongs the life time of the flash memory. As an additional benefit, it also improves systems performance as the response time of main memory is much better than that of flash memory. To make the approach work, we derive a mechanism to store the journaling data on flash in the situation of a system crash and to automatically recover it when the system reboots.

"We must lift up the negro or he will pull us down": A Southern Black Orphanage in the 1890s

Presenter: Amelia Butler
Advisor: Scott Nelson
College of William & Mary,
History

In 1890, the Virginia Legislature chartered an institution "for the benefit of orphans of the colored race...in order to rescue them from...lives of shame and crime, and to endeavor to make of them...useful members of society." Founding an orphanage in this period of cruelty-consciousness and child-saving is nothing remarkable, but the mission of the Colored Orphan Asylum and Industrial School was fundamentally different from similar institutions for white children. The history of orphanages is long and largely critical, particularly since the deinstitutionalization movement of the 1960s and the simultaneous rise of the new social history. Both of these trends saw orphanages as instruments of social control and hegemony, but these overly simplistic generalizations have been questioned by later historians. The picture that emerges of orphanages is still far from rosy, but it is far more complex. Different institutions had different missions, policies, and clientele, and they served different purposes for different classes: education and relief for the working poor, and social control and socialization for the powerful. This seems nowhere more evident than in institutions intended to socialize black children away from their "brutal" and "shame[ful]" families, and yet not a lot of work has been done on colored orphan asylums - especially in the South. The Lynchburg COAIS offers a combination of elements that has not been at all well-studied: an orphanage for African-American children in the South. Examining this institution, I illuminate broader Southern views of child welfare, African Americans, and the intersection of both.

"The Lying Captain": William Augustus Bowles and the Diplomatic Utility of an Indian Poser

Presenter: James Hill
Advisor: Brett Rushforth
College of William & Mary,
History

William Augustus Bowles has become notorious for his sojourns into Creek Country, where he claimed to have been anointed "Director-General of the Creek Nation." Often lost among his pretensions is the question of why many Native peoples seemingly went along with his act. This paper argues that Bowles was useful to Native leaders as a means for furthering their diplomatic objectives. By "playing Indian" in London, the Bahamas, and Canada, Bowles drew attention to Creeks, Seminoles, and Cherokees struggling to ward off U.S. expansion. In turn, they used his pageantry to press British officials for diplomatic and material support.

In Search of the Land of Liberty: Methodist Migrations and Antislavery in Virginia, 1780-1810

Presenter: Christopher Jones
Advisor: Christopher Grasso
College of William & Mary,
History

From 1790-1810, several hundred Methodists, frustrated with the creeping influence of slave owning converts in their church, moved from southern Virginia to Ohio in search of a "land of liberty." In this paper, I compare their experience with that of another group of Methodist migrants who left Virginia 20 years earlier. The two groups shared not only a religious affiliation but also an antislavery ideology. The crucial difference between the two groups was their race. The earlier migrants were enslaved Africans and African Americans who had escaped behind British lines under the protection of Lord Dunmore's 1775 Proclamation. And instead of heading west, they moved north to New York and then to Nova Scotia, where they established a Methodist foothold in the Atlantic provinces before migrating again, this time across the Atlantic Ocean to Sierra Leone. These two migrations were part of larger history of Methodist migration that shaped the growth and development of the movement throughout the Atlantic World. Methodism was first introduced into the American colonies by immigrant preachers, the majority of whom opposed slavery. Over time, as social pressures and internal debates led Methodists throughout the southern U.S. to accommodate slavery and slaveholders, those converts chose to migrate in hopes of finding their respective "lands of liberty." In considering their stories, I aim to highlight the contributions of both black and white Methodists to debates over the question of slavery within the larger evangelical and abolitionist movements.

Painting Thanatos: German Expressionism in the Early Weimar Republic

Presenter: Michael King
Advisor: Edward Baring
Drew University,
History

A reappraisal of the paintings of the Expressionist artists of the early Weimar Republic illustrates that the movement was characterized by a conceptual center, though scholars have consistently argued otherwise. The paintings produced by artists like Otto Dix, George Grosz, Käthe Kollwitz, and Max Beckmann demonstrate that the German Expressionists of the early Weimar Republic shared a concern for many of the same themes which interested Sigmund Freud. Though they did not refer to their work using Freudian terms, a close analysis of several paintings suggests the Expressionists of the Weimar period were preoccupied with the struggle between what might be called the life and death instincts. This conflict was discussed at length by Freud throughout many of his publications, including *Civilization and Its Discontents*, from 1930. Both the Expressionists and Freud explore elements of a dualistic metaphysics in their work, reminiscent of the Dionysian and the Apollonian dichotomy first outlined by Friedrich Nietzsche in *The Birth of Tragedy*. The traumatic effects of the First World War encouraged Freud and others, including the Expressionists, to foreground this element of Nietzsche's philosophy within their own work. This Nietzschean inheritance endowed the Expressionists and Freud with a conceptual apparatus they could each employ to expose and diagnose the ills of the civilization in which they lived. Therefore, this common Nietzschean heritage permits the use of Freud's conceptual framework to draw out a common, but unspoken aesthetic core to post-war German Expressionist art.

ARTS & SCIENCES

The Shift to Quietism: Male and Female Quaker Perspectives in Political Context

Presenter: Caitlin McGeever
Advisor: Amy Froide
University of Maryland Baltimore County, History

The early female Quaker ministry of mid-seventeenth century England has been widely discussed in recent decades by several historians and literary scholars arguing that the women involved held great authority and agency. Despite extensive research conducted on and about the Quakers during the English Civil Wars and Revolution some questions are left unanswered, in particular the connections with male members have been overlooked. And since egalitarian values were a core component to the Quaker religion, the contributions of each sex deserve equal examination. It is essential to examine the male perspective on female preaching alongside the female perspective since the men also supported the public practice despite its clear opposition to a patriarchal society and English views of masculinity. I explore if male and female Friends emphasized different ideas during the chaotic politics of the Civil War years of the 1640s and the Interregnum of the 1650s, and how these ideas compared to the sect's changes in the Restoration years following 1660. I examine male and female tracts from the Commonwealth, (1649-1652), the Protectorate, (1653-1659), and the Restoration (1660) in order to trace any changes and/or developments in attitudes about Quietism as expressed in Quaker writings. Such an analysis will provide a demonstration of how the religious Society moved toward the development and installment of Quietism after the Restoration. This information will further expand our knowledge of the inner workings of Quaker preaching but also provide solid examples of how the inner light was interpreted as equality.

Austria-Hungary's Emigrant Houses as Transnational Spaces in Turn-of-the-Century New York City

Presenter: Kristina Poznan
Advisor: Scott Nelson
College of William & Mary, History

Austria-Hungary subsidized three "Emigrant Houses" in New York City to facilitate the travel of migrants between Austria-Hungary and the United States in the early 20th century. Leo House housed Catholic German-speaking migrants from the whole Empire; the Hungarian House all those from Hungary of any nationality or religion, and the Polish St. Joseph's Home, Slavic-speaking Catholics. The divisions between these houses show the inconsistencies between linguistic, territorial, and religious categorization of migrants' identities. As quasi-governmental but officially American-based institutions, the Emigrant Houses also illustrate profound disagreements between the Austro-Hungarian Foreign Ministry and various American parties. The Foreign Ministry had to work through ethnic American boards to operate the homes, sometimes disagreeing on who was to be served and at whose expense. U.S. Immigration and Health Department officials also played active roles in the homes' histories, forcing their temporary closure and stranding migrants in the short term, but ultimately bettering conditions by demanding renovations. Most dramatically, the Emigrant Houses that were still operating when the U.S. entered the World War I were seized as alien property, as part of their mortgages were in foreign hands. Using documents from the Austrian and Hungarian State Archives, the U.S. Immigration and Naturalization Service, and the American English-language and immigrant press in New York, this paper examines the contradictions and challenges that the Emigrant Houses, as transnational spaces, posed for the Austro-Hungarian government in providing travel and social services to its migrants abroad.

The Political Theology of European Integration

Presenter: Mark Royce
Advisor: Mariely Lopez-Santana
George Mason University,
Public and International Affairs

Historians such as Coupland (2006) and Kaiser (2007) have observed that most theoretical explanations of European integration have lacked any appeal to spiritual or religious dimensions, as well as to idealism generally. Yet aside from the survey research of Nelsen and Guth (2011), no one has actually tested any correspondence, at the national level, between the historically prevalent religious traditions of European countries and their level of integration. To understand variances in levels of integration, this paper hypothesizes that historically Catholic countries will display deeper levels of European integration than historically Protestant ones. To develop this argument, I establish the prevailing political theology in eighteen West European countries through a content analysis of their written constitutions, which often contain provisions concerning religious establishments. The findings will establish whether "religion matters" by qualifying the "secularization thesis" of modern sociology, as well as by demonstrating that an important spiritual dimension has been lacking from existing accounts of European integration.

The Qweak Experiment: Simulations for Determining the Møller Electron Scattering Background at Small Angles

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

The Qweak experiment was recently completed at Jefferson Lab with the purpose of measuring the weak charge of the proton. The experimental apparatus used for the experiment was designed to detect elastically scattered electrons from a liquid hydrogen target. This experimental method is subject to backgrounds in the form of other types of scattering. In order to perform the most precise measurement, these backgrounds have to be quantified and understood so that their signal contribution can be subtracted from the final result. The objective of this research has been to determine the rate of electron-electron scattering, also known as Møller scattering, at small scattering angles. Møller scattering is a known signal background in the experiment that can be quantified through the use of computer simulation. The Qweak experiment makes use of the CERN Geant4 particle transportation framework, to create a Monte Carlo simulation that models the particle's passage through the experimental apparatus. The simulation was originally developed during the planning phase of the experiment and has been updated over time to represent the final running configuration. A series of simulations were conducted to determine the Møller scattering rate and I will present these results here.

Thickness dependence of superconducting properties in NbN thin films

Presenter: Matthew Burton
Co-Authors: D. Beringer, M. Beebe, E. Visosky, D. Brantley
Advisor: R. Ale Lukaszew
College of William & Mary,
Physics

Thin film NbN is a promising material currently researched for improvements in superconducting radio frequency (SRF) technology and applications. At present, bulk niobium SRF accelerating cavities suffer from a fundamental upper limit in maximally sustained accelerating gradients; however, a scheme involving multi-layered superstructures consisting of superconducting-insulating-superconducting (SIS) layers has been proposed to overcome this fundamental material limit of 50 MV/m [1]. The SIS multi-layer paradigm is reliant upon implementing a thin shielding material with a suitably high Hc1 which may prevent early field penetration in a bulk material layer and consequently delay the high field breakdown. It has been predicted that for thin superconducting films — thickness less than the London penetration depth (~200 nm in the case of NbN) — the lower critical field Hc1 will be enhanced with decreasing thickness. Thus, NbN thin films with a high Hc1 value are prime candidates for such SIS structures. Here we present our study on the structure and superconducting properties of a series of epitaxial NbN thin films and correlate the effects of film thickness on the lower critical field, Hc1. [1] A. Gurevich, Appl. Phys. Lett., 88, 012511 (2006).

