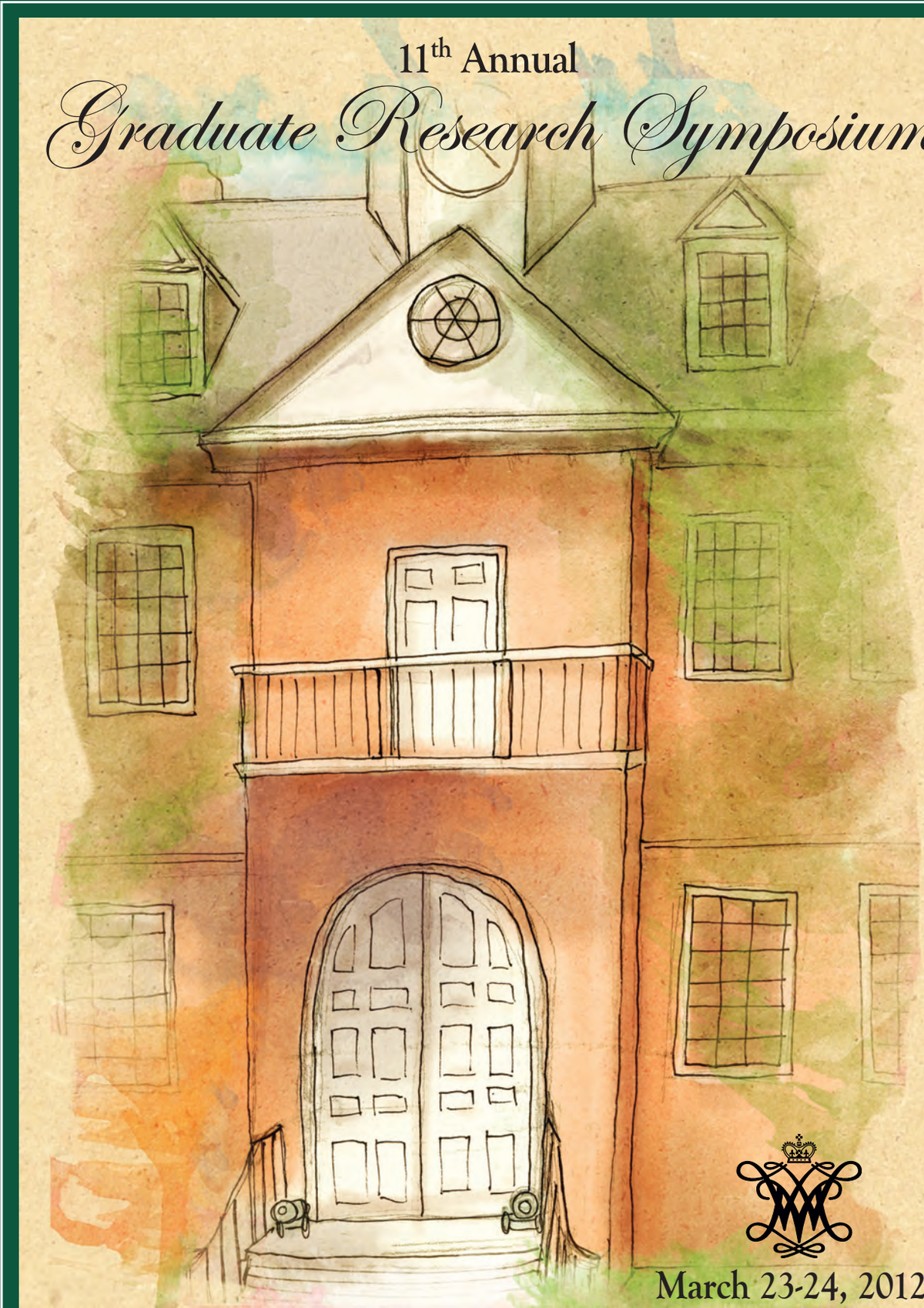
11th Annual

Graduate Research Symposium



March 23-24, 2012

The College of William & Mary, Sadler Center

Williamsburg, Virginia

Schedule at a Glance

Friday, March 23, 2012 -- 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, James Room, York Room and Colony Room*
9:45 am - 10:45 am	Concurrent Sessions *Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*
11:00 am - 12:00 pm	Poster Presentations with Q&A *Second Floor Lobby*
12:00 pm - 1:00 pm	Luncheon & Welcoming Remarks *Chesapeake A*
1:00 pm - 2:00 pm	Concurrent Sessions *Tidewater A, Tidewater B, Chesapeake C, James Room, York Room, Colony Room and Commonwealth Auditorium*
2:00 pm - 2:30 pm	Undergraduate and Graduate Student Coffee Break *with Graduate Studies Advisory Board Members* *Second Floor Lobby*
2:45 pm - 3:45 pm	Concurrent Sessions *Tidewater A, Tidewater B, Chesapeake C, James Room, York Room and Colony Room*
4:00 pm - 5:00 pm	William and Mary Awards for Excellence in Scholarship Presentations *Tidewater A*
5:00 pm - 7:00 pm	Evening Networking Reception *Chesapeake A*

Saturday, March 24, 2012 -- 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, and York 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*

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The 11th 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,

Welcome to the 11th Annual Graduate Research Symposium at The College of William & Mary! The Symposium, now in its eleventh year, retains its character as a student-run conference. For many graduate students it is their first step into the more formal world of academia. However, the Symposium is more than simply an opportunity to present research, it is an opportunity to present, receive constructive feedback from affiliated faculty and fellow graduate students, as well as to establish relationships between future peers in the profession. The Symposium is truly a forum for intellectual and professional development for junior scholars.

This year, as in years past, the Graduate Research Symposium will feature the work by current graduate students from William & Mary and eighteen visiting institutions. We hope that you will attend many of the more than 150 engaging presentations that will facilitate the interdisciplinary and inter-institutional exchange of ideas. This year our scholars come not only from Arts and Sciences at William & Mary, but also from American University, Clemson, Georgetown, George Mason, Howard, James Madison, The University of Pennsylvania, The University of Maryland - Baltimore, The University of North Carolina - Chapel Hill, Marymount University, Norfolk State, Old Dominion University, Radford, Temple, Towson, Virginia Tech, Virginia Commonwealth University, and West Virginia University. The diversity of our presenters not only reflects the geographical breadth of the symposium's reputation, but also the intellectual depth and breadth of the symposium.

Finally, the committee would especially 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 hope that you will find that this year's program continues the tradition of cultivating an environment of interdisciplinary intellectual exchange amongst our graduate peers and peer institutions. On behalf of the Symposium committee, and myself, we wish you the best of luck here and in all of your future graduate endeavors.

Warm Regards,

Alexandra Méav Jerome
Chair, American Studies

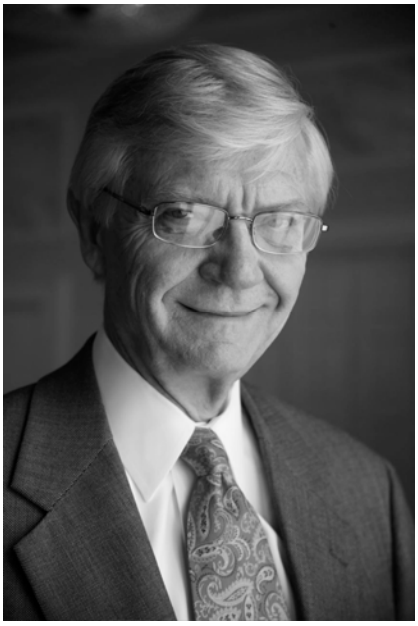
THE COLLEGE OF WILLIAM & MARY
OFFICE OF THE PRESIDENT
P.O. BOX 8795
WILLIAMSBURG, VIRGINIA 23187-8795
757/221-1693; Fax 757/221-1259

Dear Students and Friends,

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

The Symposium's theme – "Preparing Scholars, Presenting Excellence"– reflects William & Mary's mission in graduate education. Our students contribute seriously to human understanding on their way to advanced degrees. Then they keep doing 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 for the William & Mary community to enjoy the presentations.

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



Cordially,

W. Taylor Reveley, III
President

The Arts & Sciences Graduate Studies Advisory Board at the College of William & Mary is a proud sponsor of the 2012 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 2012 Graduate Research Symposium, initiating the Distinguished Thesis/ Dissertation Awards, the Carl J. Strikwerda Awards for Excellence and the 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, 2011-12

President: Cynthia Morton '77 BS Biology
Vice-President: Diane Alleva Cáceres '87 BA Economics, '89 MA Government
Past President: Larry McEnerney '76 BA English & History
Chair, Student Professional Development Committee: Robert Saunders '00 BS Physics
Chair, Development and Communications Committee: Bill Tropf '68 BS Physics
Chair, Nominations and Membership Committee: Patti Barry '63 BS Chemistry

Debbie Allison '77 BS Chemistry
John D. Burton '89 MA History, '96 PhD History
Kathryn Caggiano '90 BS Mathematics
D. Nelson Daniel '90 BS Geology & Economics
Ann L. Koch '83 BA Religion
Peter Martin '71 MS Physics, '72 PhD Physics
George Miller '67 BS Physics, '69 MS Physics, '72 PhD Physics
Brian J. Morra '78 BA History
Bradley (Lee) Roberts '70 MS Physics, '74 PhD Physics
Edwin Watson II '68 BA History, '70 MA History
Gail W. Wertz '66 BS Biology

2012 Graduate Research Symposium

Program Chair
Alexandra Méav Jerome, *American Studies*

Graduate Student Committee
Sarah Byrd, *Anthropology*
Megan Kobiela, *Biology*
Jennifer Ogborne, *Anthropology*
Shaun Richards, *American Studies*
Jennifer Thorne, *Computational Operations Research*
Christian Wilbers, *American Studies*
Sarah Zimmet, *Anthropology*

Office of Graduate Studies and Research
Dean S. Laurie Sanderson, *Graduate Studies*
Aundrea Baker
Cortney Cain
Wanda Carter
Betty Ann Jones
Chasity Roberts

Distinguished Speakers
President W. Taylor Reveley, III
Provost Michael R. Halleran
Vice Provost Dennis Manos
Dean Gene Tracy, *Arts and Sciences*

Session Chairs
Dr. Chris Abelt, *Chemistry*
Dr. Lizabeth Allison, *Biology*
Dr. David Armstrong, *Physics*
Dr. Seth Aubin, *Physics*
Dr. Elizabeth Barnes, *American Studies and English*
Dr. Kathleen Bragdon, *Anthropology*
Dr. Marley Brown, *Anthropology*
Dr. Josh Burk, *Psychology*
Dr. John Burton, *Graduate Studies Advisory Board*
Dr. Kathryn Caggiano, *Graduate Studies Advisory Board*
Dr. Cheryl L. Dickter, *Psychology*
Dr. Jonathan Glasser, *Anthropology*
Dr. Grey Gundaker, *Anthropology and American Studies*
Dr. Peter Kemper, *Computer Science*
Dr. Rex Kincaid, *Computational Operations Research*
Dr. Matthias Leu, *Biology*
Prof. Elaine McBeth, *Public Policy*
Mr. Larry McEnerney, *Graduate Studies Advisory Board*
Dr. Leisa Meyer, *History and American Studies*
Mr. Brian Morra, *Graduate Studies Advisory Board*
Dr. Cynthia Morton, *Graduate Studies Advisory Board*
Dr. Neil Norman, *Anthropology*
Dr. Mumtaz Qazilbash, *Physics*
Dr. Enrico Rossi, *Physics*
Dr. Brett Rushforth, *History*
Dr. Robert Saunders, *Graduate Studies Advisory Board*
Dr. Leah Shaw, *Applied Science*
Dr. Andreas Stathopoulous, *Computer Science*
Dr. Tamara Sonn, *Religious Studies*
Dr. John Swaddle, *Biology*
Dr. Bill Tropf, *Graduate Studies Advisory Board*
Dr. Janice Zeman, *Psychology*

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 and Social Sciences
Dr. John Burton, *Graduate Studies Advisory Board*
Ms. Ann Koch, *Graduate Studies Advisory Board*
Prof. Elaine McBeth, *Public Policy*
Dr. Charles McGovern, *American Studies*
Dr. Neil Norman, *Anthropology*
Dr. Ayfer Stump, *History*
Dr. Todd Thrash, *Psychology*

Natural and Computational Sciences
Dr. Randy Chambers, *Biology*
Mr. Nelson Daniel, *Graduate Studies Advisory Board*
Dr. Denys Poshyvanyk, *Computer Science*
Dr. Bill Tropf, *Graduate Studies Advisory Board*
Dr. Patricia Vahle, *Physics*

Mentoring Awards Humanities and Social Sciences
Dr. Marley Brown, *Anthropology*
Dr. Josh Burk, *Psychology*
Prof. Elaine McBeth, *Public Policy*
Dr. Charles McGovern, *American Studies*
Dr. Ayfer Stump, *History*

Mentoring Awards Natural and Computational Sciences
Dr. Shantá Hinton, *Biology*
Dr. Pieter Peers, *Computer Science*
Dr. Wouter Deconinck, *Physics*
Dr. Patricia Vahle, *Physics*

Sponsors
Berret's Seafood
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Special Thanks To:
Volunteers and Room Proctors
Aroma's of Williamsburg
Robin Cantor-Cooke
Rachel Follis, Creative Services
Qdoba Mexican Grill
Barbara Monteith
Barbara Pearsall, Student Photographer
Amelia Rooks, Creative Services
Sadler Center Operations & Technical Services
Office of Student Activities Scheduling Office
William & Mary Catering Service
William & Mary Information Technology
Williamsburg Hospitality House

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

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

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

MARKET ACCESS INTERNATIONAL, Inc. (www.marketaccessintl.com) 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

JENNA SIMPSON
The College of William and Mary, American Studies, Advisor: Dr. Arthur Knight
Selling a Shameful Past: Tourism and Living History in Salem, Massachusetts

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Please Join us Friday, March 23 from 4:00-5:00pm in Tidewater A as Corporate Award Winners Jenna Simpson and Matt Simons present their research

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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

MATT SIMONS
The College of William and Mary, Physics, Advisor: Dr. Irina Novikova
Bright squeezed light from a whispering-gallery mode resonator via second harmonic generation

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

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

EDWARD HUNT
American Studies, Advisor: Dr. Charles McGovern
Computer Penetration: Preparations for Cyber War

JULIE KITTEL
Psychology, Advisor: Dr. Cheryl Dickter
Early Attention to Racially Ambiguous Faces

William & Mary Honorable Mention

ALEXANDRA MÉAV JEROME
American Studies, Advisor: Dr. Maureen Fitzgerald
From Bridget's into Bin Laden's: A Comparative Study of how the 19th Century Irish became the 20th/21st Century Muslims in American Political Cartoons

Visiting Scholar Award for Excellence in the Humanities and Social Sciences

ERIN FARQUHAR
English Literature and Folklore, George Mason University, Advisor: Dr. Erika Lin
The Devil Beside You: Issues of Sense in "The Witch of Edmonton"

Visiting Scholar Honorable Mentions

JAMES HOWARD
Public Policy, University of Maryland, Baltimore County, Advisor: Dr. Scott Farrow
Measuring the Impacts of the National Flood Insurance Program

CHRISTA MARTENS
Health Behavior and Health Education, University of North Carolina, Chapel Hill
Advisor: Dr. Edwin Fisher
Una Red Social: Peer Support for Improved Diabetes Self-Management in Real del Monte, Mexico

BEN PLACHE
History, Virginia Commonwealth University, Advisor: Dr. Timothy Thurber
The Doughboys in Their Own Words: Reconstructing the Narrative of the Battle of St. Mihiel

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

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

YUDISTIRA VIRGUS
Physics, Advisor: Dr. Henry Krakauer
Many-body effects in cobalt adatoms absorbed on graphene

William & Mary Honorable Mentions

KATHLEEN MOORE
Computer Science, Advisor: Dr. Pieter Peers
The Effect of Translucency on Photometric Stereo

WEI WEI
Computer Science, Advisor: Dr. Qun Li
MobiShare: Flexible Privacy-Preserving Location Sharing in Mobile Online Social Networks

Visiting Scholar Award for Excellence in the Natural & Computational Sciences

SAMIUR ARIF
Computer Science, Old Dominion University, Advisor: Dr. Stephan Olariu
A Versatile Model for Stem Cell Growth

Visiting Scholar Honorable Mention

HEATHER M. STOWE
Animal and Veterinary Sciences, Clemson University, Advisor: Dr. Scott Pratt
Characterization of Porcine Argonaute-2

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

REBECCA SCHUMANN
Anthropology, MA, Advisor: Dr. Marley Brown
Law, Material Wealth and the Identity of the Williamsburg Area's Free Black Population in 1784 to 1815

MEGAN VICTOR
Anthropology, MA/PhD, Advisor: Dr. Neil Norman
Rogue Fishermen: Codfish, Ceramics, and Identity of the Piratical People on the Isles of Shoals: 1630-1775

Award for Excellence in the Natural and Computational Sciences

MORGAN NICCOLI
Biology, MS, Advisor: Dr. Matthias Leu
Using an Occupancy Model of a Neotropical Migrant Bird to Correlate Probability of Occurrence with Productivity

The College of William & Mary
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

ALEXANDRA MARTIN
Anthropology Department, PhD

JACKSON SASSER
American Studies Program, PhD

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

KEVIN LESLIE
Biology Department, MS

AJARA RAHMAN
Chemistry Department, MS

KELLY SUBRAMANIAN
Biology Department, MS

Recruiting / Mentoring Opportunities

APL
The Johns Hopkins University
APPLIED PHYSICS LABORATORY

A William & Mary alumnus and member of the Arts & Sciences Graduate Studies Advisory Board, Dr. Bill Tropf is available at the evening networking reception, Saturday poster session, and awards luncheon to speak with interested students (all degree levels) regarding employment and internship opportunities with the Johns Hopkins University Applied Physics Laboratory (http://www.jhuapl.edu/).