Ballistic Atom Pumps

Presenter: Tommy Byrd
Co-Authors: M. Ivory, A. Pyle, S. Aubin
Advisor: John Delos
College of William & Mary,
Physics

Researchers have long been interested in electron transport through mesojunctions containing time-dependent potential barriers, a process often called “quantum pumping”. However, such pumps have proven to be difficult to realize experimentally due to coupling and rectification effects. A useful model of such a system is a ballistic atom pump: two reservoirs of neutral ultra-cold atoms connected by a channel which has oscillating repulsive potential-energy barriers. The particles move through the pump independently, and only interact with the walls and potentials. Such a system can transport particles from one reservoir to the other, even when the reservoirs have equal chemical potentials. It can also transfer energy from one reservoir to the other, even if there is no net particle pumping. Another type of pump, a rectifier--which only allows current to flow in one direction--can be constructed by tuning the properties of the potentials. While these phenomena are often called ``quantum pumping,'' we have found that the quantum description cannot be fully understood without analysis of the underlying classical dynamics. Classically, the system displays rich dynamics, and is a nice model of chaotic transport. We use classical trajectories, along with phase information, to construct a semiclassical approximation to the quantum description. The classical description allows us to understand the location of peaks seen in the quantum theory, and the semiclassical description explains the relative heights of the peaks.

Measuring the Weak Charge of the Proton Through Parity Violating Electron-Proton Scattering

Presenter: Juan Cornejo
Advisor: Wouter Deconinck
College of William & Mary,
Physics

The Qweak collaboration at Jefferson Lab in Newport News, Virginia, published the first direct measurement of the proton’s weak charge (Q^pW), which is analogous to electric charge. As described by the Standard Model of particle physics, so far the best theory that describes fundamental particle interactions, the weak charge arises from the exchange of a heavy neutral Z-boson and comparatively the electric charge arises from the exchange of the massless photon. In the publication, we incorporated the results of other parity-violating electron scattering (PVES) experiments with an experimental parity-violating asymmetry, using about 4 days worth of data, to determine $Q^pW(PVES) = 0.064 \pm 0.012$. Though this represents an uncertainty of 18.75%, we anticipate that the analysis of the entire data set, spanning over 2000 hours, will yield an uncertainty of 3 to 5 times smaller. During this talk, I will introduce the experimental and analytical methods involved in measuring a small (~200 ppb) asymmetry using the Qweak apparatus and illustrate my involvement. Furthermore, I will introduce how these and any future results test the validity of the Standard Model.

An Update on the g_2^p Experiment

Presenter: Melissa Cummings
Advisor: Todd Averett
College of William & Mary,
Physics

The internal components of the proton, quarks and gluons, have been known for many decades, yet scientists still lack an understanding of the forces and dynamics that are necessary to produce the proton, a primary constituent of all visible matter. Electron scattering provides a precise tool to study these processes. Numerous measurements have been made at Jefferson Lab to study the spin-dependent structure functions of the nucleon, $g_1^{p,n}$ and $g_2^{p,n}$. While g_1 can be expressed in terms of quark distribution functions, g_2 contains contributions from higher order interactions, and so has no simple interpretation in the quark-parton model. The neutron spin structure functions, g_1^n and g_2^n and the proton structure function g_1^p have been measured over a wide kinematic range, but data for g_2^p remains scarce. This talk will discuss the g_2^p experiment, which ran in Hall A at Jefferson Lab in the spring of 2012 and will provide the first measurement of g_2^p in the resonance region; $0.02 < Q^2 < 0.2$ GeV^2. These data will provide insight on several outstanding physics puzzles, such as why Chiral Pertubation Theory calculations fail to predict the behavior of the longitudinally-transverse spin polarizability (Δ_{LT}). They will also provide a test of the Burkhardt-Cottingham Sum rule, which says that the integral of g_2 over the Bjorken scaling variable x tends to zero. In addition, the data will reduce the uncertainty in calculations of hydrogen hyperfine splitting as well as the proton charge radius. This talk will outline the theory and motivation behind the g^p_2 experiment as well as present the current status of the analysis.

Tidal Effects on Titan's Upper Atmosphere

Presenter: Justin Denno
Co-Author: J. Bell
Advisor: Anna Dejong
Christopher Newport University,
Applied Physics and Computer Science,

Planetary atmospheres is an active area of space research that is fundamental to NASA's missions to other worlds and for understanding our own world. Titan, the largest moon of Saturn, is of particular interest because it has the only substantial N_2 atmosphere besides Earth in our solar system. Many believe that Titan resembles an early state of Earth prior to life. It is possible that Saturn's large gravitational field may cause tidal effects on Titan's atmosphere. Current models for Titan's upper atmosphere have not included the effects of Saturn's gravitational field. In our work, we have developed a mathematical description for Saturn's gravitational influence on Titan's atmosphere. We will implement this mathematical description into a three-dimensional (3-D) numerical model for Titan's thermosphere-ionosphere system–the Titan Global Ionosphere-Thermosphere Model (T-GITM). We will examine the effect of Saturn's gravitational pull on Titan's global winds and densities. We will also compare our simulation results with the recent measurement made by the Ion-Neutral Mass Spectrometer (INMS) instrument that is onboard the Cassini orbiter currently active in the Saturn System.

Hybrid optical dipole trap for ultracold rubidium and potassium with magnetometry applications

Presenter: Charles Fancher
Co-Authors: E. Urbach, M. Ivory, A. Ziltz, A. Pyle
Advisor: Seth Aubin
College of William & Mary, Physics

We present progress on the development of a hybrid magnetic-optical dipole trap for the rapid production of ultracold atomic samples of Rb and K. This optical trap adds experimental capability to the first chamber of an existing dual-chamber atom chip apparatus. By using a magnetic trap to quickly load the dipole trap while simultaneously cooling the atoms via forced radio-frequency or microwave evaporative cooling we have produced samples of 10^7 87Rb atoms at the μK level with a phase space density of 10^{-3} in a retro-reflected optical dipole trap. We are working towards negating the effects of an optical lattice created by retro-reflecting the dipole trap beam and loading into a higher stability 1W fiber laser-based dipole trap. We intend to leverage our capability to selectively evaporate 87Rb using 6.8 GHz microwaves and the added compression of the dipole trap to sympathetically cool K to increase its phase space density without decreasing its atom number. This could enhance planned atom chip-based experiments that require both large atom number and phase space density of K. This optical dipole trap approach enables research on cold collisional physics, as well as atomic clocks and gradient magnetometry. A Larmor precession method that uses magnetically sensitive atomic states can be used to measure magnetic fields. Two spatially separated magnetometers can then be used to measure magnetic field gradients.

Simulations of an Atomic Hydrogen Polarimeter for Future Precision Parity-Violating Electron Scattering Experiments

Presenter: Valerie Gray
Advisor: Wouter Deconinck
College of William & Mary, Physics

Parity-violating electron scattering experiments are making more and more precise measurements of quantities predicted by the Standard Model of particle physics. In parity-violating electron scattering a polarized electron beam scatters off an unpolarized target, and it is crucial that the polarization of the electron beam is known to high precision. Upcoming experiments for which this will be important include the MOLLER and SoLID experiments at Jefferson Lab and the P2 experiment at the MESA accelerator at the Johannes Gutenberg University in Mainz, Germany. One reliable way to measure the polarization of the electron beam is through electron-electron scattering or Møller scattering. The present Møller polarimeters using magnetized iron foils will not be able to reach the precision needed for future experiments, so a different polarimetry technique will be needed. The use of an atomic hydrogen Møller polarimeter would allow this demand to be met. In order to build such a polarimeter, much research and development is needed. A dilution refrigerator and solenoid magnet from a previous experiment have been moved to the Johannes Gutenberg University where testing revealed that the dilution refrigerator will need to be replaced. A Geant4 simulation has been written to determine various design parameters of the polarimeter system and their impact on future parity-violating experiments. I will discuss the status of this project, with a focus on the simulations performed at William & Mary.

The M2 phase of vanadium dioxide: a view from infrared and optical spectroscopy

Presenter: Tyler Huffman
Co-Author: P. Xu
Advisor: Mumtaz Qazilbash
College of William & Mary,
Physics

Bulk single crystalline vanadium dioxide (VO_2) undergoes a metal-insulator transition (MIT) at 340K. This thermally-driven MIT is accompanied by a structural phase transition that results in pairing of all vanadium ions in the insulating, monoclinic M1 phase. However, there also exists an insulating monoclinic M2 phase, usually only accessible via external strain or chemical doping, in which only half of the vanadium chains exhibit pairing. The M2 phase of VO_2 is vital for understanding the roles of electronic correlations and vanadium pairing to the MIT. Recent x-ray diffraction studies show that small pure VO_2 crystals can exhibit an M2 phase below 318K, likely due to internal strain. These crystals undergo phase transitions from M2 to M1 and from M1 to rutile metal upon heating. We have performed reflectance micro-spectroscopy with polarized light and generalized spectroscopic micro-ellipsometry between 12 meV and 5.5 eV on these VO_2 crystals as a function of temperature, uncomplicated by external strain or chemical doping. We report infrared and optical data on the M1, M2 and rutile phases and compare electronic and phonon properties of M1 and M2 phases. 1. B.S. Mun et al. Physica Status Solidi (RRL) - Rapid Research Letters 5, 107 (2011).

7Li MAS NMR Study of Temperature Dependent Spin-Lattice Relaxation in Cation-Ordered Microwave Perovskites

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

The temperature dependence of spin-lattice relaxation in cation-ordered perovskites has been qualitatively investigated using a pulsed NMR spectrometer at two different magnetic field strengths over the temperature range of 220–370 K. The samples used in this project are complex perovskites and can be categorized into two groups, those with single A-site cations and those with mixed A-site cations. All these samples have interesting properties, such as: they show complete B-site order, have very large dielectric constants, and show low loss in their microwave response. In order to minimize the dipolar and quadrupolar interaction, magic angle spinning (MAS) is employed, where the samples are crushed into powder, packed inside a 2.5 mm diameter rotor, and spun at 10 kHz at an angle (54.70°) with respect to the static magnetic field. To find the relaxation time of the samples, Saturation recovery technique is used. The relaxation rates for these materials were observed to increase proportional to either T or T2, depending on the material. A linear temperature dependence of the relaxation rate is expected for the direct process of nucleus coupling with a single phonon while the quadratic temperature dependence can arise from an indirect process involving two phonons (Raman process). Further studies at higher magnetic field suggest that the dominant relaxation mechanism is due to paramagnetic impurities where spin diffusion is important in dissipating the energy.

Implication of Gauge Symmetries for the Quantum Electrodynamics Vertex

Presenter: Shaoyang Jia
Advisor: Michael Pennington
College of William & Mary,
Physics

As a consequence of the gauge invariance of Quantum Electrodynamics (QED), there are constraints on the complete electron-photon vertex known as Ward-Takahashi identities. We impose these identities to restrict the functional form of the QED vertex parameterized in terms of the renormalization functions of the electron propagator. Both longitudinal and transverse parts of QED vertex are explored. Using such a construction, we expect to obtain a gauge invariant method for truncating the Schwinger-Dyson equations of QED.

Metal-based Photocathode Able to Sustain High Currents

Presenter: Zhaozhu Li
Co-Authors: K. Yang, J. Riso
Advisor: R. Ale Lukaszew
College of William & Mary,
Physics

Existing photocathode technology may not meet the various requirements for long photocathode lifetime, high current and repetition rate, high polarization and/or low emittance that are required for next generation light sources and nuclear physics accelerator capabilities, particularly for electron ion colliders (EIC). Specifically, next-generation light sources will need MHz repetition rates with high charge, high energy, low emittance, and a very high repetition rate while new EIC proposals stipulate hundreds of mA of current. Metallic photocathodes offer several advantages over present semiconductor photocathodes for these stringent requirements but also exhibit low QE. Coupling to the surface Plasmon polariton (SPP) modes on the metal surface offers an ideal solution to decrease the optical penetration depth and reduce the metal reflectivity thus leading to higher QE. Moreover, theoretical calculations[1] and experimental results[2] have both shown potential for lowering the work function of metals by capping with an adequate over-layer and hence further enhance their QE. We will present our experimental set-up and the results exploring metallic photocathode performance by enabling Surface Plasmon Polariton excitation as well as the use of adequate over-layers. [1] L. Giordano et al., Phys Rev B 73, 045414 (2005) [2] T Konig et al., J. Phys. Chem. C 113, 11301 (2009).