The Applied Physics Laboratory (APL) is a not-for-profit center for engineering, research and development. APL recruits and hires the best and the brightest from top colleges to work on more than 400 programs that protect our homeland and advance the nation's vision in research and space science, at an annual funding level of about $680M. APL is primarily looking for science, engineering, mathematics, and computer science graduates with bachelors, masters, or doctoral degrees.

SYMPOSIUM COFFEE BREAK

Friday, March 23
2:00-2:30pm
Sadler Center Lobby

Please join Graduate Studies Advisory Board members for coffee, dessert and an informal networking opportunity with Board members as well as current Arts & Sciences undergraduate and graduate students.

Friday Morning, March 23 Program Schedule

8:00 AM - 8:30 AM REGISTRATION (Second Floor Lobby)

8:30 AM - 9:30 AM CONCURRENT SESSIONS

Tidewater A	Tidewater B	James Room	York Room	Colony Room
Session Chair: *Dr. Leah Shaw*	**Session Chair:** *Dr. David Armstrong*	**Session Chair:** *Dr. Grey Gundaker*	**Session Chair:** *Dr. Brett Rushforth*	**Session Chair:** *Dr. Cheryl L. Dickter*
Eric Dieckman Applied Science *College of William & Mary*	**Qian Si** Physics *College of William & Mary*	**Sarah Zimmet** Anthropology *College of William & Mary*	**Sarah Thomas** History *College of William & Mary*	**Jamie Hershaw** Psychology *College of William & Mary*
Corey Miller Applied Science *College of William & Mary*	**Travis Horrom** Physics *College of William & Mary*	**Shea Winsett** Anthropology *College of William & Mary*	**Joshua Wilson** History *Old Dominion University*	**Antoinette Sabatino** Psychology *UNC-Chapel Hill*
Ilker Tunc Applied Science *College of William & Mary*	**Melissa Cummings** Physics *College of William & Mary*	*__Rebecca Schumann__ Anthropology *College of William & Mary*	**Meghan Holder** American Studies *College of William & Mary*	**Chris Martin** Psychology *College of William & Mary*
Shadrack Antwi Applied Science *College of William & Mary*		** indicates award winner*		

9:45 AM - 10:45 AM CONCURRENT SESSIONS

Tidewater A	Tidewater B	James Room	York Room	Chesapeake C	Colony Room
Session Chair: *Dr. Mumtaz Qazilbash*	**Session Chair:** *Prof. Elaine McBeth*	**Session Chair:** *Dr. Neil Norman*	**Session Chair:** *Dr. Elizabeth Barnes*	**Session Chair:** *Dr. Matthias Leu*	**Session Chair:** *Dr. Peter Kemper*
William Roach Applied Science *College of William & Mary*	**Andrea Schirokauer** Public Policy *Georgetown University*	**Ellen Chapman** Anthropology *College of William & Mary*	**Sarah Adams** American Studies *College of William & Mary*	**James Deemy** Environmental Studies *VCU*	*__Kathleen Moore__ Computer Science *College of William & Mary*
Kaida Yang Applied Science *College of William & Mary*	**Thomas Vargas-Castro** Public Policy *College of William & Mary*	**Jenna Carlson** Anthropology *College of William & Mary*	**Kathryn Bennett** American Studies *College of William & Mary*	**Stephen Via** Biology *VCU*	*__Samiur Arif__ Computer Science *Old Dominion University*
Douglas Beringer Physics *College of William & Mary*	*__James Howard__ Public Policy *Univ of Maryland-Baltimore*	**Tomeka Scales** Communication & Culture *Howard University*	**Janine Yorimoto** American Studies *College of William & Mary*	**Dan Ramos** Biology *College of William & Mary*	**Zhengrui Qin** Computer Science *College of William & Mary*
Lei Wang Physics *College of William & Mary*				**Julie Charbonnier** Biology *VCU*	

11:00 AM - 12:00 PM POSTER PRESENTATIONS (Second Floor Lobby)

1) S. Biradar (Materials Science) *Norfolk State University*	**5) Patrick Hammett** (Psychology) *College of William & Mary*	**9) Stephen Laws** (Chemistry) *College of William & Mary*	**13) Benjamin Rislow** (Physics) *College of William & Mary*	**17) Rebecca Wittenstein** (Public Policy) *College of William & Mary*
2) Katharine Donlon (Clinical Psychology) *Virginia Tech*	**6) Robert Isdell** (Biology) *College of William & Mary*	**10) Kevin Leslie** (Biology) *College of William & Mary*	**14) Lauren Rusnak** (Biology) *College of William & Mary*	**18) Peng Xu** (Physics) *College of William & Mary*
3) *Erin Farquhar (English Lit. & Folklore) *George Mason University*	**7) Katelyn Kinsley** (Biology) *Towson University*	**11) Cutter Lindbergh** (Psychology) *College of William & Mary*	**15) Jason Safko** (Chemistry) *College of William & Mary*	**19) Chelsie Young** (Psychology) *College of William & Mary*
4) Virupaxi Goornavar (Materials Science) *Norfolk State University*	**8) Jade LaDow** (Biology) *James Madison Univ*	**12) Jennifer Poon** (Psychology) *College of William & Mary*	**16) Gregory Shuler** (Psychology) *College of William & Mary*	

12:00 PM - 1:00 PM LUNCH (Chesapeake A)

Friday Afternoon, March 23 Program Schedule

1:00 PM - 2:00 PM CONCURRENT SESSIONS

Tidewater A	Tidewater B	James Room	York Room	Chesapeake C	Colony Room
Session Chair: *Dr. Rex Kincaid*	**Session Chair:** *Dr. Enrico Rossi*	**Session Chair:** *Dr. John Swaddle*	**Session Chair:** *Dr. Josh Burk*	**Session Chair:** *Dr. Christopher Del Negro*	**Session Chair:** *Dr. Chris Abelt*
Nan Zheng Computer Science *College of William & Mary*	**Ekaterina Mastropas** Physics *College of William & Mary*	**Kenton Buck** Biology *College of William & Mary*	***Julie Kittel** Psychology *College of William & Mary*	**Maria Cristina Picardo** Applied Science *College of William & Mary*	**Jessica Belton** Chemistry *College of William & Mary*
***Wei Wei** Computer Science *College of William & Mary*	**Zachary Brown** Physics *College of William & Mary*	**Megan Kobiela** Biology *College of William & Mary*	**Eric La Freniere** Writing and Rhetoric *James Madison Univ*	**Tara Raftery** Biological Sciences *Clemson University*	**Jacob Neal** Chemistry/Biochemistry *Univ of Maryland-Baltimore*
Fengyuan Xu Computer Science *College of William & Mary*	***Yudistira Virgus** Physics *College of William & Mary*	***Morgan Niccoli** Biology *College of William & Mary*	**Aimee Brasseur** *Technical & Scientific Communication* *James Madison Univ*	**Xueying Wang** Applied Science *College of William & Mary*	**Lee Speight** Chemistry *University of Pennsylvania*
Andrew Pyles Computer Science *College of William & Mary*		** indicates award winner*		**K. Weragalaarachchi** (Applied Science) *College of William & Mary*	

1:00 PM - 2:00 PM CONCURRENT SESSIONS CONTINUED
Commonwealth Auditorium

Session Chair: *Dr. Tamara Sonn*	***Alexandra Jerome** American Studies *College of William & Mary*	**Fatih Harpci** Religion *Temple University*	**Kit Crawford** History *American University*

2:00 PM - 2:30 PM COFFEE BREAK (Second Floor Lobby)

JOIN GRADUATE STUDIES ADVISORY BOARD MEMBERS FOR AN INFORMAL NETWORKING OPPORTUNITY

2:45 PM - 3:45 PM CONCURRENT SESSIONS

Tidewater A	Tidewater B	James Room	York Room	Chesapeake C	Colony Room
Session Chair: *Dr. Andreas Stathopoulous*	**Session Chair:** *Dr. Seth Aubin*	**Session Chair:** *Dr. Brett Rushforth*	**Session Chair:** *Dr. Marley Brown*	**Session Chair:** *Dr. Leisa Meyer*	**Session Chair:** *Dr. Janice Zeman*
Feng Yan Computer Science *College of William & Mary*	**Chen Chen** Physics *College of William & Mary*	**Jaclyn Spainhour** History *Old Dominion University*	**Sarah Chesney** Anthropology *College of William & Mary*	**Neeve Kelly** American Studies *College of William & Mary*	**Sydney Tafuri** Psychology *College of William & Mary*
Zhijia Zhao Computer Science *College of William & Mary*	**Austin Ziltz** Physics *College of William & Mary*	**Lindsay Keiter** History *College of William & Mary*	**Amanda Johnson** Anthropology *College of William & Mary*	**Christian Wilbers** American Studies *College of William & Mary*	**Victoria Marshall** Psychology *College of William & Mary*
Myles Baker Computational Operations Research *College of William & Mary*	**Megan Ivory** Physics *College of William & Mary*	**Shannon Goings** History *College of William & Mary*	**Andrew Beaupre** Anthropology *College of William & Mary*	**Shaun Richards** American Studies *College of William & Mary*	**Johanna Folk** Psychology *College of William & Mary*
Lei Lu Computer Science *College of William & Mary*	**Philip Roser** Physics & Astronomy *Clemson University*				

4:00 PM—5:00 PM William and Mary Awards for Excellence in Scholarship Presentations—Tidewater A
Moderator: Vice Provost for Research and Graduate/Professional Studies Dennis Manos

MATT SIMONS, PHYSICS "Bright squeezed light from a whispering-gallery mode resonator via second harmonic generation"

JENNA SIMPSON, AMERICAN STUDIES "Selling a Shameful Past: Tourism and Living History in Salem, Massachusetts"

5:00 PM - 6:00 PM EVENING NETWORKING RECEPTION (Chesapeake A)
JOIN GRADUATE STUDENTS, FACULTY AND GRADUATE STUDIES ADVISORY BOARD MEMBERS
Hors D'oeuvres and Refreshments will be served.

Saturday Morning, March 24 Program Schedule

8:00 AM - 8:30 AM REGISTRATION (Second Floor Lobby)

8:30 AM - 9:30 AM CONCURRENT SESSIONS

Tidewater A	Tidewater B	James Room	York Room	Chesapeake C (8:30-10:30)	Colony Room
Session Chair: *Dr. Cynthia Morton*	**Session Chair:** *Dr. Robert Saunders*	**Session Chair:** *Dr. Kathleen Bragdon*	**Session Chair:** *Mr. Brian Morra*	**Session Chair:** *Mr. Larry McEnerney and Dr. John Burton*	**Session Chair:** *Dr. Kathryn Caggiano*
Kelly Subramanian Biology *College of William & Mary*	**Juan Cornejo** Physics *College of William & Mary*	**Laura Buchanan** Anthropology *College of William & Mary*	**Xiao Wang** Applied Science *College of William & Mary*	**Jacob Ivey** History *West Virginia University*	**Yifan Zhang** Computer Science *College of William & Mary*
Amanda Say Genetics & Biochemistry *Clemson University*	**Joshua Magee** Physics *College of William & Mary*	***Megan Victor** Anthropology *College of William & Mary*	**Minzhen Cai** Applied Science *College of William & Mary*	***Edward Hunt** American Studies *College of William & Mary*	**Jennifer Thorne** Computational Operations Research *College of William & Mary*
Daniella Triebwasser Entomology, Soils, and Plant Sciences *Clemson University*	**Joshua Hoskins** Physics *College of William & Mary*	**Derek Miller** Anthropology *College of William & Mary*	**Yichun Fan** Applied Science *College of William & Mary*	**Kimberly Mann** American Studies *College of William & Mary*	**Samy El-Tawab** Computer Science *Old Dominion University*
		** indicates award winner*	**Xin Ma** Applied Science *College of William & Mary*	**Mark Dwinnells** Humanities *Marymount University*	

9:45 AM - 10:45 AM CONCURRENT SESSIONS

Tidewater A	Tidewater B	James Room	Chesapeake C (8:30-10:30 Continued)
Session Chair: *Dr. Lizabeth Allison*	**Session Chair:** *Dr. Bill Tropf*	**Session Chair:** *Dr. Jonathan Glasser*	
Serena Caplins Biology *VCU*	**Graham Giovanetti** Physics & Astronomy *UNC-Chapel Hill*	**Melissa Gray** History *College of William & Mary*	***Ben Plache** History *VCU*
Kari Messina Biology *College of William & Mary*	**Guangzhi Qu** Physics *College of William & Mary*	**Dessa Lightfoot** Anthropology *College of William & Mary*	**Casey Schmitt** History *College of William & Mary*
Poulomi Ray Biology *Clemson University*	**Joshua Devan** Physics *College of William & Mary*	**Jennifer Ogborne** Anthropology *College of William & Mary*	
Richa Koul Genetics and Biochemistry *Clemson University*	**Alena Gavrilenko** Physics *College of William & Mary*		

11:00 AM - 12:00 PM POSTER PRESENTATIONS (Second Floor Lobby)

1) Victoria Akins (Applied Science) *College of William & Mary*	**5) James Dowd** (Physics) *College of William & Mary*	**9) Tyler Huffman** (Physics) *College of William & Mary*	**13) Rachel Komosinski** (Biology) *VCU*	**17) Ester Sesmero** (Chemistry) *Univ of Maryland-Baltimore*
2) Tommy Byrd (Physics) *College of William & Mary*	**6) Maurice Fluitt** (Genetics) *Howard University*	**10) Angela Hutto** (Environmental Studies) *VCU*	**14) Elizabeth MacMurray** (Biology) *College of William & Mary*	**18) *Heather Stowe** (Veterinary Sciences) *Clemson University*
3) Kevin Cavanagh (Psychology) *College of William & Mary*	**7) Leah Gordon** (Health Behavior) *UNC-Chapel Hill*	**12) Zachary Jones** (Chemistry) *West Virginia University*	**15) *Christa Martens** (Health Behavior) *UNC-Chapel Hill*	**19) Kristin Zajo** (Psychology) *College of William & Mary*
4) Bobby DeMuro (Public Health) *UNC-Chapel Hill*	**8) Anna Harris** (Psychology) *College of William & Mary*	**12) Sarah Kerper** (Psychology) *Radford University*	**16) Ajara Rahman** (Chemistry) *College of William & Mary*	

12:00 PM - 1:30 PM LUNCHEON & AWARDS CEREMONY (Chesapeake A)

Dr. S. Laurie Sanderson, *Dean of Graduate Studies and Research, Arts & Sciences, College of William & Mary*
Dr. Gene Tracy, *Dean of Arts & Sciences, College of William & Mary*
Dr. Michael R. Halleran, *Provost of the College of William & Mary*
President W. Taylor Reveley, III, *President of the College of William & Mary*

Cheap Tricks: Beadle's Dime Handbook Series and Constructions of Cheapness

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

Describing an object, service, or person as cheap confers meaning that can range from the assessment of monetary worth to an indictment of immorality. The language of cheapness connects economic value with social legitimacy: while thrift has long been lauded as a noble quality and consumers revel in a good bargain, extreme frugality and obvious markers of low price are typically disparaged or considered suspect. Cheapness's vernacular not only allows us to organize and value material possessions; it provides orientation within the systems of order that construct the social and material world around us. One site where we can see cheap at play is in the series of inexpensive social manuals that New York's Beadle companies published from 1859 to 1880. At ten cents a piece, the handbooks sought to educate readers in etiquette, communication, grooming, sports, and games, largely middle-class arts and pastimes whose practice tended to demand some financial outlay while promising to ascribe social respectability. In this paper I explore how these bargain volumes, which preach genteel conspicuous consumption to a largely working-class readership, illustrate cheapness's competing values against later 19th century socioeconomic development and division. As the Beadle series reveals, the construction of cheapness and the language employed to disseminate it reflects more than mere price point or insult. Cheap is a site where money, morals, and manners converge.