Energy and Position Resolution of HERA-B Shashlik Calorimeter Modules

Presenter: Anthony Losada
Advisor: Edward Brash
Christopher Newport University,
Applied Physics and Computer Science

A number of approved 12GeV experiments at Thomas Jefferson National Accelerator Facility will require upgrading or replacing existing detector systems. As part of this effort, an array of "shashlik" sampling calorimeters has been considered for potential use in the GEP-5 experiment, due to its improved radiation hardness compared to traditional lead-glass calorimeters, as well as its excellent position and energy resolution potential. To determine the appropriate construction to meet the needs of upcoming experiments, we have carried out tests of ten shashlik sampling calormimeter modules from the HERA-B detector using an electron test beam in End Station A at SLAC. We will report on both the energy and position resolution results from these tests, as well as on the methods used to determine these quantities.

The Qweak Experiment: Implications from the First Determination of the Proton's Weak Charge

Presenter: Joshua Magee
Advisor: David Armstrong
College of William & Mary,
Physics

The Qweak experiment recently completed data taking at Jefferson Laboratory with the aim of making the first experimental determination of the proton's weak charge. The weak charge is analogous to the more familiar electromagnetic charge. Results have been obtained from the first period of data-taking, which comprises 3 "perfect" days of beam (only 4% of the total data set). The experiment measured the small parity-violating asymmetry of elastic electron-proton scattering, which allows direct extraction of the proton's weak charge, Q_w^p. Once extracted, the current results directly probe potential "new" physics, and the limits set are competitive, and complementary, with those from the Large Hadron Collider at CERN. When these results are combined with the world's parity-violating data, extraction of the neutron's neutral-weak charge, Q_w^n, and the individual quark weak vector couplings, C_{1u} and C_{1d}, are also possible. This talk will focus on the implications of the current Qweak experimental results, including the extraction of the proton and neutron weak charges, the quark weak couplings, and also highlight the mass-limit reach of Standard Model extensions probed. This talk will be for a general audience.

Lattice study of the leptonic decay constant of the pion and its excitations

Presenter: Ekaterina Mastropas
Advisor: David Richards
College of William & Mary,
Physics

Using computational methods of Lattice Quantum Chromodynamics (LQCD), we present a novel calculation of the decay constant of the pi-meson, and its lowest-lying three excitations. This theoretical study was performed on anisotropic lattices, at three different values of the pion mass between 400 and 700 MeV. Obtained results predict that the decay constant of the first excitation, and more notably the second, is suppressed with respect to that of the ground-state pion, but that this suppression shows only a mild dependence on the quark mass.

Detecting periodic breathing in preterm infants

Presenter: Mary Mohr
Co-Authors: M. Patel, D. Lake, K. Fairchild, R. Moorman
Advisor: John Delos
College of William & Mary,
Physics

Periodic breathing (PB – also called periodic apnea) is a normal developmental phenomenon in preterm neonates that, if exaggerated, may be pathologic. It represents a common and easily detected oscillation of normal physiology that has unexplored clinical consequences. Characterization of PB has previously been limited to short monitoring times in small numbers of infants. We developed a new algorithm to quantify PB in Neonatal Intensive Care Unit (NICU) patients and sought clinical correlations. Waveform (EKG, chest impedance) and vital sign data (heart rate, oxygen saturation) were collected continuously on University of Virginia NICU patients from 2009-2012. Wavelet methods were developed for detecting PB (rhythmic apnea with 10 to 40 second cycles). A previously developed apnea -recognition algorithm gives the probability of apnea as a function of time. PB is identified using a continuous wavelet transform of this signal with a periodic mother wavelet. The absolute values of the wavelet coefficients are a function of time and range from zero to one. PB is marked at times when the coefficient exceeds 0.5. These methods were applied to our large dataset, and the percentage of time spent in PB was calculated. Although PB has been thought to be benign, two cases of extreme PB occurred in infants who later died unexpectedly. Excessive PB may be a sign of poor development of respiratory control or impending pathology, underscoring the potential benefits of real-time monitoring of physiological oscillations.

Nuclear Form Factor Ratios in MINERvA

Presenter: Anne Norrick
Advisor: Jeffrey Nelson
College of William & Mary,
Physics

The MINERvA experiment is a dedicated neutrino scattering experiment in the NuMI beam line at the Fermi National Accelerator Laboratory in Batavia, Illinois. It is designed to measure neutrino cross sections, final state interactions and nuclear effects on a variety of nuclear targets from Helium to Lead. The structure of the nucleus can be described by functions called Nuclear Form Factors. Neutrino scattering provides a unique probe into the structure of the nucleus, allowing us to systematically measure the Axial Nuclear Form Factor, inaccessible through electromagnetic interactions. This compliments experiments done at Jefferson Lab that measure the Vector Nuclear Form Factor, which is accessible through electron scattering. This poster will summarize our current results, measuring Nuclear Form Factor ratios, and future plans for a continuation of this work in the Medium Energy regime.

Scattering of Ultracold Atoms from an Oscillating Barrier

Presenter: Andrew Pyle
Co-Authors: M. Ivory, K. Das, T. Byrd, J. Delos
Advisor: Seth Aubin
College of William & Mary,
Physics

We present progress on an experiment to study 1D quantum mechanical scattering by an amplitude-modulated barrier. The oscillating barrier imparts or subtracts kinetic energy in discrete amounts from the scattered atoms. In this manner, the energy spectrum of the scattered atoms resembles a comb with a tooth spacing of $\hbar\omega$ where ω is the oscillation frequency of the barrier. Numerical simulations of the scattering process confirm this basic scattering picture. We present an atom chip-based experimental system to study the scattering dynamics with Bose-Einstein condensates (BEC) of 87Rb. The experiment is performed by directing a BEC at a tightly focused, 532nm laser beam that serves as an oscillating barrier, located in the center of the trap. Once the atoms conclude their interaction with the barrier, the atoms begin to oscillate back towards the barrier; and on their return the amplitude of the barrier is kept fixed to serve as a discriminator. We plan to use the discriminator to obtain the energy distribution of the scattered atoms by measuring the transmission through the discriminator as a function of energy. This experiment represents a first step toward implementing a quantum pump for ultracold atoms based on two such barriers modulated out of phase with one another. Quantum pumping was originally proposed in the context of electron transport in nanowires, but has proven difficult to implement. The ultracold atom approach represents a possible route around the current experimental bottleneck.

Effect of strain on the dynamics of optically induced metal-insulator transition of VO_2 thin films

Presenter: Elizabeth Radue
Co-Authors: L. Wang, M. Simmons, S. Wolf, R. Lukaszew
Advisor: Irina Novikova
College of William & Mary,
Physics

VO_2 is a paradigm of a highly correlated material that undergoes a phase transition, changing from an insulator phase to a metallic one upon increasing its temperature while its lattice structure changes dramatically. VO_2 has drawn interest because the insulator--metal transition (MIT) occurs just above room temperature at 154°F (68°C) enabling technological applications. It has been shown that VO_2 thin films can also undergo such phase transition when stimulated by an ultrafast optical pulse, leading to interesting applications, such as ultrafast optical switches and novel electronic devices. Thin films often exhibit different properties than bulk materials due to microstructure defects, strain, etc. Thus, we have been studying the metal insulator transition of VO_2 thin films grown on different substrates using a strong 100fs pulse to induce the transition, while changing the arrival time of a weaker pulse to probe the changes of the film over time. By studying films grown on different substrates and observing differences in the dynamics of the MIT we aim to better understand the mechanisms of the light -induced transition. We have found noticeable differences in the threshold fluence needed to optically induce the MIT in films on different substrates, as well as the longevity of the metallic state. We will be discussing the implications of these differences regarding the mechanisms responsible for the optically induced phase transition.

Effect of long-range disorder on competing orders in bilayer graphene

Presenter: Martin Rodriguez-Vega
Co-Authors: C. Triola, J. Zhang
Advisor: Enrico Rossi
College of William & Mary,
Physics

Two general classes of spontaneously broken symmetry phases have been proposed for bilayer graphene: a gapped phase and a nematic phase. Some experiments suggest the establishment of a nematic phase whereas other suggest the presence of a gapped phase. In this talk I will present the results of our theoretical study of the effect of long-range disorder on the conditions for the establishment of a nematic or a gapped phase in bilayer graphene. In particular I will discuss the effect of the disorder-induced carrier density inhomogeneities on the properties and robustness of each phase. I will then discuss the relevance of our results for the current experiments. Work supported by ONR, grant number ONR-N00014-13-1-0321, ACS-PRF doctoral new investigtor grant 53581-DNI5, and the Jeffress Memorial Trust.

EIT-based quantum memory

Presenter: Gleb Romanov
Co-Authors: L. Wang, M. Simmons, S. Wolf, R. Lukaszew
Advisor: Irina Novikova
College of William & Mary,
Physics

Efficient and long-living quantum memory is an important component of quantum repeaters. Quantum memory can be based on the effect of Electromagnetically Induced Transparency (EIT). EIT is an effect where one electromagnetic field (control) creates a window of transparency in a resonant atomic media for another electromagnetic field (probe). By adjusting the control field, one can control the dispersion seen by the probe field. This allows for observation of slow and stored light. In this report I will describe our progress towards improving the efficiency and storage time for the EIT-based quantum memory.

Spin-imbalanced fermion populations with attractive interactions in 3D optical lattices

Presenter: Peter Rosenberg
Co-Author: S. Chiesa
Advisor: Shiwei Zhang
College of William & Mary,
Physics

Recent advances in the ability to cool atoms in optical lattices have generated interest in using cold atomic gases in optical lattices to emulate many condensed matter systems. Cold atomic gases in optical lattices are an appealing avenue of research because they can provide insight into the many-body physics of interacting electron systems by limiting many of the complexities of typical condensed matter systems, and also realize physics that is difficult to observe in condensed matter systems. These systems are free of disorder and can be modeled by Hamiltonians with tunable parameters and interaction strengths. One model system of intense interest is an optical lattice populated with unequal densities of two spin species that have attractive interactions. It has been suggested that this system could develop a variety of interesting phases, including an exotic superconducting state in which electron pairs travel with finite momentum. In this work we investigate different ground-state phases of attractive spin-imbalanced populations of fermions in 3-dimensional optical lattices. The ground state is determined using Hartree-Fock-Bogoliubov theory, and is studied for several values of density, spin polarization and interaction strength.