"The Wages of War": Politics, Sensation, and Violence in the Pre-War *New York Ledger*

Presenter: Kathryn C. Bennett
Advisor: Elizabeth Barnes
College of William & Mary,
American Studies

Few periods in American history are as charged as the run-up to the Civil War. In this presentation I will explore how one popular story paper, the *New York Ledger*, endeavored to shape public discourse in order to advocate against war while simultaneously avoiding the appearance of bias (and the canceled subscriptions that might have accompanied it). In editorial columns, fiction, and poetry, the *Ledger* attempted to mediate memories of history to this end. The American Revolution is used to stress a set of shared values and a specific notion of American identity, while discussion of Napoleonic-era conflicts in Europe emphasize the destructiveness of war. Stories about the Mexican-American War and various conflicts on the American frontier suggest the nascent imperial project as an alternative to civil war. The *Ledger* never took a stand against slavery or succession prior to the shots at Fort Sumter, and repeatedly denied that the paper had a point of view at all. The treatment of martial subjects in the *Ledger*, however, was dialectical: literary tropes celebrate violence but a desperate pragmatism cautions against it and suggests the possibility of lasting trauma. This presentation will explore what it meant to be political in antebellum America and how historical memory collided with sensationalism in the fictionalization of violence on the eve of the Civil War.

Constraints and Augmentations of Militia Development in 17th Century Colonial Massachusetts

Presenter: Mark B. Dwinnells
Advisor: Patrick Mullins
Marymount University,
Humanities

The development of colonial regulations for militia existed in a cause-and-effect frame of reference. The statutes enacted in Massachusetts Bay reflect multiple causes and considerations for colonists to weigh before deciding on which requirement could be reasonably passed into law; this presentation seeks to draw out several salient facets of what economic development, inherited militia traditions, colonial militia organization, and tactical developments in Massachusetts Bay during the 17th century. In particular, the option of firearms weighed against the technological base to support them, the tactics the militia were expected to handle, and the prevalence of colonial warfare (declared or undeclared) resulted in general statutes placing the burden not on the colonial government but the colonists themselves to bear arms for one another and their own safety.

Strange Fruit: Images of African Americans in Advertising Cards and Postcards, 1860-1930

Presenter: Meghan B. Holder
Advisor: Susan Webster
College of William & Mary,
American Studies

"Strange Fruit: Images of African Americans in Advertising Cards and Postcards, 1860-1930" addresses two main questions: How is blackness visually represented in American advertising cards and postcards and why, in the cards' imagery, is the black body so frequently linked with food and agricultural products? My paper studies nineteenth- and early-twentieth century advertising cards and postcards as works of art, an approach that is equally useful as it is rare. The imagery that I analyze depicts African Americans as being from, part of, and sustained by the land. By rendering the black body as a sort of strange fruit itself, the images suggest that blacks were innately and justifiably linked to land and its labors. From the anxiety-riddled days of Reconstruction America emerged depictions of blacks as hybrid plant matter--as a human subspecies trapped within a liminal realm where watermelons, chickens and cotton were the only necessities. My work considers the imagery of advertising cards and postcards as visual texts that widely disseminated a very specific, racially charged agenda. By creating food-centric representations of the black body as half-human, always in pursuit-and production-of foodstuffs, and even as consumable products, whites strove to control and contain African Americans within a marginalized landscape of agricultural labor.

Computer Penetration: Preparations for Cyber War

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

By the mid 1970s, the defense establishment in the United States had developed the ability to break into the securest computer systems. Technical studies, scholarly articles, and newspaper reports all indicate that government analysts had created many of the tools and techniques used to crack a computer system's safeguards. The new line of research, described in the literature as "computer penetration," had developed as part of a much broader effort to assess the security of the nation's on-line, time-sharing computer systems. Indeed, trap doors and trojan horses had originally been theorized and developed as techniques for testing computer safeguards. Although security had always been the primary goal, these new penetration techniques had an offensive potential, one which had grown increasingly obvious by the end of the 1970s. More recent evidence, found in memoirs, testimonials, and newspaper reports, indicates that US intelligences agencies eventually began to employ computer penetration as an offensive weapon, with covert operations dating back to the early 1980s. While many scholars have focused their attention on the so-called computer hackers, very little has been written about the government's experts. In my talk, I will discuss some of the main players involved in the government's early efforts to research computer penetration, the approaches that they had adopted to develop their testing methods, and the eventual transition to offensive cyberwar.

From Bridget's into Bin Laden's: A Comparative Study of how the 19th Century Irish became the 20th/21st Century Muslims in American Political Cartoons

Presenter: Alexandra M. Jerome
Advisor: Maureen Fitzgerald
College of William & Mary,
American Studies

In the 19th century United States, Irish Catholic immigrants fleeing famine and feudalism found themselves not only the outskirts of American Protestant religion, culture, and politics, but also as ruthlessly parodied outsiders. The Irish were lampooned by political cartoonists across the country like Thomas Nast, who like his contemporaries, found the Popish Irish to be a threat to Protestant culture. Nearly a century later, the Irish immigrants, ensconced in the American middle class and political royalty, are replaced by Muslims, immigrating to the United States for many of the same reasons as the Irish and parodied in almost an identical fashion in contemporary cartoons. Muslims, according to popular Islamophobic political and social discourse represent a specific threat to the American (Protestant) way of life through their supposed desire to institute authoritarian religious rule, their allegiance to Allah and Muhammad above national governments and American citizenship, and their aspirations within the professional middle and upper middle class. The signifiers within cartoons have shifted from Irish Catholic to Muslim. Islam offers a limited number of religious signifiers, but there are commonalities in the use of religion and gender in the cartoons to parody, critique, and fear monger amongst Americans about Muslims and the Islamic World: veils are the new Bridget's and crescent moons have taken the place of the Papal mitre. Political cartoonists prey on the supposedly inherently violent, backward nature of Muslims in much the same way that earlier cartoonists preyed upon the tempers, intoxication, and bumpkin-like behaviors of the Irish.

Commodifying Orphans: Abortion, Adoption and Popular Culture

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

American popular and material culture of the late 1970s through the 1980s contains numerous references to adoption. Television, cinema, and children's toys portrayed adoption in positive ways during this time period. There are several possible explanations for this trend, but the key historical moment that attends this talk is the drastic shift in the institution of adoption in the early 1970s, caused by the second-wave feminist movement. This presentation examines the correlation between the reproductive revolution and the subsequent increased interest in adoption, specifically the alternative adoption of minority and older children, as manifest in The Cabbage Patch Kids. Through theories of material culture, gender, race, and social work, this paper will argue that these dolls were not only a response to the adoption adaptation, but also served as preparational objects that familiarized children with the new structure and appearance of the American family.

Automatic Xerography: Gendering the Mechanical Body

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

During his lifetime Ukrainian-born American artist Boris Artzybasheff (1899-1965) illustrated World War II propaganda posters, over two hundred *Time* magazine covers, and drawings for many advertisements and magazine articles. While by no means a famous artist at the time of his death, Artzybasheff had gained some small measure of notoriety for being the man who, as one *Mechanix Illustrated* article from 1954 claims, "brings machines to life." In this paper I focus on Artzybasheff's gendered images of xerography machines from Haloid Xerox advertisements (1958) and his steel-processing machines from a series commissioned by the Wickwire Spencer Steel Company in the late 1940s. By interrogating the way that Artzybasheff maps gender onto representations of machines, I suggest that he invokes gendered narratives of the working-class body even as he obscures the body of the human subject. This paper is part of a larger project exploring the shift from external mobility and embodiment to internal mobility and disembodiment in representations of mechanical life in American popular culture, literature, and film from the late nineteenth century to the late twentieth century.

"Tomorrow There Will Be No Shortage of Patriots": The Experience of War in *Call of Duty Modern Warfare*

Presenter: Shaun Richards
Advisor: Susan Donaldson
College of William & Mary,
American Studies

In first-person military shooter videogames, the gamer adopts the perspective of a virtual soldier. The point-of-view is that of a playable character fighting intense action sequences across a variety of hostile terrains. The genre's intended effect is to present combat with as much verisimilitude as possible. An oft-ignored aspect of the straightforward plot of such games, however, is the fact that the outcome is always already determined. The *Call of Duty Modern Warfare* series, loosely based on the ongoing War on Terror, follows this trend. This paper examines the latent neoconservative American militarism condoned and promoted by the so-called 'realism' of the best-selling franchise's narratives. Because of the structural limitations on the user-controlled character's positional agency, I argue that the plots of the different story mode "Campaigns" enlist the gamer as "citizen soldier" in a public relations effort to win hearts and minds on the digital homefront. By examining two of the series' levels, the cinematic chapter "The Coup" and the skippable mission "No Russian", I detail one subplot of the games, the tangential connection between acts of terrorism perpetrated against America by Cold War-era Soviet Communists and contemporary radical Islamic extremists, a link espoused in recent years by war hawk politicians and pundits. *Call of Duty Modern Warfare* may thus be understood as an interactive effort to (re)produce ideology and revise history through its representations of war on the part of both programmers and players.

Selling a Shameful Past: Tourism and Living History in Salem, Massachusetts

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

Salem, Massachusetts: the very name is synonymous with superstition, persecution, intolerance, and downright creepiness. For over 300 years the infamous Salem witch trials of 1692 have overshadowed that town. As this presentation will show, Salem's late-nineteenth and early-twentieth-century residents often downplayed their city's troubled history, as they were eager to remake their reputation and emphasize their region's importance as a global shipping and whaling hub, thriving industrial town, and cultural center. One legacy of these early celebrations can be found in "Pioneer Village," a small living history museum in Salem (and one of the oldest living history museums in the United States.) Originally built as the set for a pageant commemorating the tercentennial of Salem's settlement, the buildings were later opened to the public as a tourist attraction. Unfortunately, the history that Pioneer Village recreates is not the history for which the typical tourist visits Salem today: there's not a witch in sight. Located on the outskirts of town, Pioneer Village sees few of the visitors who flock to the heart of Salem in search of thrills and chills; modern Salem embraces its troubled past as it thrives on witch-hunt tourism. Drawing on historical documents and interviews with administrators at Pioneer Village, this presentation will explore Salem's shift from a town downplaying its "shameful" story to a city living off its supernatural reputation and ask why and how that change came about.

Between Volksgemeinschaft and American Way

Presenter: Christian A. Wilbers
Advisor: Charles McGovern
College of William & Mary,
American Studies

After World War I the trope of the Auslandsdeutsche, of "Germans abroad," entered center stage in the German political discourse. Postulating not citizenship, but ethnicity, language, and culture as foundations of belonging, politicians from Stresemann to Hitler made the fate of Germans abroad a matter of domestic and foreign policy, which renewed interest in emigrants who had found a new home in the United States. Historians have argued that by then, German-Americans, once a vibrant, vocal and unified ethnic group, no longer felt the bonds of the "Heimat" and had largely assimilated. My dissertation complicates that argument by exploring transnational factors in the evolution of German America. The end of World War I, which reopened the Atlantic Ocean as a field of social circulation between Central Europe and the United States, revived older patterns of migration and exchange. People, goods, and ideas again moved through transnational space influencing the ways in which those invested in that space partook in the political, cultural, and social discourses of the times. For this paper, I have analyzed a collection of letters from the mid-1930s written by German-Americans to the "Volksbund für das Deutschtum im Ausland," an organization devoted to fostering and preserving a sense of "Germanness" among emigrants. German-Americans were fascinated with National Socialism because its sinister blend of national community and ethnic exclusivity portended to have answers in a time of international crisis and it was this fascination that forced many German-Americans into an unbridgeable conflict between Third Reich and American Way.

"To draw pleasure and instruction": Robert Gilmor, Jr. and Collecting in the Early Republic

Presenter: Janine Yorimoto
Advisor: Chandos Brown
College of William & Mary,
American Studies

Robert Gilmor, Jr. (1774-1848) spent fifty years amassing a private collection of American art, coins, autographs, and minerals. Although scholars have divided his collections in scholarship, my research will look at Gilmor's remarkable collection as an integrated whole. Gilmor's collecting was a method of self-cultivation justified in his mind by his preservation of American artifacts and the promotion of national culture during the Early Republic. During this time, art, coins, autographs, and minerals all had national connotations and imperatives. By collecting these cultural artifacts, Gilmor was participating in the national attempt to define "America" and preserve its history. His attempt to integrate his collection into the newly formed Smithsonian Institution upon his death further reveals his commitment to public cultivation and civic responsibility. My research provides insight into the culture of the Early Republic, the formation of national identity, and collecting through looking at an individual and his remarkable collection.

Notes

ARTS & SCIENCES

"You're Not French-Canadien": Combating Essentialist Ideals in the Identity of a Border Archaeologist

Presenter: Andrew R. Beaupre
Advisor: Martin Gallivan
College of William & Mary,
Anthropology

In January of 2010, I was approached to direct an archeological field program at Fort St. Jean, Saint Jean-sur-Richelieu, Quebec. Fort Saint Jean is a deeply stratified archaeological site with components ranging from First Nations settlement through the French, British and Canadian periods. Given my interest in the cultural interaction of the French colonial period, I was eager to take advantage of the opportunity to direct excavation at such a significant archaeological site. I set about the project with a research question geared toward the role frontier settlements played in the creation of a Quebecois identity. At the time I was completely unaware that in taking this assignment, my own ethnicity would be called into question. Fort St. Jean lies in the Eastern Townships of Quebec, a space that has seen contestation between First Nations, French, British Canadian and American identities. In the past three hundred years this ethnic contestation has taken a number of forms, ranging from occasional ethnic slurs, to open warfare in *la Guerre des Patriots* of 1835. In this paper I will explore some of the social situations that called my own ethnicity in question while establishing my positionality as an American of Quebecois descent studying the creation of French-Canadian identity and heritage.

The Representation and Analysis of Archaeological and Historic Landscapes Using Geographic Information Systems (GIS)

Presenter: Laura E. Buchanan
Advisor: Danielle Moretti-Langholtz
College of William & Mary,
Anthropology

Within anthropology and particularly for the subfield of linguistics, semiotic theory provides a framework for interpreting different levels of cultural signs. However, semiotics is also a useful way of understanding and implementing the cartographic representation of geographic data. Methodological approaches drawn from cartographic theory, particularly the concept of geographic visualization, can be used to interpret historic and archaeological landscapes using Geographic Information Systems (GIS). Both interactive and presentation-oriented representations of archaeological and historic data with geographic components can be used to analyze and interpret (rather than simply to represent) archaeological and historic data for a variety of audiences. This project will focus on the use of GIS in (a) interpreting archaeological and historic data to lay audiences in the practice of public archaeology and (b) reevaluating concepts of linguistic, cultural, and political boundaries in the attribution of cultural affiliation of archaeological materials. Examples will focus on Chesapeake Virginia, particularly areas of Gloucester County.

The Bovine Remains from Whitehall, Bermuda: A Case Study in Eighteenth-Century Epizootics, Environment, and Economy

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

In 2010, two ruminant interments were uncovered from the mid-eighteenth-century fill layer of Whitehall in St. George's Bermuda. These interments were the first of their kind in Bermuda. Zooarchaeological analysis of the remains centered on the questions: What caused the death of these two individuals? and How does their presence in the archaeological record inform our knowledge of cattle usage in eighteenth-century Bermuda? Preliminary analyses of the ruminants identified them as two fully mature bovids with no evidence of perimortem trauma or chronic illness. These individuals likely represent Bermudian dairying activities. However, the exact cause of death of the bovids and the circumstances surrounding their burial are less clear. Perhaps the cattle fell victim to the "Ticks," an epizootic that hit the island in the 1780s or the animals may have succumbed to the ravages of the 1784 drought on Bermuda. Further research into the DNA and isotopic signatures of these enigmatic individuals will hopefully clarify their function and their relationship with the Whitehall residents and their role in Bermuda's economy and history.