Effect of a spin-active interface on proximity-induced superconductivity in topological insulators

Presenter: Christopher Triola
Co-Author: A. Balatsky
Advisor: Enrico Rossi
College of William & Mary,
Physics

We examine the effect of a spin-active interface on the symmetry of proximity-induced superconducting pairing amplitudes in topological insulators. We employ diagramatic techniques to investigate the leading order contribution to the pairing amplitude considering 3 different kinds of spin-active interfaces: 1) those for which the interface leads to the wavefunctions of transmitted electrons picking up spin-dependent phases in addition to flipping the spin of transmitted electrons, 2) those with only spin-dependent phases and no spin-flipping, and 3) those with only spin-flipping and no spin-dependent phases. We find that in cases (1) and (2) a considerable odd-frequency spinful-triplet pairing is induced in the TI while for case (3) no spin triplet pairing is induced to leading order. We compare our results to those for a normal metal and ferromagnetic materials finding that the nontrivial spin structure of the TI leads to qualitatively different behavior. Work supported in part by ONR, grant number ONR -N00014-13-1-0321.

The Stability, Energetics, and Magnetic States of Cobalt Adatoms Adsorbed on Graphene

Presenter: Yudistira Virgus
Co-Authors: W. Purwanto, S. Zhang
Advisor: Henry Krakauer
College of William & Mary,
Physics

Graphene, a single layer of carbon atoms densely packed in a honeycomb lattice, is often hailed as a wonder material due to its remarkable intrinsic properties. It is the thinnest, the strongest, and the most stretchable crystal ever measured. Of all semiconductors, it also exhibits the highest electron mobility and current density at room temperature. Recently, the adsorption of transition metal adatoms on graphene has attracted significant research interest due to their possible use to induce magnetism on graphene for spintronic applications. Single Co atoms on graphene have been extensively studied both theoretically and experimentally. In our previous work, we used auxiliary-field quantum Monte Carlo (AFQMC) and a size-correction embedding scheme to calculate the binding energy of Co/graphene for the six-fold hollow site. Recent experimental results show that single Co atoms can be adsorbed on graphene at both the hollow and the top sites. We use AFQMC to investigate Co/graphene for the three high-symmetry adsorption sites; six-fold hollow site, two-fold bridge site, and top site. Highly accurate binding energy curves for the three sites are obtained. The stabilities of the different magnetic states and adsorption sites are examined and discussed in relation to the experimental observations.

Off-diagonal Terms Connection Between Particle and Momentum Transport in DIII-D Plasma

Presenter: Xin Wang
Co-Authors: E. Doyle. O. Meneghini
Advisor: Saskia Mordijck
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Physics

Understanding particle and momentum transport in tokamaks is essential to predict density and rotation profiles, which would be beneficial to reaching ignition criteria and making plasma stable in future's large plasma device like ITER. Previous work[1] has indicated that there is a connection between changes in momentum transport as well as particle transport across ITG-TEM domains, and relates it to the observed peaking of density profiles. However, on DIII-D, recent experiments were unable to reproduce those peaking results[1] in H-mode low beta plasma. In support to the fact that rotation profile plays role on the changes in particle transport, we varied the input torque through the neutral beams, from co to counter. Using TGLF, we compare linear instability growth rates and frequencies to show a change of turbulence type among mid-radius area when ECH power is added. Then we calculate the perturbed D and v coefficients and compare them to experimental measurements and theoretical predictions for inward turbulent pinch and outward diffusion. Through this, we could investigate the off-diagonal contribution of rotation profile on particle transport. [1] C. Angioni, *et. al.*, Nuclear Fusion 52, 114003 (2012).

Infrared spectroscopy of rare-earth-doped $CaFe_2As_2$

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

Recently, rare-earth doping in $CaFe_2As_2$ has been used to tune its electronic, magnetic, and structural properties. The substitution of rare-earth ions at the alkaline-earth sites leads to the suppression of the spin-density wave (SDW) phase transition in $CaFe_2As_2$. For example, Pr substitution results in a paramagnetic metal in the tetragonal phase that is susceptible to a low temperature structural transition to a collapsed tetragonal phase. However, La-doped $CaFe_2As_2$ remains in the uncollapsed tetragonal structure down to the lowest measured temperatures. Both the uncollapsed and collapsed tetragonal structures exhibit superconductivity with maximum Tc reaching 47 K, the highest observed in inter-metallics albeit with a small superconducting volume fraction. In this work, we perform ab-plane infrared spectroscopy of rare-earth-doped $CaFe_2As_2$ at different cryogenic temperatures. Our aim is to ascertain the contributions of electron doping and chemical pressure to the charge and lattice dynamics of this iron-arsenide system.

Infrared study of metallicity in vacuum annealed strontium titanate

Presenter: Peng Xu
Co-Authors: T. Huffman, I. Kwak, A. Biswas
Advisor: Mumtaz Qazilbash
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Physics

Widely employed as a substrate and as a dielectric layer in heterostructures, strontium titanate (STO) has been thoroughly studied. Metallicity in Nb-doped $SrTiO_3$ and at the interface of $SrTiO_3/LaAlO_3$ superlattices is also well known. In this work, we focus on the charge dynamics of vacuum annealed $SrTiO_3$-δ crystals which have metallic and atomically smooth surfaces. Far-field and near-field infrared measurements supported by spectroscopic ellipsometry have been carried out to provide insight into the emergence of metallicity due to oxygen deficiency in this insulator. Infrared reflectance and near-field optical microscopy are employed to obtain the dielectric function of $SrTiO_3$-δ. This information is analyzed to extract the characteristics of the electron gas in the metallic layer.

Spatial correlation of quantum noise in a laser beam interacting with atomic ensembles

Presenter: Mi Zhang
Advisor: Eugeniy Mikhailov
College of William & Mary,
Physics

We generated quantum squeezed states of light (with noise levels below the standard quantum limit or shot noise) utilizing the polarization self-rotation effect in a hot Rb vapor. We measured noise in the squeezed quadrature and the amplitude quadrature of a spatially-masked laser beam after its interaction with the Rb atomic vapor. We observed that the detected noise level was largely affected by the symmetry of the applied mask, rather than solely by the total power masked/removed from the beam. We also studied the dependence of the noise level on temperature of the Rb cell, i.e. the Rb vapor density, and noticed that different parts of the beam had uncorrelated noise contributions, which followed the power law dependence. Results of our studies are of interest for precision metrology, spectroscopy, and quantum memory applications.

Atom chip-based ultracold potassium for microwave and radio-frequency potentials

Presenter: Austin Ziltz
Co-Authors: M. Ivory, C. Fancher, A. Pyle
Advisor: Seth Aubin
College of William & Mary,
Physics

We present progress on an experiment to manipulate and trap ultracold atoms with microwave and RF (μ/RF) AC Zeeman potentials produced with an atom chip. These μ/RF potentials are well suited for atom interferometry and 1D many-body physics studies due to their inherent spin-dependent nature and ability to operate in conjunction with magnetic Feshbach resonances to tune interactions. We have completed a dual species, dual chamber apparatus for producing ultracold rubidium and potassium gases on an rf-capable atom chip. The system produces Bose-Einstein condensates of 104 87Rb atoms. We have successfully trapped 39K on the atom chip and are working to increase the number of trapped atoms for eventual sympathetic cooling by rubidium. Once the atom chip-trapped 39K has been sufficiently cooled and subsequently transferred to a co-located optical dipole trap, we plan to conduct a series of spatial manipulation experiments to study the capabilities and performance of μ/RF potentials. These potentials offer a possible route towards the development of an ultracold fermion interferometer for precision measurement of forces and microscopy.

The Intersection of Race and Gender: Cognitive and Memory Consequences of Intersecting Identities

Presenter: Nicholas Alt
Co-Author: J. Schug
Advisor: Cheryl Dickter
College of William & Mary,
Psychology

In two studies we assessed the degree to which social categories of race and gender overlap and influence each other. Recent research on gendered race theory shows that the racial category of Black is more associated with stereotypes of masculinity while the racial category of Asian is more associated stereotypes of femininity. In study one we hypothesized that participants, when asked to imagine a Black or Asian individual, would recall prototypical examples that align with gendered race predictions. Results indicated that when participants wrote a short story about a Black individual the majority wrote about males, while this trend reverses for Asian individuals. Study two expanded upon these findings by looking at a potential negative consequence of gendered race stereotypes for non-prototypical members (i.e., Asian men or Black women). Previous research has shown that statements made by Black women are more likely to be forgotten and misremembered compared to statements made by White men and women and Black men. Results from study two demonstrated a similar finding however for Asian men. Non-Asian participants were less likely to remember statements by Asian men and more likely to forget statements stated by Asian men. Overall this research demonstrates both the prevalence of gendered race prototypes as well as one potential negative impact of non-prototypical gendered race status. Implications for both societal discrimination (e.g., mate discrimination) and social cognitive categorization will be discussed.

Testing the Enabling Hypothesis of Coping with Physical and Sexual Assault Survivors

Presenter: Katherine Ashford
Co-Authors: A. Smith, K. Ashford, N. Vayer
Advisor: Russell Jones
Virginia Tech,
Psychology

The enabling model of coping highlights the role of self-efficacy and social support dynamics in situations involving emotional duress. This model has been tested in post-combat and medical trauma contexts. The current study sought to extend the enabling model through testing with a pilot sample of 66 physical and sexual assault survivors recruited from a local university. We hypothesized that perceived social support (PSS) would indirectly influence posttraumatic stress symptom severity (PTS) through its effect on coping self-efficacy (CSE). The model was tested through hierarchical regressions that were developed via a-priori, enabling model theory based hypotheses. Findings supported the overall hypothesis, revealing: (1) a significant, negative, direct effect of PSS on PTS severity without inclusion of CSE in the model ($b = -0.29$, $p = 0.02$); (2) a significant, positive, direct effect of PSS on CSE ($b = 0.48$, $p = 0.01$); (3) a significant, negative, direct effect of CSE on PTS severity when including both PSS and CSE in the model ($b = -0.18$, $p = 0.021$), and; (4) a non-significant relationship between PSS and PTS severity when including both PSS and CSE in the model ($b = -0.21$, $p = 0.09$). These findings support previous research suggesting that coping self-efficacy is a pathway through which coping is enabled. Limitations, future research directions, and clinical implications are discussed.

Inter-group Trust Among Different Caste Groups in Nepal

Presenter: Gagan Atreya
Advisor: Joanna Schug
College of William & Mary,
Psychology

Inter-group trust is seen as a major component in understanding relationships between different social groups in psychological research. However, much remains unknown about the inter-group relations of Eastern populations. Specifically in the case of Nepal, very little is known about the inter-group dynamics that exist between the hierarchical caste groups that are the basis of Nepali society. Given the fact that animosity and lack of trust between the various ethnic groups has been a major reason why Nepal has not been able to establish a constitution since the removal of monarchy in 2008, we believe that investigating trust between the various ethnic groups of Nepal is especially relevant right now. Since a Federal Republic of Nepal was established in 2008, a principal disagreement among the elected Constitutional Assembly, who had been tasked with drafting a new constitution, has been the issue of equitable distribution of power among the various ethnic groups. While the many ethnic groups or "janajatis" demand greater representation, even asking for their own respective states based on their ethnicity, the Brahmins and Chettris who have historically enjoyed immense legislative and administrative power largely disagree with the idea of ethnic federalism, arguing that it leads to division and infighting. This study aims to measure trust between the different caste groups in Nepal with the help of a simple economic "trust game", a technique that has previously been used in social/psychological research to assess levels of trust between different social groups.