Indigeneity, Stakeholder Communities, and Public Opinion: Theorizing Pagan Reburial Requests in Britain

Presenter: Ellen L. Chapman
Advisor: Michael Blakely
College of William & Mary,
Anthropology

Pagan reburial requests in Britain began in the mid-1990s, but have escalated in recent years with a well-publicized debate over best practice in the excavation and curation of British human skeletal remains. Focal issues in this debate include the ethics of indefinite curation of human remains, ownership of pre-Christian British remains, and beliefs and desires of British publics in regards to skeletal material. This paper will consider how pagan groups have couched their requests relative to the desires and beliefs of other British publics, particularly in terms of the claims to indigenous status that some druid groups have made. I will employ theories from indigenous, community, and public archaeologies to consider the ethical responsibility of archaeologists towards these claims. Finally, the impact of this debate on archaeological ethical standards, public perceptions of archaeologists, and relationships with stakeholder groups will be examined.

The Root of the Matter: Searching for William Hamilton's Greenhouse at The Woodlands estate, Philadelphia, Pennsylvania

Presenter: Sarah J. Chesney
Advisor: Frederick Smith
College of William & Mary,
Anthropology

In the late eighteenth and early nineteenth centuries The Woodlands was the home of William Hamilton, a Philadelphia philanthropist and collector of exotic plants. His botanical collection was considered by contemporaries to be the most extensive and aesthetically pleasing example of native and exotic flora in early America. The heart of this collection was Hamilton's greenhouse complex, a structure 140 feet long said to contain over ten thousand exotic plants. At a time when there was both a widening interest in botany in Europe and America and an increasing professionalization of the field by its practitioners, Hamilton's position as a well-respected botanical collector straddled the space between the diverging trends of "scientific" and "amateur" approaches to botany. Recent archaeological investigations of Hamilton's greenhouse have begun to reveal the complexity of its internal spatial arrangements that embody the changing nature of botany and botanical exchange on local, national, and international levels.

"Echar una mano": Social Networks and overcoming barriers to care among Latino migrant seafood-processing workers in North Carolina

Presenter: Leah A. Gordon
Advisor: Clare Barrington
University of North Carolina, Chapel Hill,
Health Behavior and Health Education

Given the lack of data on Latino H2-B migrants in the seafood-processing industry, farmworker organizations and health departments are unable to adequately serve this community. This study aimed to conduct formative qualitative research exploring the utilization of U.S. medical services and barriers to accessing care among Latino seafood-processing workers in Eastern North Carolina. The author examined workers' social networks to identify strategies for future health outreach activities. In-depth semi-structured interviews were conducted with 12 migrant seafood-processing workers in Eastern North Carolina by the researcher during 2011. Delayed theoretical sampling was used to capture a range of work experience. Interviews were transcribed by native Spanish speakers and coded by the researcher. An inductive analytical approach was used to identify emergent themes around workers' experience with the U.S. health care system. While working in the U.S., workers attempt to manage acute and chronic conditions. Obstacles to accessing health care include transportation, interpretation, and lack of knowledge about clinic locations and hours. Analysis revealed how workers use a complex web of formal and informal networks, including their employer, other workers, permanent Latino residents, and family in Mexico, to overcome barriers and obtain clinical care. Workers' pre-existing networks are a leverage point for health-related organizations seeking to increase clinical access among this population. Findings have direct implications for how organizations can effectively extend clinical and outreach services to this previously underserved community.

Booze at the Brothel: Alcohol-Related Artifacts and Their Use at the 27/29 Endicott Street Privy

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

Recent archaeological analysis of artifacts associated with a nineteenth-century brothel in Boston, Massachusetts are beginning to shed new light on the inner workings of Victorian brothels, including the consumption of alcohol by the male patrons and the women in residence. Alcohol was widely consumed in the Victorian era, but unless consumed as part of a formal dinner, it was often considered part of the male realm. The evidence from the brothel site offers fresh insights into the Victorian presentation and consumption of alcohol for both men and women. The archaeological evidence suggests that owners of middling-brothels pursued highly ritualized practices of alcohol consumption in order to establish the veneer of upper-class respectability and an entertainment environment, while at the same time using alcohol to treat their anxiety in private. Alcohol-related materials suggest that alcohol played an important role in guiding the performance of brothel players and patrons that is more complex than can be gleaned from historical narratives alone.

Urbanity, Estrangement, and Edibility: A Social History of Cheesecake

Presenter: Dessa E. Lighfoot
Advisor: Frederick Smith
College of William & Mary,
Anthropology

Food history is social history—impossible, and unwise—to separate from human lived experience. Deep at the root of any food history is a complex tangle of ecology, economy, labor, population demographics, migration, and class. What and how people eat changes as human environments and relationships change, and foods rise or fall in popularity due to more than just whim. The history of cheesecake in the Anglo-Atlantic world is the history of land and labor alienation, the pitfalls and benefits of urbanization, the separation of the producer and the consumer, and the invention of haute cuisine. Cheesecake itself is not a historically pivotal food, but its unremarkable nature makes it ideal to explore the ways in which food touches almost every aspect of the human experience, and how the use and meaning of a single food item can change over time while remaining fundamentally the same in recipe and form. More than just social, foods are personal, and can provide a rare opportunity to experience and take part, at least in some small way, in otherwise inaccessible past lived experiences. Food history, after all, is a 'touchable' history, one that can be experienced partially on a sensual and visceral level. By integrating multiple lines of evidence from history, archaeology, zooarchaeology, and recipe reconstruction the aim of this research is to demonstrate how food-centered research can contribute greatly to historical and archaeological understanding of some very large-scale issues-to, in effect, take the food out of the kitchen and place it in its larger context in the social world.

Buried Treasure and Big Houses: An Exploration of 18th Century Wealth

Presenter: Derek R. Miller
Advisor: Frederick Smith
College of William & Mary,
Anthropology

In 1781, a fleet of British Navy ships under the command of Admiral George Bridges Rodney captured the small Dutch Caribbean island of St. Eustatius. Upon landing on the island, the British commanders were amazed at the material wealth in the merchant's warehouses and quickly seized all the merchants' goods that they could find. The value of the seized goods was immense and the promised wealth was alluring. Interestingly, Admiral Rodney not only seized the warehouses but also sent soldiers to dig in particular merchant's yards believing that these merchants had hidden their wealth by burying it. While pillaging the merchants, Rodney spared the planters. Why? Rodney's actions highlight the various perceptions of prestige and danger associated with invisible (buried treasure) and visible (big houses) wealth.

"To Make Katch-up that will keep Twenty Years": The Homogenization and Commodification of Ketchup

Presenter: Jennifer H. Ogborne
Advisor: Martin Gallivan
College of William & Mary,
Anthropology

What is now commonly referred to as ketchup, a tangy tomato-based sauce that enjoys an incredible popularity amongst Americans, once referred to a wide variety of sauces, few of which were tomato-based. Sauces could consist of ingredients that included mushrooms, oysters, peaches, anchovies, and many more foods that are rarely seen in grocery stores today. Included in many of these recipes are descriptions as to how long the particular concoction could last, ranging from a few weeks to many years. Common to most recipes are salt, vinegar, and alcohol, agents that would act as preservatives. As the production of ketchup entered into the emerging industrialized food industry in the nineteenth century, new ingredients were sought to expand the shelf life of this popular condiment. In this process, American ketchups became distilled into the tomato sauce known today, the varieties and ranges in flavors lost along the way. This paper will explore the transformations and increasing commodification of ketchup as it was moved from kitchens into factories.

Poke and Prod if the Media Allows: Media Portrayal of Cosmetic Surgery in the United States vs. Singapore

Presenter: Tomeka B. Scales
Advisor: Melbourne Cummings
Howard University,
Communication and Culture

This study seeks to find out whether there is a differentiation in the media's portrayal of cosmetic surgery between the United States and Singapore; in particular, is the media's portrayal of plastic surgery more positive in the United States than Singapore? Cosmetic surgery is an aesthetic practice that enhances one's appearance through surgical and medical techniques. Cosmetic surgery includes, but is not limited to, Botox, breast augmentation, rhinoplasty, eyelid surgery, and liposuction. The United States is one of the top advocates for freedom of press, whereby journalists have the ability to express their opinions within legal parameters. In Singapore, however, media freedom is more constrained. Journalists self-censor for fear of stringent defamation charges. This influences the types of stories that are published. It is hypothesized that Singapore media will be more negative on the liberal practice of publishing articles favoring cosmetic surgery than the United States. A qualitative content analysis approach will be utilized for this study. Using the LexisNexis® database, two of the highest selling, English language newspapers in the United States and Singapore will be analyzed: *USA Today* and *The Straits Times*, respectively. Certain themes will be extracted and grouped as being positive or negative. This research will further shed light on cultural differences between the United States and Singapore and serve as a platform for better understanding intercultural communication practices.

Law, Material Wealth and the Identity of the Williamsburg Area's Free Black Population in 1784 to 1815

Presenter: Rebecca Schumann
Advisor: Marley Brown
College of William & Mary,
Anthropology

Until 1782, manumission was only granted through the approval of the general assembly and governor. As a result, Virginia's free black population was very small, primarily consisting of trained, free-born mulatto craftsmen. In 1782, however, Virginia's manumission law was revised, allowing slave-holders to free slaves through deeds and wills. This revision produced a six-fold increase in the state's free black population by 1800 and led to an influx of black unskilled laborers into this population. My study illustrates the effect of this revision on the identity of the free black community in the Williamsburg area through an investigation of the change in their material wealth from 1784 to 1815. An analysis of personal property tax lists reveals that free blacks had progressively less access to wealth following the 1782 law revision. This change may partly be due to the increase of untrained laborers into the free black community. However this finding also indicates that the darkening of Williamsburg's free black population following the 1782 revision made race much more important in the interaction between whites and free blacks. Moreover my analysis shows that by 1815 free blacks preferentially chose to purchase slaves over livestock, which were previously extremely important to free blacks. It is possible that they were saving their money to purchase relatives and friends in order to manumit them. These changes point to a larger transformation of the identity of Williamsburg's free black population in an increasingly racialized society.

Rogue Fishermen: Codfish, Ceramics, and Identity of the Piratical People on the Isles of Shoals: 1630-1775

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

In the seventeenth and eighteenth centuries, taverns stood as integral places in the daily lives of the inhabitants of England and her colonies. While they functioned as a central location in nearly every town and city, taverns also served as locations where wages, windfalls, and purloined wealth could be spent or consumed through gifting, making them important sites for scholars who examine a range of economic networks. Despite the potential for illuminating practices of daily life and local customs of socialization, as well as the role of feasting and gifting in a historical context, there has been a relative dearth of archaeological research done on colonial coastal taverns. This paper seeks to address these underrepresented tavern sites through a three-fold comparison. It focuses upon the ceramic assemblages from the taverns at the fishing village of Pemaquid, Maine, the fishing station established on Smuttynose Island in the Isles of Shoals, whose tavern was discovered only this past summer, and the larger port city, Port Royal, Jamaica. Through this comparison, the paper seeks to illuminate the exchanges of economic and social capital, as well as the processes of identity formation that lie behind illicit trade, which took place within these establishments.

I' Just an American: Archaeology and African American Identity in Freedom

Presenter: Shea Winsett
Advisor: Marley Brown
College of William & Mary, Anthropology

African American archaeology has long focused on the material culture of enslaved plantation contexts as a means of understanding the development of African American culture and identity within the confines of slavery; focusing on ethnic markers that connect Black Americans to an African past. Though insightful, many practitioners of the field are advocating for expanding the sites which go outside of the plantation norm as well as frameworks which are used to interpret sites that are not within the plantation context. In this paper, I agree with these practitioners and advocate for African American archaeology to explore late 19th century sites of African American freedom, such as the Black towns of the American West. Furthermore, I propose exploring these sites by engaging in discussions on race, racialization, class and gender to understand the culture and identity that African Americans developed in freedom. For this paper I will be using the ghost town of Blackdom, the first Black town to emerge in New Mexico in the late 19th century as a case study.

From Blue Ribbons to Silver Buckles: Memory and Personal Adornment Objects in Enslaved African Plantation Communities

Presenter: Sarah Zimmet
Advisor: Jonathan Glasser
College of William & Mary,
Anthropology

This paper considers the meaningful ways in which personal adornment objects were incorporated into the lives of enslaved Africans in Colonial America between the eighteenth and early nineteenth centuries. These objects will be discussed through the theoretical framework of memory where the meanings and significance of objects may be connected to a collectively familiar past or place. Using historical documents, in the form of runaway slave advertisements, and visual depictions of enslaved Africans from the period, as well as archaeological collections, not only establishes the types of items that were worn but also suggest what type of memory or knowledge was linked to a certain object. The questions considered here include the following: do specific adornment objects items remind individuals or the community of mutually understood remembrances of Africa as a place? Do items represent knowledge of threads of traditional African practices? Do items distinguish people in a plantation community through their recent link to Africa or traditional African knowledge such as ritual or medicinal practices? The presence of adornment objects among enslaved plantation communities not only reflects the varieties of knowledge, language, and religion that were coming together on the plantation landscape but also show the ways in which enslaved people were actively procuring objects through which to express their own unique identity. This was likely aimed not only at distinguishing themselves from other enslaved people but also from other groups of people on the plantation.

Regulation of Ryanodine Receptors through Luminal Sarcoplasmic Reticulum Calcium Concentration

Presenter: Victoria Akins
Advisor: Gregory Smith
College of William & Mary,
Applied Science

Cardiac diseases such as arrhythmias have been associated with changes in the regulatory processes in the cytosol and inside of the sarcoplasmic reticulum (SR) during the cardiac cycle. Both cytosolic and luminal SR calcium concentrations regulate the behavior of ryanodine receptors (RyRs), but the way in which these two concentrations interact on a molecular level to influence the behavior of the RyR is not completely understood. Experimental results using permeabilized ventricular myocytes have been obtained that show calcium oscillations inside of the SR can occur in spite of the fact that cytosolic calcium concentration is essentially clamped at the calcium concentration of the extracellular bath. When the permeabilized myocytes are exposed to activating cytosolic calcium, spontaneous oscillations of calcium occur in the SR as a result of periodic opening and closing of the RyRs. When the cytosolic calcium is increased to 10uM the frequency of the oscillations increases, however, when the cytosolic calcium concentration is increased beyond 50uM the frequency of the oscillations is decreased. This behavior indicates that the luminal SR calcium concentration dynamically regulates RyR open probability in complex manner that is sufficient to maintain intracellular calcium oscillations. I will use a whole-cell modeling to further investigate the dynamics of SR calcium oscillations driven by luminal regulation of the RyR.

Population dynamics of a risk-based evolving social network

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

Human behavior can affect the dynamics of an infection that is transmitted through interpersonal contacts. We model stochastic social dynamics in a network with formation and breaking of links representing changes in interpersonal contacts. Each node has an intrinsic benefit its neighbors derive from connecting to it. Motivated by HIV and other STDs where individuals' infection status is not apparent, we further assume that links represent an inherent risk and that nodes with a higher degree are less desirable partners. The probability to form and break connections is determined by a payoff computed from the benefit and degree-dependent risk. We study the network evolution via Monte Carlo simulation and an approximate analytic treatment. The dependence of network connectivity on parameters is determined, and the steady state degree distribution is obtained.

Role of ionic diffusion in polymer solution mediated growth of nanoparticles

Presenter: Santoshkumar Biradar
Advisor: Govindarajan Ramesh
Norfolk State University,
Materials Science

With the advent of nanotechnology, many methods of synthesizing nanoparticles have been developed and the polymer mediated growth (PMG) technique is one among them. In this route, ions of one of the reactants are allowed to diffuse from an external solution into a polymer matrix where the other reactant is complexed and bound. The exact role of ionic diffusion in the formation of nanoparticles has been investigated in the current study. Typically calcium carbonate nanoparticles have been formed by PMG route using polyethylene glycol solution. The molecular weight of polyethylene glycol, amount of solvent used, reactant to polymer ratio and reaction temperature all affect the size of the particles formed. Particle size was calculated using Scherrer's formula on x-ray diffraction plots and was reconfirmed with field emission scanning electron microscope images. Through this knowledge we have optimized the above parameters to obtain smaller particles as they are more suitable for applications in biomedical, polymer and plastic industries. We have confirmed that this technique can be used to synthesize and control the size of nanoparticles.