Does Strategic Management of Self-Regulatory Resources Prevent Weight Gain in Undergraduates? A Prospective Study

Presenter: Emma Bennett
Co-Author: M. Feeney
Advisor: Niels Christensen
Radford University,
Psychology

Rising levels of BMI with age have become a prevalent health risk with an estimated 35.7% of adults in the US being obese (Ogden et al., 2012). The present research investigated whether individual differences in “metaregulation” would predict changes in BMI in a sample of undergraduate students. Metaregulation is defined as strategies designed to circumvent over-reliance on a person’s self-regulatory resources (e.g., goal-setting, temptation avoidance, and formation of good habits). Since a person’s resources available to exert self-regulation are limited and deplete with use (Muraven & Baumeister, 2002), using metaregulation strategies should become protective factors for making efficient self-regulatory decisions throughout one’s daily life. Prior cross-sectional data from our lab indicated that endorsing metaregulatory strategies attenuated the relationship between age and BMI. That is, among “low metaregulators” older participants reported higher BMI than younger participants, however age was not a factor for the BMI of “high metaregulators.” The current study adds a prospective design with two timepoints of data collection (M = 83 days apart). At both timepoints participants had their BMI objectively measured and reported on metaregulatory strategies (e.g., “I develop a plan so that I know what to do when temptations arise”). Regression analyses revealed that endorsing more metaregulatory strategies was associated with lower weight gain, $b = -0.28$, $t(70) = 2.07$, $p = .04$. Low metaregulators gained an average of 0.86 BMI points, whereas high metaregulators only showed a 0.24 increase.

A Brief Neurometric Battery: EEG methods for the detection of age-related changes in brain function.

Presenter: Emily Cunningham
Advisor: Paul Kieffaber
College of William & Mary, Psychology

With the prevalence of Alzheimer's disease (AD) projected to increase by upwards of 40% over the next decade, the urgency surrounding development of reliable methods of early detection is intensifying. This urgency is amplified by the promise of "disease -modifying" drugs, whose success may depend upon beginning administration in the pre-symptomatic stages of AD. As a relatively cost-effective, flexible, and noninvasive means of assessing changes in brain activity, electroencephalography (EEG) holds promise in this area, and the primary aim of this research is to develop and evaluate a brief battery of EEG-based neurometric tests for use in the detection of subtle changes in sensory/perceptual function. While typical EEG-based designs focus on evaluation of single types of event-related brain potential (ERP), the current project takes a more comprehensive approach, in which recordings are made of electrophysiological responses to an array of auditory and visual stimuli designed to elicit a number of different types of ERP. Responses were obtained for younger (ages 18-24) and older (ages 60+) adults, with the goal of creating and identifying age-related differences in neurometric profiles for both groups. Results are anticipated to demonstrate not only the feasibility of generating profiles of distinct ERP responses using this battery of stimuli, but also the potential utility of these neurometrics and resulting profiles for identifying/classifying groups of individuals (e.g. those with AD, MCI, et al.). Future directions include testing this design in a sample of patients with AD and integration of this design with existing biometric tests.

Event-Related Brain Potentials Reveal Deficits in Emotion Recognition, Attention, and Memory Processes in Individuals with Psychometrically Defined Schizotypy

Presenter: Docia Demmin
Co-Authors: E. Willroth, P. Kieffaber, M. Hilimire
Advisor: Glenn Shean
College of William and Mary, Psychology

Deficits in cognitive functioning vary across the schizotypy continuum as a function of symptom severity. The purpose of this study is to investigate the generalizability of abnormalities in Event-Related Potentials (ERPs) that are evidenced in Schizophrenia to the more mild end of the schizotypy spectrum. A psychometrically defined schizotypy group was identified by scores in the 90th percentile on the Chapman Scales, with a control group corresponding to the 10th percentile. In Part I, ERPs will be compared for high and low groups during an emotion recognition task where participants categorize emotional expressions presented at varying intensities based on anger, disgust, fear, and sadness emotion response pairs. This unique test design reduces the cognitive load of the task and will allow for the discovery of more precise group differences. In Part II, ERPs will be recorded as participants respond to the presentation of a series of auditory tones and visual stimuli. We anticipate the schizotypy group will exhibit greater difficulty in identifying faces of fear and sadness at low intensities and potentially demonstrate abnormalities in P1, FcEP, EPN, or LPP ERP components, similar to those previously established in Schizophrenia. Results from Part II are expected to reveal deficits in attentional selection, sensory memory, inhibitory processes, and stimulus categorization illustrated by abnormalities in corresponding ERP components, as is demonstrated in Schizophrenia. Results may be suggestive that less pronounced, but similar ERP abnormalities may be indicative of schizotypy at the less extreme end of the spectrum, where symptoms are at attenuated levels.

Pain Perception and Perspective Taking in Spinal Cord Injury Patients

Presenter: Caitlin Duckett
Advisor: Jennifer Stevens
College of William & Mary,
Psychology

The mirror neuron system and the 8-12 Hz activity associated with it is implicated as a systematic response important for empathy. Previous research has demonstrated that this activity is suppressed when participants observe painful stimuli. Perspective taking, such as taking the perspective of a stranger, the self, or a close other has been shown to activate different areas of the brain in response to these same stimuli. The goal of the current investigation is to determine whether the mirror neuron system activity is modulated for spinal cord injury patients whose injuries have resulted in paraplegia when taking each of the three aforementioned perspectives. EEG recordings were conducted while participants observed painful images of the upper and lower extremities. It is hypothesized that the mirror neuron system activity response will be modulated for the spinal cord injury patients because they cannot feel pain in their lower extremities, but they should show the typical response for the upper extremities. This hypothesis stems from research on amputee patients who show cortical reorganization as a result of loss of limb, and we are interested in determining whether spinal cord injury patients show a similar reorganization. Results are considered within the context of empathy and its role in social evaluation.

Evil Witches or Gentle Practitioners? Examining Prejudice Toward Wiccans as a Function of Exposure to Texts and Religious Orientation

Presenter: Melissa Gomez
Advisor: W. Larry Ventis
College of William & Mary,
Psychology

Much of the research to date concerning religion and prejudice focuses on prejudice demonstrated toward other religions (i.e. Brambilla et. al, 2013; Johnson et. al, 2010). However, prejudice toward non-Abrahamic religions has not been broadly studied. Relationships between religious orientation and prejudice are also important to consider. The present study examines prejudice exhibited by Christians towards Wiccans. One hundred Christians will complete measures of religious orientation. Religious orientation, assessed by the *Religious Life Inventory* (Batson, Schoenrade & Ventis, 1993) describes how a person views religion, whether as a means to an end, an end in and of itself or as a quest. After completing the *Religious Life Inventory*, participants will then read passages describing Wicca either positively or negatively. They will also read 4 situations in which a Wiccan (W) and a Christian (C) interact as follows: W behaves positively toward C; W behaves negatively toward C; C behaves positively toward W; C behaves negatively toward W. After reading the situations, participant prejudice toward Wiccans will be measured. We expect that participants will rate the Christian in the situations more favorably than the Wiccan. We also expect participants who read the negative passage to exhibit more prejudice, and individuals who score higher on measures of the quest orientation to exhibit less prejudice. These findings not only impact the study of religion and prejudice, but also give insight into combating prejudice by increasing positive information about various religious groups.

Factors influencing Suicide among African American Adolescents

Presenter: Tiarra Green
Co-Authors: J. William, S. Nicholson
Advisor: Jonathan Livingston
North Carolina Central University, Psychology

Historically, African Americans teens and young adults have lower suicide rates than white teens, but in recent decades, the suicide rate for black youth has increased dramatically (Lee, 2009). African American adolescents have the highest risk for attempted and the highest rate of suicide and of any age group of African Americans. In addition, African American adolescent females are more likely than males to attempt suicide, whereas, African American males are more likely to complete suicide (American Association of Suicide, 2007). Studies suggest that depression may be particularly important for explaining self-injury and suicide attempts (Sanchez & Le, 2001). Moreover, lower levels of family cohesion, and adaptability, were also found to be linked to an increased rate for suicide attempt in African American adults, however, findings remain unclear if this is also the case with youth (Compton, Thompson, Kaslow, 2005). Given that suicide is the one of the top five causes of death and the rising prevalence of suicide in African American adolescent, there is a need to investigate the social aspects that influences suicidal behavior. Thus, this research will explore differences between perceived social support, depression, and self- concept amongst African American male and female adolescents. A cross-sectional design will be used; moreover (T-test) will be used to evaluate differences across gender. This study will provide mental health providers a thorough understanding of factors influencing suicide among African American Adolescents.

Fear Conditioning and Memory Intrusions

Presenter: Songhee Kang
Co-Author: R. Barnet
Advisor: Christopher Ball
College of William & Mary, Psychology

Repeated vivid flashbacks of a traumatic event are a major symptom of psychiatric disorders like post-traumatic stress disorder (PTSD). Previous research has focused on ways to mitigate the unpleasantness of these intrusive memories and to reduce their occurrence in such patients. However, repeated intrusive memories of non-traumatic events are common in non-clinical populations. If we assume that similar memory mechanisms are involved in the elicitation of these involuntary memories, then we can study these memory mechanisms in laboratory settings using non-clinical populations. Our study combines two such methodologies for the first time in one experiment: the fear conditioning methodology (behavioral) and the traumatic film methodology (cognitive). Short video clips involving driving and a car-motorcycle accident were used as the conditioning stimuli, and EMG amplitudes of startle potentials were used as the measures of conditionability in the first phase of the experiment. For 7 days following the fear conditioning phase, participants also recorded memory intrusions involving this event in a diary. After this phase of data collection, participants finally completed a measure of anxiety sensitivity (ASI-3) that predicts PTSD occurrence and symptom severity. We found that anxiety sensitivity correlated with fear conditioning variables (e.g., mean startle amplitude) and memory intrusion variables (e.g., frequency of occurrence). In addition, we also found correlations between fear conditioning variables and memory intrusion variables. This combination of two methodologies allows a more detailed examination of the interactions between associative learning and memory mechanisms that underlie memory intrusions in non-clinical and clinical populations.

Bullying and Being Bullied: Evaluation of Peer Status and Psychopathology Outcomes

Presenter: Caroline Kelsey
Advisor: Danielle Dallaire
College of William & Mary,
Psychology

Studies have shown, over half of elementary school children are exposed to some form of bullying each year (Olweus, 1993; Wang, Iannotti, & Nansel, 2009). Peer victimization can lead to serious negative outcomes including emotion dysregulation (McLaughlin, Hatzenbuehler, & Hilt, 2009), internalizing problems such as depression, anxiety, and low self-esteem (Hodges & Perry, 1999), and peer rejection (e.g., Crick & bigbee, 1998). In the present study we examine the relationship between those variables across classifications of bullies and recipients of bullying ("victims"). Children (N=435) second through fifth grade (41.5% Male, 76.2% African American, M age= 9.10 years, range: 7-12) were recruited from low income area elementary schools, located in Newport News, Virginia . A multi-method, approach was taken. Based off of self-report measure students were categorized as, "Bullies", "Bully-Victims", "Victims", and "Neither". These groups were compared on: reports of levels of initiating and receiving prosocial behaviors(seen through lab tasks and self-report), peer-report of bully behavior, emotion regulation strategies, and symptoms of depression and anxiety.Initial analyses show trend differences by factors of gender, age, and ethnicity. Structure equation modeling will be used to highlight the relationship between emotion regulation, bully-victim groupings, and developmental pathology symptoms.

Emotional multisensory integration in aging adults

Presenter: Jamie Klein
Advisor: Paul Kieffaber
College of William & Mary,
Psychology

Stimuli are perceived using multiple senses in the phenomenon of multisensory integration (MSI). The simultaneous perception of a visual stimulus and corresponding auditory stimulus can lead to faster and more accurate responses than either sense alone. Our knowledge of multisensory perception prompts interesting questions about emotional recognition and aging. Emotional recognition is essential to social communication and is facilitated by MSI, and research suggests that MSI may give aging adults a compensatory mechanism for sensory deficits which would otherwise make it difficult for them to engage in the emotional life of family and friends. The work on emotional recognition in aging has found mixed results, and corresponding neural explanations for multisensory processes have not been definitively established. This study used reaction time data and electroencephalography (EEG) to measure brain activity in order to determine whether participants would demonstrate the effects of MSI in a task of emotional recognition, and if these effects are enhanced in older adults. We found that neural components associated with MSI were moderated by participant age. Older adults displayed stronger gains from MSI than younger participants do. Additionally, participants benefited similarly from MSI in conditions where they focused on auditory or visual stimuli. These results suggest that emotional MSI is a mandatory process.

Interactions between cholinergic and noncholinergic basal forebrain neurons on attentional performance

Presenter: Christine Kozikowski
Advisor: Josh Burk
College of William & Mary,
Psychology

Numerous studies have provided evidence that basal forebrain corticopetal cholinergic neurons are critical for normal attentional performance. However, the role of noncholinergic basal forebrain neurons in attention has not been well-characterized. Moreover, evidence regarding interactions between cholinergic and noncholinergic basal forebrain neurons remains scarce. In the present experiment, rats were trained in a two-lever sustained attention task that required discrimination of brief, variable duration visual signals from trials when no signal was presented. After reaching criterion performance, rats then received infusions of the immunotoxin, GAT1-saporin, or saline into the basal forebrain. Task performance was re-established following recovery from surgery and then rats received systemic administration of the muscarinic receptor antagonist, scopolamine (0, 0.05, 0.20 mg/kg, ip). Scopolamine administration did not differentially affect lesioned and sham-lesioned animals for any aspect of task performance. However, lesioned animals did exhibit an elevation in the omission rate during injection sessions compared to sham-lesioned animals. The present findings suggest that the loss of basal forebrain noncholinergic neurons may leave animals more vulnerable to stress. These results have implications for conditions in which basal forebrain noncholinergic neurons are known to change, such as during aging.

Effects of Mental Practice and Physical Practice On Physical Performance with Drummers

Presenter: Nicole Lippman
Advisor: Richard O'Brien
Hofstra University,
Psychology

In this study, the relative effectiveness of mental practice and physical practice in improving drum performance was examined. Subjects were 30 hobbyist and percussion major drummers from NY. Subjects completed the Vividness of Movement Imagery Questionnaire (VMIQ) and were assigned from matched groups to one of three conditions:(1) physical practice, (2) mental practice and (3) mental practice combined with physical practice. Subjects were matched based on their baseline performance of an original piece which served as both the pre and post treatment performance measure. It was predicted that the greatest improvement in scores from pre to post test would be in the combined mental and physical practice group, followed by the physical practice group and then the mental practice group. It was further predicted that those subjects in both mental practice conditions who scored highest on the VMIQ, would show the greatest improvement in performance scores. Two 3 x 3 repeated measures ANOVAs using number of beats played correctly and number of measures played correctly, revealed statistically significant improvement over time for all subjects. There was a significant effect of practice type on the difference scores between the number of beats played correctly at baseline and the number of beats played correctly during the first post-test. Post hoc comparisons revealed that subjects in the physical practice condition improved more than the subjects in the mental practice condition and those in the mental and physical practice combined condition from baseline to the first posttest for number of beats played correctly.

Adding the patient's voice to our understanding of collaborative goal setting: How do patients with diabetes define collaborative goal setting?

Presenter: Heather Morris
Co-Author: K. Carlyle
Advisor: Jennifer Elston Lafata
Virginia Commonwealth University,
Social and Behavioral Health

Introduction: Collaborative goal setting is recognized as a critical component of high quality diabetes care as a method of improving patient health outcomes. However, we have a limited understanding of how patients define this process. Design: Focus groups stratified by clinical control were conducted with 19 individuals across four groups. A semi-structured focus group guide was used to explore patient perceptions of collaborative goal setting and what needed to happen for a goal to be considered collaborative. Focus groups were transcribed and then coded using thematic analysis. Results: Patient definitions of collaborative goal setting occurred in two phases: (1) goal discussion and (2) support for goal achievement. Goal discussion included four components: listen and learn from each other, share ideas, take time to care, and articulate a measurable objective. After setting a goal, support for goal achievement was needed to successfully make progress. While patients want to have an active role in goal discussions, they also want the physician to set the specific target level. Limitations: Eligible participants were limited to those receiving care from Virginia Commonwealth University Health System limiting the sample size and generalizability of findings. Conclusions: Patient definitions of collaborative goal setting differ from measures currently in use. A new measure is needed to accurately measure patient reports of collaborative goal setting within the clinical setting.

An examination of the daily relationships between prayer and well-being

Presenter: David Newman
Co-Authors: T. Thrash, J. Schug
Advisor: John Nezlek
College of William & Mary,
Psychology

Most research on the relationship between prayer and well-being has relied on cross-sectional designs in which individuals provide one measure describing how they pray and one describing their well-being. Although useful, such studies have yielded mixed findings (Masters & Spielmans, 2007). To address the shortcomings in previous research, we used an intensive repeated measures design to examine within-person relationships between daily prayer and daily well-being. 130 participants completed questionnaires at the end of each day for 14 consecutive days. Based on McKinney and McKinney's (1999) taxonomy of prayer types (supplication, thanksgiving, confession, and adoration), participants described how much they prayed each day. They also provided measures of daily life satisfaction and daily affect. Largely in line with our predictions, results at the within-persons level showed that three of the four prayer types were significantly related to well-being. Daily prayers of thanksgiving were positively related to daily life satisfaction and daily increases in positive affect relative to negative affect, whereas daily prayers of supplication and confession were negatively related to daily life satisfaction and daily positive affect relative to negative affect. As this study is the first to measure daily forms of prayer and well-being as part of a repeated-measures diary study, the findings enrich our understanding of the daily nature of prayer.

**Black Children:
Marginalized and Misunderstood**

Presenter: Sheronda Nicholson
Co-Authors: J. Williams, T. Green
Advisor: Jonathan Livingston
North Carolina Central University, Psychology

Underperformance in school and increased expulsion and suspension rates among African American children have been an issue of continued concern for educators and social and behavior scientist. Although a number of intervention have been developed to address the school failures and poor academic achievement, the differences in achievement continue to exist. Given the challenges many kids face throughout their life span there is need to address the theoretical positions that undergird the research on black children. The purpose of this study is to address the idea that western theories that have been introduced for growth and development may not be applicable to the development of African American children. The two specific theories that will be presented to argue this position will be the theory of psychosexual development by Sigmund Freud and the cognitive-stage theory by Jean Piaget. In contrast, theories of five Africentric theorist will be presented to argue the position that African American children develop differently thus, traditional theories of western psychologists are not apropos in explaining black child development. The primary question is; can the theories of western psychologist be used to explain how African Americans learn and develop? Moreover, do the theories of the Africentric theories differ from those of western psychologist? Theories of both western and Africentric theorist will be examined in theoretical and archival design. This study is being conducted to investigate the argument that Africentric theorists have a better description of development in relation to black children.

**Race is not Black or White:
Racial Categorizations and the Mixed Race Option**

Presenter: Gandalf Nicolas
Advisor: Cheryl Dickter
College of William & Mary, Psychology

Social categorization is an automatic and uncontrollable part of our perception of others. But how do we deal with individuals that do not seem to fit clearly into one category or another? Racial ambiguity usually leads to ingroup over-exclusion biases, and thus to the assignment of minority labels to racially ambiguous faces, a phenomenon known as hypodescent. However, little is known about the effects of including “mixed race” labels as a plausible alternative to the traditional dichotomous options (e.g., White vs. Black) in racial categorization tasks. Furthermore, the relationship between Mixed Race categorizations and the human need for meaning and structure has not received widespread attention. This study explores the implications of the use of mixed race labels on the categorization of racially ambiguous individuals, as well as the relationship between alternative racial categories and meaning maintenance strategies. We expect that the inclusion of Mixed Race labels will provide an alternative to hypodescent, causing the asymmetry between the assignment of majority and minority labels to racially ambiguous faces to partially disappear. Additionally, we expect that this movement away from hypodescent will only occur when doing so does not conflict with meaning maintenance motivations.

The Relation of Tears to Affect and Personality

Presenter: Victoria Oleynick
Co-Author: E. Moldovan
Advisor: Todd Thrash
College of William & Mary,
Psychology

A simple act of kindness, a poignant film, or even a funny joke can bring an individual to tears. Although tearing up (lachrymation) is a common phenomenon in adults, researchers have yet to define precisely which affective states are associated with tearing up. The primary aim of this study is to map the location (and range of locations) of tearing up within the affect circumplex, a model of affect in which affective states are distributed around a circle defined by underlying valence and arousal dimensions. A secondary aim of this study is to identify basic trait dimensions that are associated with tearing up. A sample of 150 participants will watch a diverse set of 14 emotionally evocative film clips and report on their affect and lachrymation in response to each film clip. We will then characterize the range of affective states that are associated with tearing up at both between-person and within-person levels of analysis. In addition, we will identify individual difference variables (e.g. Big 5 traits, mindfulness, and implicit motives) that predict overall levels of tearing up, as well as interactions between personality variables and film contents. In doing so, we begin to answer complex questions about why adults cry in response to certain emotionally evocative stimuli.

Childhood Maltreatment, Poly-victimization, Psychological Distress in College Females

Presenter: Brianna Pomeroy
Co-Authors: L. Wagner, A. Roccaforte
Advisor: Ann Elliot
Radford University,
Psychology

With a sample of approximately 350 undergraduate females, the question examined in this study concerns the relationship between poly-victimization (i.e., high cumulative levels of victimization) and the 6 different categories of victimization measured by Finkelhor et al.'s (2005) *Juvenile Victimization Questionnaire* (JVQ). This correlational study uses hierarchical regression to first examine the proportion of variance in psychological distress that is accounted for by property crime, physical assault, peer/sibling, witnessed/indirect, sexual victimization, child maltreatment and poly-victimization. Measures of psychological distress include the Symptom Checklist 90-R and the Trauma Symptoms Inventory-2. Consistent with studies conducted by Finkelhor (2007) with child participants, the current study with female college participants examines whether poly-victimization contributes any unique variance, beyond that accounted for by each of the six individual categories. A first set of regression analyses revealed that poly-victimization is a significant predictor of psychological distress, beyond the proportion of distress predicted by any of the six categories of childhood victimization alone. A second set of regression analyses revealed that the categories of childhood victimization predicted very little of scores for psychological distress beyond that predicted by poly-victimization. These preliminary results are consistent with Finkelhor's studies with children and emphasize that studies which examine only one category of victimization in isolation (such as sexual abuse), rather than multiple categories simultaneously (such as the six categories assessed by the JVQ), may lead to overly simplistic and misleading conclusions about the impact of victimization on psychological distress.