Measuring and Visualizing Stress Transfer in Polymer–Graphene Oxide Nanocomposites at the Single Sheet Level

Presenter: Minzhen Cai
Advisor: Hannes Schniepp
College of William & Mary,
Applied Science

Graphene oxide (GO) sheets, exhibiting outstanding mechanical properties, are excellent candidates as reinforcement fillers in high-performance polymer nanocomposites. However, to make full use of the outstanding strength of the GO sheets, it is necessary to achieve very efficient stress transfer between the polymer and GO sheets. We developed an experimental technique to quickly assess the relative strength of the GO–polymer interface for a series of different polymers and found that polyvinyl alcohol (PVA) features a particularly strong interface with GO. In order to assess the load transfer across the PVA–GO interface more quantitatively, we monitored the strain in individual GO sheets inside the polymer via force modulation microscopy, as a function of the external strain of the composite. We found that, the matrix strain is directly transferred to some of the GO sheets in this system for strains of up to 7%. Based on this, the maximum interface shear stress was estimated. This directly shows that, in principle, it is possible to make such nanocomposites work. We complemented this atomic force microscopy-based study by in situ Raman spectroscopy on relaxed and strained composites. Our findings suggest that techniques as ours - with the capability of revealing the mechanical properties of nanocomposites at the single sheet level - are needed in order to fully understand and optimize the performance of nanocomposites.

Toward autonomous walking-speed robots: Acoustic and infrared data fusion

Presenter: Eric A. Dieckman
Advisor: Mark Hinders
College of William & Mary,
Applied Science

The unsolved issue in creating a useful, autonomous walking-speed robot that can operate in unstructured outdoor environments is maintaining situational awareness to enable the robot to make sound decisions. By combining information from different sensors, the autonomous robot can correctly perform its given task in a variety of conditions and environments. We are currently investigating the combination of infrared (passive and active) and acoustic echolocation sensors on our robotic sensor platform, rMary. Using an acoustic parametric array to generate the audible echolocation signal allows control of a tight beam of low-frequency sound at long distances, while infrared imaging works well at close distances and in difficult weather conditions. We are also investigating the use of the Microsoft Kinect in robotics. This device was originally designed as an accessory for the Xbox 360 gaming system, but the creation of open-source drivers has allowed for its use in the robotics community. The Kinect has active infrared sensors to produce RGBD (RBG color + depth) images, as well as collecting raw RGB color and infrared images. Four spatially-separated microphones are also located along the bottom of the unit, allowing the implementation of beamforming alogirthms to localize sounds in space. To validate the Kinect's sensors, infrared images were also obtained with a conventional thermal imaging camera and audio information was recorded with a parametric microphone.

Tuning the Gilbert Damping of Spin Wave in Ferromagnetic Thin Film by Anti-ferromagnetic Spins

Presenter: Yichun Fan
Advisor: Gunter Lüpke
Co-Author: F. Fang
College of William & Mary,
Applied Science

Ultra-fast magnetic switching requires a large damping of magnetization oscillation. We investigate the ferromagnetic spin precession with frequency of tens of GHz in Fe/CoO(001) using time-resolved magneto-optical Kerr effect. An enhancement of Gilbert damping by a factor of three is achieved in the Fe film by tuning the thickness of CoO layer. The damping increases with CoO thickness but decreases with temperature. The enhancement of damping is attributed to the spin wave dephasing effect induced by the exchange coupling of ferromagnetic and anti-ferromagnetic spins.

Ultrafast spin dynamic study on FePt alloy thin films

Presenter: Xin Ma
Advisor: Gunter Lüpke
Co-Author: H. Zhao
College of William & Mary,
Applied Science

For the past few decades, magnetic recording has been a major technology for information storage. Nowadays, the large amount of digital information creates ever increasing demands for much higher storage densities, in which magnetic materials with large magnetic anisotropy play a key role for the excellent thermal stability and reliability. One promising material is the FePt alloy with face-centered tetragonal L10-ordered phase, which has huge perpendicular magneto-crystalline anisotropy (PMA). Moreover, this huge PMA can significantly rotate the polarization of light propagating perpendicular to the substrate, and hence makes FePt alloy a good candidate for magneto-optical recording employing either the Faraday effect (in transmission) or the magneto-optic Kerr effect (in reflection). Also, the switching speed between magnetic states can be very fast, if combined with other techniques such as optical induced demagnetization and precession. In our study, we investigated the magnetic properties of FePt alloy thin films using the Time Resolved Magneto-Optic Kerr Effect (TRMOKE). This technique provides a real time probe of spin dynamic behavior, while magnetic switching speed and damping rate are straightforwardly reflected. Also, the analysis of TRMOKE measurements gives important parameters such as uniaxial anisotropy constants in this material system. From our results, we find that magnetic switching speed, damping rate and PMA magnitude in FePt alloy thin films increases with the system's chemical order or the reduction of Pd atoms doping level, which hints to a new way of improving device performance with such material systems.

Characterization of Flaw Severity using Lamb Wave Tomography and Pattern Classification

Presenter: Corey Miller
Advisor: Mark Hinders
College of William & Mary,
Applied Science

The multi-modal properties of Lamb waves are often used in NDE and structural health monitoring because they allow for interaction with many types of flaws. Lamb wave tomography collects Lamb wave measurements in an array of pitch-catch positions around an area of interest, and allows for the generation of a reconstructed image that accurately locates and sizes flaws. These images, however, cannot reliably predict the severity or type of flaw when the flaws become severe enough that scattering effects dominate. Pattern classification routines provide an alternative means for processing ultrasonic waveforms in order to predict flaw severity. Lamb wave tomography is first used to localize a flaw. Waveforms from ray paths that cross the suspected flaw area are automatically identified, and the dynamic wavelet fingerprint technique is used to generate feature vectors from these complex multimode ultrasonic signals. This combination of tomography and pattern classification allows for the prediction of flaw severity in plate-like samples with defects of varying depths. Here an aluminum plate with a rectangular thinning milled at 17 different depths is scanned sequentially in order to provide a training data set for pattern classification with the performance of several standard classifiers compared.

Evaluating the role of Dbx1-derived neurons in respiratory rhythm generation

Presenter: Maria Cristina Picardo
Advisor: Christopher Del Negro
College of William & Mary,
Applied Science

Mammalian breathing must function properly and continuously at birth. The breathing motor rhythm originates from a small region in the ventral medulla oblongata called the preBötzinger Complex, but the mechanism in generating the respiratory rhythm is not fully understood. Within the preBötC, a subset of glutamatergic neurons that also express peptides and peptide receptors is known to be essential for rhythmogenesis. Dbx1, the homeodomain transcription factor which controls the development of neuron subpopulations in the brainstem and spinal cord, gives rise to this subset of rhythm-generating neurons in the preBötC. Therefore, the key to understanding rhythmogenesis is likely to be revealed by studying the characteristics of the Dbx1-derived ($Dbx1^+$) neurons. We evaluated the role of $Dbx1^+$ neurons as the core rhythm generators in mammalian respiration through electrophysiological and anatomical procedures. In this project, we studied the electrophysiological properties of Dbx1-derived neurons in the preBötC by whole-cell patch-clamp recordings of inspiratory $Dbx1^+$ neurons in brainstem slices in vitro. After recording, slices were processed for immunohistochemistry to reveal morphological characteristics of $Dbx1^+$ neurons. Our findings show that $Dbx1^+$ neurons possess physiological and anatomical properties that are coherent with a role in respiratory rhythm generation.

Bacterial biofilm interaction with nanoparticles

Presenter: Tara Raftery
Advisor: Tamara McNealy
Co-Author: C. Kitchens
Clemson University,
Biological Sciences

The use of nanoparticles (NPs) in everyday applications, such as sunscreens, socks, cosmetics and bike frames, is increasing daily. This leads to advancement in funding opportunities in nanotechnology. *Legionella pneumophila* is a bacterium that forms biofilms in natural and man-made environments, and is the causative agent of Legionnaire's Disease. Eradication and prevention of this disease source is a key public health mission. *Legionella* biofilms were exposed to gold (Au) or platinum (Pt) NPs for 48 hours, and morphological changes analyzed. A concentration of 0.7µg/L of 4 or 18nm Au or 4nm Pt NPs caused a significant reduction in biofilm biomass that was not observed at higher concentrations or with 50nm AuNPs, suggesting that NP-induced destabilization may be related to size and concentration. NP interactions with planktonic cells were also examined. No significant difference in biomass, pigment production, or viability was observed. The use of NPs to destabilize biofilms could lead to major improvements in treatment of contaminated man-made aquatic systems. Currently required biocide concentrations needed for biofilm eradication exceed suggested and allowable concentrations, as these can be toxic to the environment. In an effort to optimize eradication efforts and stay within recommended guidelines of biocide use, we investigated combination treatments based on our nanotechnology application. Preliminary data demonstrate that 18nm AuNPs followed by 0.5 mg/L chlorine decreases biofilm biomass significantly better than either treatment alone. Our proposed combination treatment may effectively remove and inactivate difficult biofilms, decreasing infectious disease risk.

NbN Thin Films for SRF Cavities

Presenter: William M. Roach
Advisor: R. Ale Lukaszew
Co-Authors: D. Beringer, Z. Li, C. Clavero
College of William & Mary,
Applied Science

Bulk niobium is the material currently used for superconducting radio frequency (SRF) cavities in linear accelerators such as the one at Jefferson Lab in Newport News, VA. However, these cavities are nearing the critical field limit of niobium. Therefore, new materials will need to be incorporated to overcome this limit. A model has been proposed that incorporates other materials, such as NbN, in superconducting-insulating-superconducting (SIS) multilayer coatings in order to shield bulk niobium from higher magnetic fields. NbN is chosen due to its having larger critical fields, which will allow for a larger accelerating gradient, and a higher critical temperature, which will lessen the cooling demands of SRF cavities. In addition, it is a simple material in terms of its feasibility to be deposited as a thin film onto a cavity. Here, we present our correlated study of structure, morphology, and superconducting properties of NbN thin films and SIS multilayers to show that this is a viable route to improving SRF cavity performance.

Epidemic spread in an adaptive social network with temporary deactivation of connections

Presenter: Ilker Tunc
Advisor: Leah Shaw
Co-Author: M. Shkarayev
College of William & Mary,
Applied Science

In studying spread of an infectious disease, the population is often modeled as a network where nodes represent individuals and links represent the relationships between the individuals. In a static social network, the connections between individuals do not change, even though the disease state of the nodes changes as the disease progresses. However, people may change their connections in response to the disease, creating an adaptive social network. The form of adaptation studied previously was one in which susceptibles rewire their connections away from infected individuals and toward non-infected individuals. Here we study a more realistic adaptation in which people temporarily deactivate social contacts with infected neighbors but reactivate the connection once it is safe. We study the interaction between the infection spread and the network adaptation. We derive a mean field system of ordinary differential equations that accurately predicts the infection levels for certain network geometries. For a scale free network geometry, we study the effect of disease and adaptation on the geometry of the remaining active links.

Cumulative single-cell ablation of rhythmic neurons in mammalian respiratory network *in vitro*

Presenter: Xueying Wang
Advisor: Christopher Del Negro
Co-Author: J. Hayes
College of William & Mary,
Applied Science

Understanding the degeneration of brain functions subjected to progressive cell loss is critically important in designing treatments for neurodegenerative diseases as well as interrogating the basic properties of neural networks. To investigate this issue we developed an automated system that uses two-photon laser-scanning microscopy to detect rhythmic neurons based on calcium-activated fluorescence changes, and then individually laser-ablates the neuron targets while monitoring network motor output in real time. We applied this system to the mammalian respiratory network, putatively located in the preBötzinger Complex (preBötC) of the ventral medulla. The preBötC is an advantageous experimental model that spontaneously generates breathing-related activity in 450-µm-thick brain slice preparation *in vitro*. Here we show that cumulatively deleting rhythmic neurons in the preBötC monotonically decreases respiratory frequency and diminishes the magnitude of motor output. On average, the deletion of 120 randomly selected preBötC neurons stops spontaneous respiratory rhythm irrevocably. These results provide an upper limit for tolerance to neuronal destruction, and may help elucidate the etiology of respiratory pathology in neurodegenerative diseases.

Stochastic calcium release and calcium homeostasis in a minimal model of cardiac cells

Presenter: Xiao Wang
Advisor: Gregory Smith
College of William & Mary,
Applied Science

Calcium plays an important role in regulating cellular functions in myocytes, neurons, and other cell types. Spatially localized calcium signals known as calcium puffs and sparks are mediated by clusters of calcium release channels - inositol 1,4,5-trisphosphate (IP3) receptors and/or ryanodine receptors (RyRs) -located on the endoplasmic reticular (ER) and sarcoplasmic reticulum (SR) membranes. Here, we present a minimal whole cell modeling formulation that accounts for the bidirectional coupling of localized (subcellular) and global (cellular) aspects of calcium signaling. The dynamics of each individual release sites are represented by a Langevin-type stochastic differential equation system. Several hundred Langevin equations numerically integrated using Monte Carlo techniques while coupled to bulk cytosolic and ER/SR calcium concentrations. The resulting model accounts for both spontaneous calcium sparks and the changes in cytosol and ER/SR calcium concentration that result from the dynamic equilibrium between release and reuptake by intracellular stores.

Morphological studies of respiratory neurons

Presenter: Krishanthi T. Weragalaarachchi
Advisor: Christopher Del Negro
Co-Author: M. Picardo
College of William & Mary,
Applied Science

Breathing behavior in mammals depends on a respiratory-related neural rhythm that is generated in the preBötzinger complex (preBötC), a functionally and anatomically specialized area of the lower brainstem. Rhythm-generating neurons in the preBötC are derived from a single genetic line, Dbx1 (Developing Brain Homeobox-1) expressing precursors. Dbx1 is an embryonic homeodomain protein that influences the development of hindbrain and spinal cord circuits. We are interested in properties of these Dbx1 expressing neurons ($Dbx1^+$) to understand the cellular bases of respiratory rhythmogenesis. This project focuses on morphology and specifically long-branch like structures called dendrites that receive neural communication. $Dbx1^+$ neurons are recorded in reduced brainstem-slice preparations that generate fictive respiratory-like motor activity in vitro. The $Dbx1^+$ neurons are filled with biocytin for post-hoc anatomical processing. In our preparation, one $Dbx1^+$ neuron and one control neuron were labeled separately on each side of the slice so that there was no misidentification of biocytin-filling in adjacent neurons. Biocytin labeling was reveled using Extravidin-FITC. 3-D image stacks obtained using laser-scanning confocal microscopy were stitched using 'Fiji' software. These $Dbx1^+$ neurons were digitally reconstructed using 'Neuromantic' free software and properties were studied using 'L-measure'. Our goal is to use these reconstructed data to create a mathematical model using NEURON simulation environment and manipulate the electrophysiological findings. We confirmed that $Dbx1^+$ neurons have dendritic and axonal projection patterns consistent with a role in respiratory rhythm generation.

Magneto-optical activity via surface plasmon resonance and magnetoresistance effect on Au-Co nanocomposite thin films

Presenter: Kaida Yang
Advisor: R. Ale Lukaszew
Co-Author: C. Clavero
College of William & Mary,
Applied Science

Appropriately designed metallic and metallo-dielectric nanoparticle arrays and thin film structures are suitable platforms for sensing as well as for photonic applications based on their optical and magneto-optical properties. It is possible to enhance the sensitivity of thin film under suitable external magnetic field modulation in order to develop "active" plasmonic systems. In this research, the magneto-optical properties of Au-Co nanocomposite thin films have been investigated by modifying growth parameters such as growth temperature and relative Au:Co concentration. The correlation between the nanocomposite films' microstructure, morphology, with their optical response and their magneto-optical enhancement is discussed. Also, in Au-Co composite films, electric current driving across ferromagnetic-nonmagnetic metal interface would be spin polarized so that the spin-polarized electrons would penetrate into the nonmagnetic metal for a length characterized by the spin diffusion length δ_s. In order to observe the spin injection phenomenon, the spacing of the nonmagnetic material need to be smaller than δ_s. The magnetoresistnce measurement shows AMR effect due to arising from the ferromagnetic coupling of adjacent magnetic moments between neighboring clusters.