Identifying parts and wholes in real-world objects: An application of critical spacing

Presenter: Stephanie Roldan
Co-Authors: M. Liu, J. DeRoma IV
Advisor: Anthony Cate
Virginia Tech,
Psychology

This study assessed the relative importance of part/whole shape features and diagnostic parts in object recognition. Drawing on studies of crowding and minimum critical spacing (Martelli, Majaj, & Pelli, 2005), normalized photographs of real-world objects were presented at various distances in peripheral vision and the critical eccentricity for recognition was measured. Results revealed a continuous range of critical eccentricities that were not correlated with higher-order properties such as familiarity or visual complexity, suggesting a holistic/configural continuum. Although crowding indicates the amount of parts in an object, it is unclear what features define these parts or whether informative value is equal across component features. To address this question, a second experiment asked participants to identify the most diagnostic region of object images. Results showed that items with single diagnostic parts were identified among both holistic and parts-based objects. Across subjects, identified regions tended to be more consistent in objects that fell at the extreme ends of the distribution of critical eccentricities. This suggests that uniquely identifying features may exist in both holistically- and configurally-perceived objects. Overall, these findings implicate this visual crowding method as a valid and sensitive measure for detecting subtle differences in visual structure in complex, ecologically relevant stimuli, which can be used to further inform issues of diagnostic features as well as parts-based processing in object recognition.

Childhood Maltreatment, Poly-victimization, Psychological Distress in College Males

Presenter: Rachel Turk
Co-Authors: B. Nipper, M. Pomposini
Advisor: Ann Elliot
Radford University,
Psychology

This correlational study examines the relationships among poly-victimization (i.e., high cumulative levels of victimization), six aggregate categories of childhood victimization (property crime, physical assault, peer/sibling, witnessed/indirect, sexual, child maltreatment), and psychological distress in approximately 150 male undergraduate students attending a southeastern U.S. university. Using hierarchical regression, the first question addressed in this study concerns the relative contributions of poly-victimization and individual categories of childhood victimization in predicting psychological distress, as measured by the Symptom-Checklist-90-revised and the Trauma Symptom Inventory-2. Second, the study examines whether poly-victimization contributes any unique variance, beyond that accounted for by the combination of all six aggregate categories. Preliminary regression analyses revealed that a) poly-victimization accounts for a significant proportion of variability in scores for psychological distress, beyond that accounted for by any of the six categories of childhood victimization alone, and b) the categories of childhood victimization contribute little to no variability beyond that accounted for by poly-victimization. Findings emphasize the importance for clinicians and researchers to comprehensively assess multiple categories of childhood victimization and poly-victimization when evaluating a client's psychological adjustment.

Perceived Social Support as a Mediator between Depression and Post-Traumatic Cognitions

Presenter: Nicholas Vayer
Co-Author: A. Smith
Advisor: Russell Jones
Virginia Tech,
Psychology

In the wake of traumatic events, there is a clear empirical link between depression symptoms and negative posttraumatic cognitions (PTC) related to the vulnerability of the self, the dangerousness of the world, and the malevolence of others others. Additionally, perceived social support (PSS) has been shown as an important risk/protective factor among trauma survivors. With a sample of 311 students attending university and who have experienced a criterion A trauma, this study sought to understand relationships among depression, PTC, and PSS. Utilizing an indirect effects regression based model, a-priori hypotheses were tested that posed PSS as a mediator between depression severity and PTC. Following normality and assumption checks, analyses revealed an overall model that predicted 68% of the variance in PTC ($F[2, 308] = 134.57$, $p = .00$). Direct and indirect pathways supported study hypotheses. Specifically, direct effects analyses revealed (a) that depression directly, significantly, negatively predicted PSS ($\beta = -1.47$, $p = .00$) and (b) significant, direct effects of independent variables on PTC in hypothesized directions (PSS directly predicting PTC [$\beta = .39$, $p = .00$]; depression severity directly predicting PTC [$\beta = -.67$, $p = .00$]). The final, indirect effects analysis showed that depression severity indirectly predicted PTC through PSS ($\beta = 1.01$, $SE = .22$, 95% CI, LL [.6474] to UL [1.3849]). Theoretical, empirical, and clinical implications, as well as limitations are discussed.

The Influence of Parenting Styles on Self-efficacy, Academic Achievement, and Externalizing Behaviors among College Students

Presenter: Jetta Williams
Co-Authors: T. Green, S. Nicholson
Advisor: Jonathan Livingston
North Carolina Central University,
Psychology

Recent literature suggest that African American parents have strict disciplinary practices and are more likely to employ an authoritarian parenting style as opposed to white parents who have an assertive democratic approach and typically utilize authoritative parenting styles. Statistics seem to evident African American youths having higher academic difficulties and display more externalizing behaviors compared to their white counterparts. Externalizing behaviors common among college students include alcoholism, substance abuse, and risky sexual behaviors. Previous studies have emphasized the influences of parenting styles towards children and adolescents, yet they have neglected to examine the influences on young adults. The aim of this study is to investigate the differences between African American and Caucasian parenting styles and their influence on self-efficacy, academic achievement, and externalizing behaviors in college. This study will employ a cross-sectional design in which t-test will be run to investigate mean differences in self-efficacy, academic achievement, and externalizing behaviors between black and white college students. Anticipated results will shed light on long-term behavioral outcomes of various parenting styles.

Temporal Dynamics and Memory Effects of Self- and Situation-focused Reappraisal

Presenter: Emily Willroth
Advisor: Matthew Hilimire
College of William & Mary,
Psychology

Cognitive reappraisal has positive effects on memory when compared to other emotion regulation strategies, such as suppression. However, the memory effects of reappraisal compared to passive viewing, and the exact mechanisms by which reappraisal alters memory, remain unclear. This could be due to heterogeneity within the reappraisal family. Here, we explore this idea by comparing two common types of reappraisal: self- and situation-focused. Participants will be instructed in the use of these regulation strategies before being directed to employ them in a regulation task. They will view 120 neutral and 120 negative images divided into three blocks (passive viewing, situation-focused, and self-focused reappraisal). Self-report indices of emotional experience and event-related potentials (ERPs) related to emotion regulation, such as the late-positive potential (LPP), will be measured to assess the affective consequences and neural temporal dynamics of these two strategies. A subsequent free recall task will assess the effects of these regulation strategies on memory of the emotional stimuli. We expect to find reductions in LPP amplitude and lower reports of emotional experience in both reappraisal conditions compared to passive viewing, indicating regulation success. We also hypothesize that self-focused reappraisal will occur earlier than situation-focused reappraisal. Furthermore, we hypothesize that situation-focused will result in better memory of emotional stimuli than self-focused reappraisal. The results will add to our understanding of the heterogeneity of the reappraisal family, and could indicate advantages to the use of one regulation strategy over the other.

Self-Esteem and Aggression Tactics

Presenter: Joy Wyckoff
Advisor: Lee Kirkpatrick
College of William & Mary,
Psychology

Although much theory and research has focused on the causes of “direct” aggression in response to provocation, the research literature on “indirect” aggression (gossip, rumor spreading, social exclusion, etc.) is sparse and fraught with conceptual and methodological problems (Underwood, Galen, & Paquette, 2002; Campbell, 1999). Our research is designed to address these deficiencies and examine the situational and individual-difference factors that lead people to sometimes employ indirect rather than direct aggression tactics, specifically self-esteem. In an online study, we found that the degree to which participants favored an indirect over a direct aggressive response to provocation was (1) greater among women than men; (2) inversely correlated with measures of competitive self-esteem (self-perceived superiority, mate value, and dominance); but (3) uncorrelated with social-inclusion or global self-esteem. In a second study, we manipulated participant self-perceived mate value and found that relative mate value predicted aggression tactics in women, but not men. This finding is in line with previous research that, unlike in women, dominance is a greater predictor than mate value in mating success in men (Gutierres, Kenrick & Partch, 1999). Study three is currently testing the effects of manipulating dominance on aggression tactics, and expect to find a manipulation effect in men but not women. We are currently collecting data from W&M undergraduates and we expect to replicate the same results. Implications and future directions will be discussed.

Kashmir: A Land of Neverending Conflict

Presenter: Menuka Ban
Advisor: John Gilmour
College of William & Mary,
Public Policy

Kashmir, which lies in the northwestern region of the Indian subcontinent, has been concealed under prolonged territorial dispute since 1947. India and Pakistan have been fighting for this piece of land over six decades. The Kashmir conflict is a derivative of the end of the British empire in the Indian Subcontinent. The withdrawal of the British empire from the region in 1947, introduced two independent countries- Pakistan and India in the world map. However, the dispute over "rightful ownership" of Kashmir, a land of Muslim population ruled by a Hindu ruler, has not yet resolved. The Kashmir conflict has drawn international attention in the recent decades due to three major reasons: the longevity of the conflict, the involvement of militant Islam in the conflict, and the growing nuclear power in the region. Over 60 proposals for conflict resolution had been forwarded in the past including referendum, full independence, joint control, partial sovereignty, and demilitarization. This research analyzes why those proposals could not solve the complexity of the conflict up to this date. The primary sources of the research are books, articles, journals, and government documents.

The Impact of Medicare Part D on Diabetes Drug Expenditures

Presenter: Ali Bonakdar
Advisor: Tiffany Green
Virginia Commonwealth University,
Healthcare Policy and Research

Medicare Part D was enacted as a part of the Medicare Modernization Act of 2003 and went into effect in 2006. The aim of Medicare Part D is to lower costs, increase efficiency, and increase access to prescription medications for elders and the disabled by subsidizing the costs of prescription drugs for Medicare beneficiaries. Little is known about Part D impact on racial disparities in diabetes drug expenditures. This study examines whether the implementation of Part D had an impact on racial disparities in diabetes drug expenditures among seniors. We use information on demographic characteristics, medical conditions, and prescribed medicines from the Medical Expenditure Panel Survey from 2001 to 2010. We merged these three components of the dataset across 10 years. The sample study is restricted to the eligible Medicare population, while controlling for education, marital status, poverty, and year. The empirical findings show that either minority (non-white) or Medicare Part D enactment significantly reduces the total out-of-pocket expenditures. Nevertheless, the results demonstrate that minorities' out of pocket expenditures insignificantly increase after 2006. On the other hand, the results illustrate that Medicare expenditures insignificantly decrease for minorities and significantly increases after 2006. However, the results show that part D insignificantly increases the total amount paid by Medicare for minority after 2006. This study shows that Medicare Part D did not significantly reduce out -of-pocket expenditures for diabetes drug among non-white seniors.

Local Government Decision Making and Funding Decisions to Non-profit Organizations

Presenter: Stephanie Davis
Advisor: Richard Huff
Virginia Commonwealth University,
Government and Public Affairs

Given the economic realities of local governments, many are seeking different methods of delivery of services through private and non-profit entities funding relationships. Some of the concerns regarding such funding relationships include the perceived lack of control, accountability and transparency associated with the delivery of governmental services by non-governmental entities. One method of achieving better accountability is through decision making conducted within a "network governance framework." Network governance theory describes a decision making framework which incorporates both public and nonprofit actors who work through negotiation to achieve a public purpose. This paper will examine local government relationships with non-profits to determine the extent to which funding decisions were made in the context of network governance and if so, whether those relationships achieved a higher level of accountability and transparency. The study will be a quantitative study of thirty Virginia municipalities. The data will be drawn through a survey and sample of fifteen cities and fifteen counties chosen by population. The survey will ask key questions to determine the extent to which the decision making process was conducted under a network governance framework and assess the strength of the characteristics of accountability and transparency. The study results will demonstrate the extent to which decision making with the characteristics of network governance results in higher levels of accountability and transparency. The impact of this study is to provide practitioners with a model of decision making that will enhance their ability to provide governmental services through non-profit organizations while ensuring the accountability of the public's tax dollars.