Repeatable variation in mercury accumulation of captive-dosed zebra finches

Presenter: Kenton A. Buck
Advisor: John Swaddle
College of William & Mary,
Biology

Mercury is a ubiquitous ecotoxin with numerous detrimental effects on birds. Although mercury accumulates to different levels in different bird species, little is known about the natural variation of within-species mercury accumulation. Zebra finches (*Taeniopygia guttata*) were maintained in controlled environmental conditions on a standardized diet containing either 0.0, 0.3, 0.6, 1.2, and 2.4 ppm methylmercury. Within treatments, individual zebra finches consistently differed in the amount of mercury accumulated in their blood. Among-individual variation in blood mercury greatly exceeded within-individual variation across all mercury dose treatment groups. Among-individual differences in blood mercury accumulation may reflect an underlying genetic basis for mercury mitigation, potentially allowing evolutionary adaptation to environmental mercury contamination if this variation is heritable (genetically or epigenetically). As part of an ongoing effort, the narrow-sense heritability of mercury accumulation in zebra finches was calculated using restricted maximum likelihood modeling. More research, however, is necessary to understand gene expression mechanisms underlying mercury tolerance in birds.

Reproduction and fecundity in the nemertean worm *Prosorhochmus americanus* between paired and isolated individuals

Presenter: Serena Caplins
Advisor: James Turbeville
Virginia Commonwealth University,
Biology

Reproduction is a critical aspect of an organism's life history, and the mode of reproduction along with associated traits often dictate patterns of dispersal, genetic variation, and levels of fecundity. Early observations of the hermaphroditic and viviparous nemertean, *Prosorhochmus americanus* revealed that isolated individuals are able to reproduce in the absence of cross-fertilization. In an examination of individual fecundity, worms were either placed in pairs, with the potential to cross-fertilize, or kept isolated, thus preventing cross-fertilization. Specifically, 120 adult worms (T1; n=40 replicates) and 42 juvenile worms (T2; n=14 replicates) were raised in pairs or in isolation and monitored for the development and emergence of offspring. Worms were examined every 24 hours for juvenile emergence. T2 worms were examined weekly for the development of gonads, eggs, and embryos. Observations were carried out for 160 days, over which period a total of 2,863 juveniles were produced. Isolated worms in T1 produced slightly more juveniles (n, mean=21.3±3.8) than paired worms (n/2, mean=19.1±3.4; t-test, p=0.0102). In contrast, T2 worms produced approximately the same number of offspring regardless of being isolated or paired (t-test, p=0.26). Newly emerged juveniles averaged 2.5 mm in length, and produced gonads within 2 weeks of emergence. Microsatellite DNA markers are currently being developed to determine the degree at which cross-fertilization occurs between paired worms and will provide a starting point in determining potential fitness advantages that may be associated with differing modes of reproduction.

How froglets pay the price: carry-over effects on morphology and performance in response to pond drying

Presenter: Julie F. Charbonnier
Advisor: James Vonesh
Virginia Commonwealth University, Biology

Animals with complex life cycles cope with environmental uncertainty by altering life history switchpoints through developmental plasticity. This plasticity may impact morphology, locomotor performance, and survival in later life stages. Hydroperiod is an important factor which may alter life history switchpoints in aquatic organisms. Many amphibians can plastically respond to changes in hydroperiod, but few studies have examined the post-metamorphic costs of this plasticity. To investigate the potential carry-over effects of plasticity to reduced hydroperiod, we studied the Tungara frog, *Physalaemus pustulosus,* a tropical anuran which breeds in highly ephemeral habitats. We conducted a field study with three different water level treatments (constant high volume, constant low volume, and decreasing water volume) in 60 L mesocosms and measured time and size to metamorphosis, tibiofibula length and jumping performance. We also conducted a laboratory study which similarly manipulated water levels, and also manipulated resource levels. In our field experiment, frogs from decreasing water volumes emerged earliest and had smaller body size. In our laboratory study, frogs from the low volume treatment emerged earliest and had smaller body size. In both studies, froglets from decreasing water treatments had shorter tibiofibulas relative to their size and reduced jumping performance. Our results demonstrate that animals which display plasticity in the timing of ontogenetic shifts may experience costs on their morphology and performance later in life. We interpret these results within the context of past studies which manipulate how hydroperiod may impact amphibian development.

Spatial patterns of vegetative recruitment during early succession in a recently restored mixed tidal regime wetland

Presenter: James B. Deemy
Advisor: Edward Crawford
Virginia Commonwealth University, Environmental Studies

Ecological restoration of a prior converted wetland was characterized for a recently drained impoundment along the James River. We quantified the recruitment and colonization of native and non-native wetland vegetation within a former impoundment using GPS/GIS technology. Presence of colonizing herbaceous vegetation was quantitatively assessed over three growing seasons in both tidal and non-tidal environments. Objectives for this study were (1) to examine geospatial relations of recruitment patterns among colonizing species over three growing seasons, (2) assess geospatial distribution of invasive species, and (3) assess geospatial patterns in recruitment of *Taxodium distichum* and use these patterns to identify areas where restoration efforts may be most effective. The two most common native colonizing species during 2009, 2010 and 2011 growing seasons were Narrow-leaved Cattail (*Typha angustifolia L*.) and Rice Cutgrass (*Leersia oryzoides L.).* The two most common exotic invasive species were Asian Spiderwort (*Murdannia keisak Hassk*) and Japanese Stiltgrass (*Microstegium vimineum Trin.).* We determined that *Typha angustifolia L.* and *Murdannia keisak Hassk* were the most dominant species in tidal portions of the basin. In non-tidal portions of the basin cutgrass (*Leersia oryzoides L.*) tended to dominate vegetative communities and there were fewer invasive species. Approximately 250 *T. distichum* individuals have been found within the restored wetland. Over 75% of the individuals found were seedlings or saplings. Based on geospatial relations of these recruits we have identified potential areas for natural and facilitated recruitment within the newly restored wetland.

Ghrelin in Obese African-American Adolescents with a Family History of Type-2 Diabetes

Presenter: Maurice B. Fluitt
Advisor: Kanwal Gambhir
Howard University,
Genetics and Human Genetics

Exploring molecular pathways involved in energy metabolism could lead to the identification of novel therapies and biomarkers for obesity. Ghrelin, a novel orexigenic hormone, plays a pivotal role in a number of biologically important processes, including food consumption and long-term energy balance. Leptin, which antagonizes orexigenic peptides like ghrelin, is an adipocyte-specific hormone that suppresses appetite. Targeting these and other physiological markers could unveil the molecular mechanisms involved in the development of obesity and diabetes. The purpose of this study was to determine the plasma ghrelin concentration of obese African-American adolescents with a family history of diabetes. This study also aimed to identify the possible relationship of ghrelin, leptin, and insulin during a glucose tolerance test on obese African-American adolescents. Plasma total ghrelin was measured using commercially available radioimmunoassay kits for total ghrelin. The average plasma ghrelin concentration was higher in non-obese African-American adolescents than the obese group. During glucose tolerance test, there was considerable variation in plasma ghrelin in the obese group, suggesting altered feedback circuitry in energy metabolism. Ghrelin and insulin exhibited an inverse relationship during glucose tolerance test. A positive correlation was exhibited between ghrelin and leptin in the obese group during a glucose tolerance test. These findings suggest that obese adolescents in this study may have developed resistance to the action of ghrelin and leptin. These findings also add to the current understanding of various hormones involved in obesity and create potential avenues to explore in both obesity and diabetes research.

Up-regulation of Apoptosis related protein in Lung epithelial cells by SWCNT

Presenter: Virupaxi Goornavar
Advisor: Ramesh T. Govindarajan
Norfolk State University,
Materials Science

Lung epithelial cell lines were used to investigate the mechanism underlying for apoptosis induced by single wall carbon nanotubes. Our results showed a significant amount of incorporation of dUTPs in the nucleus confirming the induction of apoptosis, which was also validated by DNA fragmentation assay. The activity of caspases-3 and caspase-8 increased in a dose and time dependent manner in parallel to the morphological apoptosis. The levels of cytochrome c, cellular ATP, Ap-1 factor, p53, p21, bax, and bcl-2 also changed reflecting the activation of the apoptosis pathway. Together, our results provide solid evidence that apoptosis in lung epithelial cells exposed to single wall carbon nanotubes occurred through activation of the caspase cascade, which in turn triggers nuclear transcription factor AP -1 and the release of cytochrome c from the mitochondria into the cytosol where it binds the apoptotic protease activating factor resulting in cell death.

Pollinator accessibility and connectivity of the Flowering dogwood (*Cornus florida*) across an urban landscape gradient

Presenter: Angela P. Hutto
Advisor: Rodney Dyer
Virginia Commonwealth University,
Environmental Studies

Urbanization greatly alters the physical and functional aspects of an environment, including floral and faunal interactions. Pollinator mobility in urban environments may be limited or assisted by the structural composition of urban areas, potentially affecting pollination rates of insect-reliant flora and subsequently impacting the genetic connectivity of populations not only within urban settings but also between urban and rural plant populations. The interaction of plants and pollinators in the context of urban environments is still not fully understood despite growing research interest in the area of urban ecology. This study uses a Flowering dogwood (*Cornus florida*) population in the urban setting of Richmond, Virginia to assess the impacts of urban structural elements on the movement and accessibility of pollinators. We studied pollination success and seed set of dogwoods along an urban gradient from Richmond City to Charles City County. Preliminary data show that urban dogwoods had a significantly higher pollination success rate than those in the rural environment. Spatially explicit analyses of reproductive success show alternating influences of floral isolation and proximity to existing physical structures along this gradient. These results suggest that local ecological context has the ability to significantly influence population persistence in this ubiquitous understory tree.

Ecosystem Health and Functioning in the Understudied Aquatic-Terrestrial Ecotone: Bridging the Gap with Spatial Models

Presenter: Robert E. Isdell
Advisor: Matthias Leu
College of William & Mary,
Biology

Knowledge of the spatial connection of ecological processes is essential to understanding ecosystem function and providing accurate assessments of ecosystem health, particularly at the terrestrial-aquatic interface. At this interface, a degradation or loss of processes in either terrestrial or aquatic realms has the potential to disrupt ecological functions in both systems. Nowhere, perhaps, is disruption more evident than throughout one of the world's largest estuaries, the Chesapeake Bay. For centuries, humans have modified both terrestrial and aquatic systems within this region by resource use for sustenance, defense, and socioeconomic gain. Today, the connectivity of ecological processes within the Chesapeake Bay and its watershed is severely disrupted. To increase our understanding of the interaction between terrestrial and aquatic ecosystems and how human stressors influence ecological processes in this ecotone, I propose to model the spatial distribution of diamondback terrapins (*Malaclemys terrapin*) throughout the lower Chesapeake Bay. I will develop a spatially explicit occupancy model based on human stressors (land-use, shoreline modification, and crabbing pressure) and environmental variables (riparian buffer, bathymetry, salinity, marsh composition, and wave action) to estimate the probability of occurrence of diamondback terrapins. I expect terrapin distribution to be negatively correlated with increasing anthropogenic disturbance. This will be one of the first studies to examine the effects of human stressor intensity and extent on the terrestrial-aquatic interface across broad scales.

Role of Type 1 Corticotropin Releasing Factor Receptors in the Dorsolateral Bed Nucleus of Stria Terminalis in the Mediation of Anxiety During Periods of Chronically Elevated Corticosterone

Presenter: Katelyn E. Kinsley
Advisor: Jack Shephard
Towson University,
Biological Sciences

It is well established that enhanced secretion of glucocorticoids, such as corticosterone, causes increased anxiety-like behaviors in rats. Recent studies demonstrate a role for corticotropin releasing factor (CRF) in mediation of this behavior, and in the development of anxiety disorders. Several areas of the brain, including the dorsolateral bed nucleus of stria terminalis (dlBNST), have been identified as possible sites of action for CRF. The goal of the proposed research is to demonstrate how CRF type -1 receptors in the dorsolateral BNST affect anxiety-like behaviors in rats during periods of chronically elevated corticosterone. Subcutaneous corticosterone implants will be placed in male Wistar rats to elevate circulating levels of corticosterone. Then, microinjection guide cannulae will be positioned bilaterally in the dorsolateral BNST using surgical stereotaxic technique. Seven days post-operation, Antalarmin, a CRF type-1 receptor antagonist, will be microinjected through the guide cannulae. Rats will then be tested for levels of anxiety using the elevated plus maze and open field test. I hypothesize that Antalarmin delivery to the dorsolateral BNST will reduce anxiety, indicating that CRF plays a role in the mediation of anxiety-like behavior when glucocorticoids are chronically elevated. This study may aid in the understanding of how CRF mediates anxiety as well as provide possible targets for new drug development.

Does mercury contamination affect risk-taking behaviors in a small songbird? Trade-offs between eating and being eaten

Presenter: Megan Kobiela
Advisor: John P. Swaddle
Co-Author: D. Cristol
College of William & Mary,
Biology

Methylmercury (MeHg) is a known toxin that persists in many ecosystems worldwide and can cause reproductive failure, reduced cognitive ability, and increased mortality. However, there has been no research on how MeHg affects the tradeoff between starvation risk and predation risk in birds. Managing this tradeoff is essential to fitness because a bird that is too occupied with foraging is likely to be eaten whereas a bird avoiding all predation risk will likely starve. Because a large suite of physiological abilities (e.g., visual acuity, reaction time) and cognitive assessments of risk are involved, a neurotoxin such as MeHg may cause suboptimal tradeoffs. To elucidate any negative effects, I ask whether MeHg-dosed birds differ from control birds in basic foraging, vigilance, and mass regulation.

Disturbance-dependent species area relationships in riverine rock pool communities

Presenter: Rachel Komosinski
Advisor: James Vonesh
Co-Authors: S. Caplins, J. Charbonnier, Z.Costa, C. Crockett
Virginia Commonwealth University, Biology

The species-area relationship (SAR) is a fundamental ecological pattern. Determining the factors shaping this relationship is critical for understanding patterns of biodiversity across communities. MacArthur and Wilson's equilibrium theory of island biogeography (ETIB) provides a conceptual framework for identifying factors shaping SARs. The ETIB posits that larger patches will have higher immigration and lower extinction rates and therefore support more species. Factors that affect immigration and extinction rates independently of area may weaken this relationship. We extend MacArthur and Wilson's ETIB by including disturbance-driven shifts in both extinction and immigration rates, and test these ideas within a system of isolated rock pools that experience frequent flooding. We propose that flooding may increase immigration of riverine taxa into isolated pools and increase extinction rates by washing taxa from pools. Both of these effects will weaken the SAR but result in different taxa abundances. We examined SARs in a system of 35 rock pools on the James River in Richmond, Virginia, before and after a flooding event. We generated species accumulation curves and estimate asymptotic species richness for 19 pools before and 16 pools after flooding. We sampled 3162 individuals from 47 different taxa, and estimated pool richness ranged from 2.5 to 27.4 taxa. As predicted, flooding reduced the strength of the SAR. The observed weakening of the SAR was largely driven by increased extinction rates of taxa with complex life cycles rather than increased colonization of riverine species.

Towards understanding the functional role of ZBTB20, a putative synaptic molecule, in autism and intellectual disability

Presenter: Richa Koul
Advisor: Anand Srivastava
Clemson University, Genetics and Biochemistry

Autism spectrum disorder (ASD) and intellectual disability (ID) are the two most frequently reported, often co-morbid, neurodevelopmental disorders that affect children all over the world. Recently, we identified mutations in the ZBTB20 gene which were associated with susceptibility to ASD and ID. The gene is highly expressed in developing brain and encodes two protein isoforms of a BTB (broad complex, tramtrack, bric-a-brac) – zinc finger family of transcription factors. The ASD and ID-associated ZBTB20 missense mutations affected dendritic and synaptic structure of pyramidal neurons. To elucidate the potential molecular links and pathways by which the ZBTB20 protein functions in neuronal cells, we used yeast-two-hybrid technology-based screening to identify brain-expressed proteins that interact with ZBTB20. Preliminary analysis revealed that three interacting proteins are secreted glycoproteins involved in cell growth regulation. Proteins NELL2 (neural epidermal growth factor-like 2) and LTBP4 (latent transforming growth factor beta binding protein 4) contain epidermal growth factor like repeats and protein PGRN (granulin precursor) contains repeats of the granulin/epithelin motif. ZBTB20 contains a predicted conserved sumoylation motif. We found that it interacts with the SUMO-conjugating enzyme, UBC9, suggesting that ZBTB20 undergoes sumoylation. This modification of the ZBTB20 protein likely regulates its subcellular localization or transcription regulation activity. Further functional analyses of the ZBTB20 interacting proteins will help define the molecular mechanisms underlying the physiological actions of ZBTB20 in neurons and its potential role in ASD/ID.

Determining Structure/Function Relationships of Novel Antimicrobials

Presenter: Jade LaDow
Advisor: Kyle Seifert
Co-Authors: K.Caran, K. Minbiole, K. Wilson-Henjum, J. Barragan
James Madison University, Biology

Multi-drug resistant bacteria necessitate novel ways of controlling their growth and spread to humans, particularly those with underlying conditions that make them more susceptible to infection, such as those in hospitals or long-term care facilities. Previous work in our lab determined the antibacterial capabilities of bicephalic (double-headed) amphiphiles with two trimethylammonium head groups and a single linear alkoxy tail. Antibacterial activities were affected by chain length of the hydrophobic region and modestly reliant on head group positioning. The current study expands upon this work, using novel amphiphiles with combinations of 0-3 various head groups and 1-3 hydrophobic tails. Preliminary data suggest that minimum inhibitory concentrations of some of these compounds are in the low micromolar range against four different bacteria, including Pseudomonas aeruginosa, a difficult to treat organism. We will continue to evaluate these compounds to determine if there are relationships between structure and antibacterial activity to generate potent antibacterial compounds.

Investigation of Prophage II in *Helicobacter pylori* Clinical Isolates

Presenter: Kevin A. Leslie
Advisor: Mark Forsyth
College of William & Mary, Biology

Helicobacter pylori colonizes in the human stomach and causes gastroduodenal complications ranging from ulcer disease to cancer. A major virulence determinant of this pathogen is the cag Pathogenicity Island (cag PAI) and isolates possessing this element are more frequently associated with severe disease outcomes. For bacteria in general, prophage are also frequently associated with bacterial virulence. Our research analyzed the presence and inducibility of prophage in a set of *H. pylori* clinical isolates. In addition, the effects of prophage sequence presence on bacterial gene expression is being investigated. Experimental data indicate a significant correlation between the absence of prophage sequence and the presence of the cag PAI in our collection's strains. TEM and epifluorescence microscopy have indicated presence of viral particles from strains induced with UV irradiation. Despite the successful generation of a plasmid vector for use in the creation of a knockout mutant, previous transformation attempts have been unsuccessful (though efforts are ongoing). Continued investigation will enable a better understanding of important virulence mechanisms and the role prophage play in this clinically relevant species.

The Expression and Tissue Distribution of Alternatively Spliced Pax5 Isoforms in the Immune System of Rainbow Trout

Presenter: Elizabeth A. MacMurray
Advisor: Patty Zwollo
College of William & Mary,
Biology

Pax5 is the master regulator of B cell development, activation, and differentiation. Because Pax5 regulates B cell proliferation, misexpression of alternatively spliced Pax5 isoforms is associated with lymphomas and other malignancies. Although specific alternatively spliced isoforms are suspected to associate with disease, a more thorough understanding of their role in B cell development must be garnered to further elucidate this correlation. Thus, to characterize the expression of Pax5 isoforms in individual developing B cells, we are currently utilizing two-color flow cytometry with antibody staining for four immune tissues in Rainbow Trout, an organism with isoform patterns comparable to human isoforms. By applying antibodies against five different regions of Pax5, we hope to demonstrate unique patterns of isoform expression, both in the frequency of Pax5 cell populations and the relative abundance of Pax5 isoforms in individual cells. Preliminary results suggest a role for isoforms containing exon 6 and exon 10 of Pax5 during B cell development. Additionally, there appear to be multiple "B" cell populations which presumably either possess or lack the Pax5 DNA binding domain. These cell populations vary across spleen, blood, anterior kidney, and posterior kidney. Further research using LPS activation and three-color antibody staining will demonstrate the role of these isoforms in B cell activation and additionally provide further insight into the coexpression of multiple Pax5 antibodies.

Novel Protein SPE-7 is Required for Fibrous Body Assembly and Chromosome Segregation in *C. elegans*

Presenter: Kari Messina
Advisor: Diane Shakes
Co-Author: M. Presler
College of William & Mary,
Biology

The development of functional spermatozoa from uncommitted germ cells requires the progression of two distinct yet presumably interacting cellular programs: the meiotic and cell differentiation programs of spermatogenesis. One spermatogenesis-defective factor required for the normal progression of both of these programs is SPE-7. SPE-7 regulates the assembly of a key cytosolic protein, MSP, into inactive structures called Fibrous Bodies (FBs) during the initial stage of nematode spermatogenesis. In wildtype spermatocytes SPE-7 localizes somewhat dynamically to FBs before it is degraded in spermatids. *spe-7* mutants express MSP but do not assemble FBs and exhibit additional defects in chromosome segregation, cytokinesis, and cell cycle progression. SPE-7 is not sufficient for FB assembly as the Casein Kinase SPE-6 is also required. In the absence of SPE-6, spermatocytes arrest prior to the meiotic divisions with stable SPE-7 aggregates. This finding suggests that SPE-6 may regulate SPE-7 resulting in a new conformation that allows SPE-7 to organize FB assembly. We are employing immunocytological and biochemical assays to examine potential post-translational modifications that may regulate SPE-7 and also explain its dynamic localization within the developing spermatocyte.

Using an Occupancy Model of a Neotropical Migrant Bird to Correlate Probability of Occurrence with Productivity

Presenter: Morgan D. Niccoli
Advisor: Matthias Leu
College of William & Mary, Biology

As the human population continues to grow, urban land cover will become the dominant land cover world-wide. Unfortunately, habitat loss is detrimental to wildlife populations. In order to support humans and wildlife, conservation biologists must find ways to maximize biodiversity while having the least impact on humans' social and economic needs. Tools such as Geographic Information Systems (GIS) and satellite imagery allow researchers to delineate optimal conditions for conservation by identifying land cover types most important for long-term conservation. Land cover types important for conservation can be identified by developing species distribution models. Species distribution models are based on relating species occurrence against environmental variables and human stressors. However, to my knowledge, no study has examined whether probability of occurrence positively correlates with productivity of the species. The objective of this study is to create an occupancy model for a Neotropical migrant bird species and correlate the probability of occurrence with demography data collected during the summer of 2011. I predict that a negative correlation will exist between the probability of occurrence and productivity of the Wood Thrush (*Hylocichla mustelina*) because unpaired males tend to sing at higher rates compared to paired males and maybe more likely to be detected.

Using Occupancy Patterns to Infer Landscape Connectivity for Breeding Anurans

Presenter: Dan Ramos
Advisor: Matthias Leu
College of William & Mary, Biology

Landscape connectivity is critical to maintaining viable populations within patches of suitable habitat and is a function of the surrounding matrix's resistance to an organism's movement. As land use within the matrix varies it can be expected that landscape connectivity will vary and as connectivity decreases, the probability of habitat occupancy by a species will decrease as well. Recognizing the inherent difficulty in directly measuring landscape connectivity, our study proposes to model the relationship of Anuran, frog and toad, distributions to anthropogenic land use in the landscape matrix as a proxy for measuring connectivity. We will use calling survey data of breeding Anurans to model occupancy probabilities in potential breeding ponds in eastern Virginia. Occupancy modeling is a likelihood-based method to estimate occupancy probabilities when the probability of detecting a species is less than one. Anthropogenic land use in the matrix around breeding sites will be calculated in a Geographic Information System using a land cover map. The output of this analysis will ultimately be used to develop a spatially explicit landscape connectivity model for Anuran species in eastern Virginia. This connectivity model will enable land managers to evaluate impacts of proposed land uses on landscape connectivity and Anuran population viability.

Mechanism of Mesenchymal Condensation during Chick Middle Ear Morphogenesis

Presenter: Poulomi Ray
Advisor: Susan Chapman
Clemson University,
Biological Sciences

The middle ear is an excellent model system for exploring fundamental principles of organ morphogenesis. A critical event during cranial morphogenesis is the condensation of migrated neural crest cells to form skeletal primordia. Our objective is to understand the mechanism of mesenchymal condensation during middle ear development in order to understand the physical processes necessary for patterning correct skeletal size and shape. Our model is the chick embryo, containing a single middle ear bone - the columella. The columella spans the middle ear cavity from the proximal inner ear to the distal tympanic membrane. The hypothesis is that dynamic cell shape changes drive condensation during morphogenesis of the columella, which is required to form the cartilage. We have visualized temporal cell shape changes in the putative columella region using fluorescence immunohistochemistry. Our results demonstrate that dynamic cytoskeletal reorganization and cell shape changes occur over several days, resulting in a cartilage template of correct size and shape. Currently, we are undertaking experiments to inhibit the cell shape changes in our region of interest to determine if dynamic cell shape changes drive mesenchymal condensation. Our experiments will be helpful in understanding the general principle of self-assembly of multi-potent progenitor cells to form a specific cartilage template.

Investigating the role of the pseudophosphatase MK-STYX in the stress granule life cycle

Presenter: Lauren Rusnak
Advisor: Shantá Hinton
College of William & Mary,
Biology

Environmental factors such as UV irradiation and hypoxia stress cells. Fortunately, cells have protective responses against stress that promote their survival. Mammalian cells respond to stress by assembling cytoplasmic compartments known as stress granules. Stress granules allow cells to adapt to stress by storing mRNA, and re-routing it for translation, degradation, or continued storage. The protein G3BP1 [Ras-GAP (GTPase-activating protein) SH3 (Src homology 3) domain-binding protein-1] participates in stress granule formation. We have shown that the pseudophosphatase MK-STYX [MAPK (mitogen-activated protein kinase) phosphoserine/threonine/tyrosine-binding protein] interacts with G3BP1 and inhibits stress granule formation. Our research explores the role MK-STYX has in disassembling stress granules and/or blocking their formation, as this mechanism is currently unknown. Additionally, since MK-STYX's interaction partner, G3BP1, has a role in Ras and Rho signaling pathways, we will investigate the effect MK-STYX has on these proteins. A modified U2OS cell line will be used that is constituently expressing G3BP1 with a fluorescent tag, allowing for easy visualization of the protein using fluorescence microscopy. We will determine if MK-STYX inhibits stress granule formation via Ras and Rho signaling pathways, which play a large role in diseases such as cancer and Alzheimer's. Multiple transfections with plasmids containing different versions of the various proteins, such as Ras, will be used to alter protein expression and immunoprecipitation experiments will help determine protein interactions. Determining the molecular mechanism of MK-STYX will provide an important model for pseudophosphatases as regulators of the stress response pathways.

The budding yeast Mei5-Sae3 complex interacts with Rad51 and preferentially binds a DNA fork structure

Presenter: Amanda F. Say
Advisor: Michael Sehorn
Co-Authors: L. Ledford, D. Sharma
Clemson University,
Genetics and Biochemistry

Meiotic homologous recombination in eukaryotes is dependent upon two conserved recombinases, Rad51 and Dmc1. Defective meiotic recombination leads to immunodeficiency, cancer, and birth defects like chromosomal aneuploidy. *Tsubouchi and Roeder (2004)* show that mutations in *MEI5* or *SAE3* in Saccharomyces cerevisiae lead to reduced sporulation, spore viability, and crossing-over events. *Ferrari et al. (2009)* demonstrated the Mei5-Sae3 complex functions as a recombination mediator that promotes nucleation of Dmc1 on single strand DNA. However, the possibility that the Mei5-Sae3 complex functions with Rad51, the other recombinase present during meiosis, remains unclear. To this end, we purified Mei5, Sae3 and the Mei5-Sae3 complex to biochemically determine their role in Rad51 mediated recombination activities. Our results show that the Mei5-Sae3 complex preferentially binds a fork-like DNA substrate. The N-terminal domain of Mei5 harbors the DNA binding activity of the Mei5-Sae3 complex. Although we show that the N-terminal domain of Mei5 interacts with the Rad51 recombinase, the Mei5-Sae3 complex lacks recombination mediator activity for Rad51 in a strand exchange assay. Mei5-Sae3 differs from a well-characterized Rad51 recombination mediator, Rad52, in that Mei5-Sae3 lacks single-strand DNA annealing activity. Our findings reveal that Mei5-Sae3 may serve to coordinate the activity of the Rad51 and Dmc1 recombinases in meiosis.

Characterization of Porcine Argonaute-2

Presenter: Heather M. Stowe
Advisor: Scott Pratt
Clemson University,
Animal and Veterinary Sciences

MicroRNAs (miRNAs) are small non-coding RNAs that form RNA-protein complexes that bind to messenger RNAs (mRNAs) and block specific protein production – a regulatory process used in reproduction and development. Argonaute proteins are the primary proteins of the acting complex, but only Argonaute-2 (Ago2) exhibits the activity to degrade the targeted mRNAs. The domestic pig (*Sus scrofa*) is an excellent model to study specific aspects of reproduction; however, porcine Ago2 (pAgo2) has not been characterized. The objective of this study was to identify the cDNA sequence for pAgo2 and verify its expression in reproductive tissues. The pAgo2 cDNA sequence identity was determined by conducting RT-PCR on porcine ovarian total cellular RNA using primers designed to highly-conserved overlapping fragments of aligned mammalian Ago2 cDNA. The PCR products were subcloned and sequenced in quadruplicate. To confirm Ago2 expression, SDS-PAGE and western blotting were performed using porcine ovary whole cell lysate. The predicted consensus coding sequence for pAgo2 was 2583 nucleotides and is predicted to produce an 860 amino acid protein with 92.2 and 99.5% identity to human Ago2 at the nucleic and amino acid levels, respectively. Two possible splice variants of pAgo2 were also identified. Western blotting and immuno-detection identified a major band of ~97 kDa corresponding to the predicted 860 amino acid sequence; however, while other cross-reacting bands were detected, none corresponded to the predicted size proteins from the splice variants. Characterizing Ago2 expression in reproductive tissues is an important step in understanding the miRNA pathway's function in reproduction.

CRM1-independent Nuclear Export of the Thyroid Hormone Receptor is Mediated by Exportin 5

Presenter: Kelly Subramanian
Advisor: Lizabeth Allison
Co-Author: H. Nelson
College of William & Mary,
Biology

Thyroid hormone receptors (TRα and TRβ) are nuclear receptors that bind to thyroid hormone to activate or repress target genes involved in metabolism, growth, and development. Although primarily found in the nucleus, TRα and TRβ rapidly shuttle in and out of the nucleus through the nuclear pore complex. Previously, we showed that TR nuclear export is not completely blocked when cells are treated with leptomycin B to inhibit the export factor CRM1, suggesting that TR can also exit the nucleus by a CRM1-independent pathway. To determine which export factors are involved in this pathway, RNAi was used to knockdown gene expression of transportin 1, transportin 2, exportin 5, and exportin 6. The effect of knockdown on the distribution of GFP-tagged TRα and TRβ was assessed in live HeLa cells using fluorescence recovery after photobleaching (FRAP). Knockdown of exportin 5 altered TRs nuclear export dynamics; recovery was markedly slower in photobleached nuclei, indicating that nuclear export was inhibited. To determine whether increased nuclear export had an impact on TR-mediated gene expression, we co-expressed TRα and TRβ, exportin 5, and a thyroid hormone response element (TRE)-mediated CAT reporter gene. CAT ELISA showed a decrease of TRE-mediated CAT reporter gene expression when increased amounts of exportin 5 were present. Further, we showed that when exportin 5 is overexpressed, the distribution of TR shifts to a more cytoplasmic localization. Taken together, our data suggest that TR nuclear export is mediated, in part, by exportin 5, and that disrupting the fine balance between nuclear import and export can lead to changes in TR-mediated gene expression.

On The Eternal Life of Tannins: effect of tannin quality on soil enzyme inhibition

Presenter: Daniella Triebwasser
Advisor: Nishanth Tharayil
Clemson University,
Entomology, Soils, and Plant Sciences

Litter decomposition, a vital process that sustains ecosystem productivity by recycling nutrients, is mediated by soil microbial enzymes. Tannins are protein precipitating polyphenolic compounds present in plant tissues which defend against herbivory. Upon senescence, tannins retard decomposition of litter by forming a tannin-protein complex with microbial enzymes that decreases the catabolic efficiency of enzymes. The tannin complexation efficiency is dependent upon the quality of the tannin which is unique to each plant species and the protein/enzyme structural features. Structurally tannins are divided into two: condensed tannins (CT) produced by both angiosperms and gymnosperms, and hydrolysable tannins (HT) produced by angiosperms. Traditionally, based on their higher ability to precipitate proteins, CTs are considered more ecologically relevant. However, since protein precipitation rarely translates to enzyme inhibition capacity, and since HTs are found in the more evolutionarily advanced angiosperms, we hypothesized that HT-containing species would have equal or greater enzyme inhibition than CTs. Secondly, this difference would depend on the history of the soil microbial community's exposure to various tannins.. We tested tannin inhibition susceptibilities of three soil enzymes from two sites with different tannin histories. Contrary to previous findings, we found evidence supporting that HT-containing tannins have equal or greater inhibition than CTs -this interaction was dependent upon the site, enzyme and tannin concentration with HT tannins inhibiting enzymes in both HT and CT site. Ecologically, our study suggests that HT increases the stress faced by the microbial community requiring more total enzymes to maintain ambient decomposition rates.