How Venison Consumption Contributes to Sustainability

Presenter: Patrick Hauer
Advisor: Kathryn Hauer
College of Charleston,
Business

Deer Friends is a non-profit organization designed to raise awareness about the social and environmental benefits of participating in ethical hunting, reducing hunger, and eating local foods. Our research includes 1) the health and environmental benefits of deer-hunting, 2) a focus on reducing hunger with the specific intent of providing a less-expensive, lean protein source, and 3) the health value of venison consumption in-home and at restaurants. We ask "Given the fact that venison is a healthy, available source of protein that couples exercise and entertainment, how can we connect hunters to venison distribution sources and potential consumers in an economical, legal, sustainability-focused manner?" Deer Friends concentrates on deer populations specifically in South Carolina but expects to expand to other states with high or invasive deer populations and extended hunting seasons. Statistics and research on hunter behavior, venison consumption, current laws on venison sale and distribution, the popularity of local meat sources in upscale restaurant menus, protein needs of those in poverty, and the controversy over commercial deer hunting inform our presentation.

An inquiry of residential solar photovoltaic deployment in the United States: cost-efficient state-level policy, or circumstance?

Presenter: Gilbert Michaud
Advisor: Damian Pitt
Virginia Commonwealth University,
Public Policy and Administration

State-level policies to incent residential solar photovoltaics (PV) have been around for nearly two decades. Considering the history of energy generation/ distribution in the United States, however, solar and renewable energies remain in their relative infancy. Nonetheless, the implementation and use of state-level policies used to support the development of solar PV is not uniform. For instance, while numerous states have interconnection / net metering laws and Renewable Portfolio Standards (RPS), their lucrativeness and ramifications vary greatly. A few states have none of these mentioned policies whatsoever. It is of interest to examine, therefore, the differences in state-level solar policy due to their variations, and to determine which strategies and practices are most compelling. Rather than investigating the forms of governmental subsidies to lessen costs of system installation, this analysis will focus on market opening and cost-efficient state-level policy. Non-policy elements such as income, educational attainment, and solar insolation also make their way into this exploration because they too, may influence domiciliary PV deployment. Thus, the study's objective is to examine whether policies to encourage residential solar PV deployment are achieving their intention, or if PV deployment remains more largely a function of income, education, and availability of sun energy resources. In other words, is residential solar PV deployment in the U.S. more contingent upon cost-efficient state-level policy, or circumstance? The inquiry will use a multiple regression analysis with data from the year 2012 to demonstrate the underlying conjecture that sophisticated state-level policies most heavily influence residential solar PV deployment.

An Economic Framework for Right-Sizing the F-35 Joint Strike Fighter Aircraft Program

Presenter: Kevin Rasmussen
Advisors: John Gilmour and Nick Sanders
College of William & Mary,
Public Policy

The Department of Defense's (DoD) F-35 Joint Strike Fighter aircraft program is a $392B program to replace the aging Cold War era aircraft flown by the U.S. Air Force, Navy, and Marines. Over the next 10-15 years, DoD plans to buy 2,443 of the aircraft and 500 more are on order by other nations.
Questions:
(1) After ten years of war in the Mideast, is this program appropriately sized for the future security requirements of the nation ?
(2) What is the socially efficient level of spending that should be spent on the program ?
Question 2 is an alternative to the DoD methodology used since WWII which determines the resources required to defeat anticipated future threats and support the U.S. National Security Strategy. Over the last 30 years, military spending during recapitalization years to replace worn out equipment has a mean of 5.6% of GDP. However, current military spending is only 4.3% of GDP and entitlements, servicing the debt, and health care spending is projected to rise. Additionally, during times of peace, U.S. military spending typically decreases to a mean of 3.6% of GDP. This research project will examine these difficult questions using open source data and apply the theories and practice from William & Mary's Public Policy courses in economics, budget policy, and benefit-cost analysis. Identification of future analysis requirements, fiscal constraints, and the measures and metrics to answer these questions will be presented.

Exploring Social Conservatism as a predictor of attitudes toward immigrants and immigration

Presenter: Grant Rissler
Advisor: Saltanat Liebert
Virginia Commonwealth University,
Public Policy and Administration

Immigration policy is one of the recurring high intensity public policy issues in the United States and other developed countries. The deeply felt divisions and conflicting interest groups are often mirrored in public surveys. These surveys are a rich area for analysis with implications for understanding what drives shifts in immigration policy. Prior empirical analyses of survey data provide limited consensus regarding factors that predict pro- or anti-immigrant and immigration policy preferences. Some researchers operate from economic competition models while others stress psycho-social factors. This paper puts forth a theoretical argument, based on Moral Foundations Theory, for social conservatism as a likely predictor of immigration policy preferences. The hypothesis, that increased levels of social conservatism will result in decreased support for ongoing immigration flows, is then tested via regression analysis of data from the Pew Research Center's 2002 American Values Survey. Controlling for factors such as age, sex, race/ethnicity, education levels, income, party affiliation, employment status and religiosity, the results indicate that social conservatism is a statistically significant predictor of immigration policy preferences. The results caution against a purely economic model of analysis when seeking to understand what drives attitudes toward immigrants and immigration. The paper concludes with suggestions for continued research.

The Role of Race in United States Asylum Laws, Policies, and Practices: Oppression of Our Most Vulnerable Immigrant Population

Presenter: Mona Siddiqui
Advisor: Saltanat Liebert
Virginia Commonwealth University,
Public Policy and Administration

Asylum seekers, one of the most vulnerable groups in the world, encounter many barriers in navigating the complex system of asylum laws and policies in the United States. Research on the asylum system consistently reveals vast disparities in successful asylum grants by asylum officers and immigrations judges in United States Citizenship and Immigration Services. This study utilizes critical race theory to examine asylum laws, policies, and practice in the United States. Critical race theory recognizes that race is a socially constructed concept, and that racism is pervasive in American society, despite the significant impact of the Civil Rights movement. This study first assesses the racialization of immigrants throughout American history. Second, this study evaluates asylum laws and policies that restrict and limit the civil and procedural rights of asylum seekers, thereby establishing barriers that impede socially just case outcomes. In addition, this study investigates the role of microaggression in asylum officers' and immigration judges' adjudication of asylum cases, through the subtle, ambiguous, and unintentional manifestations of innate racial bias. This author contends that asylum laws and policies that do not privilege human and civil rights are more likely to result in the racial subordination of asylum seekers, and structurally sustain institutionalized racism. Moreover, asylum adjudication practices that are not tailored to minimize innate racial bias of asylum officers and immigration judges are more likely to result in disparate case outcomes for asylum seekers.

Medicaid disenrollment and racial disparities in access to care

Presenter: Wafa Tarazi
Advisor: Lindsay Sabik
Virginia Commonwealth University,
Healthcare Policy and Research

Tennessee's Medicaid program experienced a dramatic decrease in eligibility among adult enrollees after implementing a new benefit policy in response to the Deficit Reduction Act of 2005. Despite the fact that this was the largest disenrollment in the history of Medicaid, little is known about the effects of this policy change. We assess the effects of this policy on access to preventive services among low-income women, and low-income black women in particular. We compare those who lived in Tennessee with a similar group, who lived in neighboring states but did not experience Medicaid disenrollment. For this purpose, we use data from the Behavioral Risk Factor Surveillance System (BRFSS) from 2003-2009. The BRFSS is a nationally representative survey that collects information on self-reported preventive health practices and risk behaviors. We estimate a differences-in-differences-in-differences model and calculate the changes in access to a personal doctor and inability to obtain care due to cost. Results suggest that there were reductions in probabilities of access to care among low-income black women who lived in Tennessee compared to those who lived in the neighboring states. While many states are expanding Medicaid eligibility under the Affordable Care Act, some states may opt to reduce eligibility once full federal funding expires. This study provides relevant evidence on the potential impact of Medicaid disenrollment on disparities in access to care in states that may consider future changes to Medicaid eligibility.

Wetlands Oversight in Virginia: A Resource Capability Analysis

Presenter: Andrea Taylor
Co-Authors: J. Cooper, J. Drabik
Advisor: Sarah Stafford
College of William & Mary,
Public Policy

In 1972, the Commonwealth of Virginia enacted the Tidal Wetlands Act, establishing a no-net loss policy for tidal wetlands. The Act provides for localities to undertake primary permitting responsibility if they so choose, with oversight from the Virginia Marine Resources Commission (VMRC). Since then, Virginia has experienced significant loss of tidal wetlands. In 2012, the Virginia Institute of Marine Science (VIMS) issued the Regulatory Fidelity Report identifying numerous problems coming out of the current regulatory scheme. Our project sought to understand why this method of oversight has not been successful, with particular emphasis on the budgetary capabilities of the institutions at issue. We also examined various possible solutions to the current problem. This analysis was accomplished through careful examination of the available data from each of the 35 wetlands boards in Virginia, as well as VMRC. We surveyed the information and discovered significant variation across localities in how the boards functioned, the funding mechanism for each, and the transparency of the locality. We discovered that many localities lacked transparency regarding the funding of their wetlands board, and that for those boards for which information was available, the boards were actually spending less than they had been allocated for their work. Our state budgetary analysis examined trends in VMRC funding over ten years and compared those with an analogous program within the Department of Environmental Quality, which regulates non-tidal wetlands.

Understanding an Epidemic: Analyzing Obesity, Food Stamps, Poverty, and Unemployment in the U.S.

Presenter: Emily Wavering
Advisor: Paul Manna
College of William & Mary,
Public Policy

Obesity is a significant public health concern in the United States, and much of the rhetoric about obesity centers on the quality of the standard American diet. At the same time, a portion of low-income citizens relies on benefits from the Supplemental Nutrition Assistance Program (SNAP), a federal voucher program, for their food purchases. Concerns about the quality of food purchased with SNAP benefits, and the potential contribution of SNAP purchases to the obesity epidemic have been consistently raised by health groups seeking to reform the program. This project seeks to answer the questions: are there significant relationships between the obesity rate and the SNAP participation rate, the unemployment rate and/or the individual poverty rate on the state level? If so, what are the natures of these relationships, what policy implications can be drawn from the analyses, and what further research should be done to more fully understand these relationships? The main tool used to answer these questions is a series of bivariate regressions that position the obesity rate as a variable dependent on SNAP participation, the unemployment rate, and the individual poverty rate. Ultimately, this project finds significant positive relationships between obesity and SNAP participation, and obesity and individual poverty. Substantively, these results discourage a drastic reduction in SNAP spending, and encourage the devotion of resources to SNAP sub-programs designed to encourage healthy lifestyle choices.

Economic Stress and Child Health: Evidence from the Great Recession in Scotland

Presenter: David Zirkle
Advisor: Tiffany Green
Virginia Commonwealth University,
Healthcare Policy and Research

Sociologists, epidemiologists, public health advocates, and health economists have long recognized the link between socioeconomic status and health. Researchers have also identified the link between chronic stress and individual health outcomes. This paper contributes to the existing literature on impact of stress on health and influence of macroeconomic fluctuations on individual health by using the recession of 2008-2010 to examine the impact of stress on child health outcomes. However, little of this research has focused on children or adequately controlled for unobservable differences in families. Growing Up in Scotland, an ongoing longitudinal study that follows children from birth to age ten is used in combination with data on local economic conditions. Despite being insulated from the loss of access to care by the United Kingdom's National Healthcare System, the data indicates that children in the lowest income quartile are adversely impacted by the stress induced from local economic conditions. Preliminary results indicate that a 1% increase in the regional unemployment rate raises the probability of a poor health report by 2%. This result suggests even absent a parental job loss or access to health care, children were still harmed by the recession.

Index of Presenters

WM ARTS&SCIENCES

Index of Presenters

ARTS & SCIENCES

Index of Presenters

WM ARTS & SCIENCES