Beyond the blast: The effects of explosives on plants

Presenter: Stephen Via
Advisor: Donald Young
Virginia Commonwealth University, Biology

There are roughly 110 million landmines currently buried across 68 nations, most at unspecified locations. Persistent landmines pose two environmental threats; one being their explosive potential and the other being the leaching of explosives. My objective was to compare physiological responses of a native shrub species *Morella cerifera* to two common explosives, RDX and TNT, to determine the potential for remote detection of explosives. Based on the mobility of the compounds and known effects on plant metabolism I hypothesized that RDX would have a greater impact on plant physiology relative to TNT. Adult individuals were treated for 8 weeks in low nutrient soils contaminated with various concentrations of explosives: up to 1500 mg RDX kg-1 dry soil and 900 mg TNT kg-1 dry soil. All contaminated individuals were measured against standard controls grown in uncontaminated soil. Measurements of gas exchange, chlorophyll fluorescence, chlorophyll concentration, and leaf reflectance were taken at the beginning and end of the experiment. RDX concentrations induced a greater physiological response relative to TNT treated plants, which was characterized by reduced photosynthesis and chlorophyll florescence. RDX contamination also resulted in morphological degradation in the form of necrosis, leaf reduction, and leaf curling whereas there were no visible morphological impacts of TNT contamination. My results indicate that remote sensing may be used to detect physiological variations among plants and thereby indicate the presence of buried explosives.

Electroless Gold Deposition For Micro-Gas Chromatographic Column Fabrication

Presenter: Jessica L. Belton
Advisor: Gary Rice
College of William & Mary,
Chemistry

Gas chromatography (GC) typically requires bench-top systems that limit the ability for on-site analysis. Portable GC systems that retain separation/ detection attributes of commercial systems require miniaturizing all GC components, in particular the column used for analyte separations. The development of capillary channels etched within silicon microchips to produce comparable GC columns has been a challenge; as previously developed micro-capillaries using conventional stationary phases in the capillary channels have not yielded adequate separation efficiencies. To overcome this hurdle, functionalizing the capillary with a long-chain organothiol through self-assembled monolayers (SAM's) attached to a gold surface has been the focus of this research. Although this has been accomplished using gold electrodeposition onto the surface prior to sealing the chips, there have been no reports of using electroless deposition as reported here. In this method, an anionic polymer, Poly (diallyldimethylammonium chloride), or PDDA, is initially coated on the internal capillary surface. A solution containing colloidal chloroauric acid (HAuCl4) nanoparticles is then added to adhere to the PDDA through chemisorption and provide a preliminary gold monolayer. A hydroxylamine/ HAuCl4 solution is finally added to reduce the auric acid and propagate nucleation of free gold particles onto the column surface. A solvated organothiol compound can then be self-assembled to the gold layer to create a stationary phase for GC separations. Optimizing the gold reduction process to produce a uniform gold layer has proven to be a significant hurdle for development of this micro-column technology.

Fabrication of aligned F-actin array patterns on inorganic substrate

Presenter: Zachary A. Jones
Advisor: R. Llyod Carroll
Co-Authors: Y. Lee, P. Famouri, L. Holland
West Virginia University,
Chemistry

Biological motor protein systems, particularly the muscular tissue components myosin and actin, are of great interest for bionanotechnological applications. F-actin has been shown to undergo rapid motion across myosin-modified surfaces in the presence of ATP. However, directional control of motion has yet to be achieved. We report the preparation of patterns of polarized F-actin at the sub-100 mm level using covalent substrate modifications and bioconjugate coupling between streptavidin, biotin, gelsolin and actin. Patterned arrays of F-actin serve as a base for directionally-controlled transport of myosin-modified beads. Two patterning methods were employed and compared to determine which could produce the most highly-resolved F-actin patterns; a lithographic technique using a photoreactive derivative of biotin and a microcontact printing technique using the bifunctional amine cross-linker, glutaraldehyde. Our goal is to design unidirectional pathways for myosin transport, ultimately for integration in to devices and lab-on-a-chip systems.

The synthesis of malbrancheamide B featuring a stereoselective Diels-Alder cycloaddition

Presenter: Stephen W. Laws
Advisor: Jonathan Scheerer
College of William & Mary,
Chemistry

Malbrancheamide B (MalB), a fungal metabolite isolated in 2006, acts as an antagonist to the calmodulin (CaM) protein and inhibits CaM-dependent phosphodiesterase activity. MalB is structurally defined by its bicyclo[2.2.2]diazaoctane core, which is characteristic of the malbrancheamide family of molecules. Several synthetic routes have been explored to prepare the bicyclo[2.2.2] scaffold, but none have been able to construct this core with selectivity or reasonable brevity. The focus of our work has been on a biomimetic preparation of the malbrancheamide core using an intramolecular Diels-Alder cycloaddition. Incorporating this reaction into our synthesis not only reduces the number of steps necessary to install this key feature, but also allows for the introduction of stereoselectivity. In our synthesis, the Diels-Alder reaction forms two diastereomers with a preference for the cycloadduct with the same chirality as the natural product. In this study we aim to demonstrate the utility of the Diels-Alder reaction in the syntheses of natural products with bicyclo[2.2.2]diazaoctane core structures.

Structural basis for the regulation of endothelin-1 mRNA stability by glyceraldehyde-3-phosphate dehydrogenase

Presenter: Jacob P. Neal
Advisor: Elsa Garcin
University of Maryland, Baltimore County,
Chemistry and Biochemistry

Glyceraldehyde-3-phosphate dehydrogenase (GAPDH) plays a key role in vascular homeostasis by modulating expression levels of the vasoconstrictor endothelin-1 (ET-1). Elevated ET-1 levels are associated with vascular diseases, and its expression is tightly regulated primarily via GAPDH-mediated destabilization of its mRNA. Recent studies suggest GAPDH binding of adenine-uridine rich elements in the 3'-untranslated region (3'-UTR) of ET-1 gene leads to decreased mRNA stability. However, structural and mechanistic details underlying the GAPDH-mediated control of ET-1 expression are lacking. We seek to probe the structural and mechanistic basis for the GAPDH-induced destabilization of ET-1 mRNA via electrophoretic mobility shift assay (EMSA), isothermal titration calorimetry (ITC), and x-ray crystallography. To identify specific GAPDH binding sequences, we constructed short RNA transcripts of the putative mRNA binding region. Utilizing ITC and EMSA, we obtained association and dissociation constants. For transcripts yielding the greatest affinity for GAPDH, we conducted co-crystal screens and obtained crystals. Ultimately, we aim to solve the co-crystal structures for these ET-1 mRNA constructs with GAPDH. These studies will provide the first molecular basis for structure-based drug design, leading to the development of novel molecules that specifically target ET-1 mRNA.

Effects of nucleophilic strength on facial selectivity in $BiBr_3$ catalyzed tandem cyclization/addition reactions

Presenter: Ajara A. Rahman
Advisor: Robert Hinkle
Co-Authors: R. Lambert, S. Ammann
College of William & Mary,
Chemistry

Catalytic quantities of inexpensive $BiBr_3$ were used as a mild promoter for the formation of intermediate 6-membered oxocarbenium ions from δ-silyloxyketones. In the presence of a silylated nucleophile, intermolecular attack of the ion provides 2,2,6-trisubstituted tetrahydropyrans via a tandem cyclization/addition sequence. With weak nucleophiles such as allyltrimethylsilane, high yields of products resulting from axial attack of the nucleophile were observed with complete diastereocontrol (>99:1). The relative stereochemistry of addition was confirmed via X-ray analysis. When strong nucleophiles such as ketene silyl acetals were used, notable decreases in chemical yield were observed and competing reactions occurred. We will describe the results from reactions using a number of different substrates as well as nucleophiles with varying reactivities.

Luminescent nitrogen and sulfur adducts of CuI disubstituted piperazine complexes

Presenter: Jason P. Safko
Advisor: Robert Pike
Co-Authors: L. Dunaway, S. McCullough
College of William & Mary,
Chemistry

Disubstituted piperazine compounds can be used to produce three coordinate metal complexes with CuI. These complexes are of interest because they are often fluorescent and have an available fourth coordination site that can take in a gaseous amine or sulfides, making them an ideal candidate for a small molecule detector. Various disubstituted piperazines were synthesized and characterized via x-ray crystalography and proton and carbon NMR. These piperazines were then reacted with CuI to determine the ideal substituent combination that would provide the best detector characteristics. (CuI) 2Bz2Pip was found to be the most consistently reactive with the widest variety of gaseous amines and sulfides, while also being non-fluorescent in its unreached form and becoming fluorescent once exposed to gaseous amines and sulfides. These adducts were then characterized by TGA, X-ray powder diffraction, and their fluorescent properties were analyzed via a fiber optic fluorimeter.

Using Dynamic Importance Sampling to Explore Conformational Space in HCV 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 and causes approximately 35,000 new infections in the U.S. each year. Though there are treatments available, they cause many unpleasant effects and are not completely effective. HCV contains a positive sense single-stranded RNA genome and replicates with the aid of RNA dependent RNA polymerase (RdRp). This polymerase is known to have two different conformations: an open inactive conformation and a closed active conformation. Only the open conformation have been seen with an inhibitor bound. Our goal is to understand how this transition occurs in order to determine how allosteric inhibitors stop the replication of HCV. These inhibitors are termed “allosteric” because they bind to the enzyme at locations other than the active site. To accomplish this goal we employ the Dynamic Importance Sampling Algorithm (DIMS). DIMS is a pathway finding algorithm that gives information about the intermediate states between defined starting and ending points. In our case of study this starting and ending points are the coordinates of the open and close conformations obtained from the Molecular Dynamics (MD) simulations we performed of RdRp previously. The DIMS algorithm will allow us to sample the conformations of intermediates between the open and close conformations so we can get a better understanding of how this transition takes place, what motions facilitate the transition and what role it plays in enzyme inhibition.

In Vivo Incorporation of a Visible Wavelength Fluorescent Amino Acid

Presenter: Lee C. Speight
Advisor: Ernest Petersson
Co-Authors: J. Goldberg, R. Mehl
University of Pennsylvania, Chemistry

Site-specific incorporation of fluorescent probes into proteins enhances the ability of researchers to study protein dynamics, structure, and cellular localization. Fluorophores with unique photophysical properties can serve as selective probes in complex intrinsically fluorescent cellular environments. Acridon-2-yl alanine (Acd) is a small, visible wavelength fluorophore with a high quantum yield. Acd has an unusually long lifetime, making it useful in fluorescence lifetime imaging. Site-specific cotranslational incorporation of Acd through amber (TAG) codon suppression has been previously reported using in vitro translation using a semi-synthetic aminoacyl tRNA. However, production of the aminoacyl tRNA is a labor intensive and time consuming process. Presently, we report the identification of an aminoacyl tRNA synthetase (aaRS) capable of charging Acd onto tRNA for incorporation into proteins in E. coli using amber suppression methods. This orthogonal tRNA and aaRS system allows for more efficient and higher yield production of proteins containing Acd than semi-synthetic tRNA. We are currently investigating the optimization of the orthogonal Acd tRNA/aaRS pair as well as the environmental sensitivity of the Acd fluorophore.

A Versatile Model for Stem Cell Growth

Presenter: Samiur R. Arif
Advisor: Stephan Olariu
Old Dominion University,
Computer Science

Stem cell research promises to revolutionize regenerative medicine and to open new avenues for fighting cancer. A fundamental ingredient in stem cell research is modeling the expansion process of the undifferentiated stem cell phenotype. A first natural step in understanding the expansion process is to get a handle on the kinetics of stem cell proliferation. Accumulated empirical evidence has demonstrated that stem cell growth is characterized by proliferative heterogeneity. Therefore, it is important to produce growth models for stem cells that are inherently heterogenous and account for mitosis, quiescence, senescence and death. Somewhat surprisingly, the overwhelming majority of growth models for stem cells, including the well known Sherley model and hyperbolastic model, are deterministic. While simple and tractable, deterministic models lack flexibility and versatility and are often too rigid to accurately describe stem cell populations that have high variability and heterogeneity. Our contribution is to propose a simple, versatile stochastic model that can be used to model and predict the proliferation of stem cells. Our model is a modified three-parameter birth-and-death model where the parameters can be fine-tuned to accommodate the proliferative heterogeneity of stem cell populations. We demonstrated that versatile model can accurately represent the dynamics of stem cell proliferation for both embryonic and adult mesenchymal stem cells.

Analytics for Everyone: A Post-Crisis Reflection of Housing Starts from 1973-2007

Presenter: Myles Baker
Advisor: Lawrence Leemis
College of William & Mary,
Computational Operations Research

The rapid decline in price and increased availability of digital storage and computational tools in the last decade presents a wealth of opportunities for analysis of large data sets. The importance of 'big data' is increasing and the need for individuals who can understand data significance in large financial operations is invaluable. This presentation reflects upon housing starts leading up to the burst of the housing bubble in late-2008, and proposes a re-imagination of the process of data analytics: using tools provided by William & Mary, any student interested in understanding the United States housing situation can create a visual representation of housing starts and predict the housing collapse that occurred starting in 2007. This talk provides a cursory generalization of time series analysis and ways for anyone interested in analytics to acquire the skills needed to begin analyzing data and making inferences about quantifiable processes.

FRIEND: A Cyber-Physical System for Traffic Flow Related Information AggrEgatioN & Dissemination

Presenter: Samy El-Tawab
Advisor: Stephan Olariu
Old Dominion University,
Computer Science

The major contribution of this research work is to lay the theoretical foundations of FRIEND – A cyber -physical system for traffic flow-related information aggregation and dissemination. By integrating resources and capabilities at the nexus between the cyber and physical worlds, FRIEND will contribute to aggregating traffic flow data collected by the huge fleet of vehicles on our roads into a comprehensive, near real-time synopsis of traffic flow conditions. We anticipate providing the drivers with a meaningful, color-coded, at-a-glance view of flow conditions ahead, alerting them to congested traffic. The workhorses of FRIEND are the ubiquitous lane delimiters (a.k.a. cat-eyes) on our roadways that, at the moment, are used simply as dumb reflectors. Our main vision is that by endowing cat-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. We envision the cat-eye system to be supplemented by roadside units (RSU) deployed at regular intervals (e.g., every kilometer or so). The RSUs placed on opposite sides of the roadway constitute a logical unit and are connected. Unlike inductive loop detectors, adjacent RSUs along the roadway are not connected with each other, thus avoiding the huge cost of optical fiber. Each RSU contains a GPS device (for time synchronization), an active Radio Frequency Identification (RFID) tag for communication with passing cars, a radio transceiver for RSU to RSU communication and a laptop-class computing device.

Fair VM Scheduling in Virtualized Data Centers

Presenter: Lei Lu
Advisor: Evgenia Smirni
College of William & Mary
Computer Science

In this paper, we introduce fair VM scheduling into virtualized data centers. Fair VM scheduling ensures fair resource allocation to VMs through balancing workload across different resources in a data center. With careful association between VMs and servers, fair VM scheduling targets max-min fairness in VM resource allocation and min-max load balancing in server workload assignment. This can lead to provable system properties (e.g., Pareto efficiency) in data center resource management. While previous work on fair load balancing focuses on single resource (e.g., bandwidth), we consider multiple resources during the VM-server association. We calibrate VM resource utilization by learning cross-resource utilization causality relationships due to virtualization overhead, and enable accurate load balancing on other resources even when one resource is overloaded. Our multi-resource fair load balancing (MFLB) solution introduce the principles of largest normalized allocation and largest normalized load for the unified resource management. It includes a suite of algorithms for both online and offline VM placement decisions, and present their approximation properties (3-approximation for the offline algorithm, O(logN)-approximation for the online algorithm). In a Xen-virtualization cluster testbed, the MFLB mechanism is implemented as a VM scheduling module. The evaluation is done through the server consolidation on diverse applications including RUBiS 3-tier web service and SPEC CPU2006 benchmark applications.

The Effect of Translucency on Photometric Stereo

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

In the fields of Computer Graphics and Computer Vision, it is often necessary to capture the surface geometry of real-world materials. This information can be used for purposes such as object recognition or rendering. One technique for capturing surface geometry is the photometric stereo method, which involves taking at least three photographs of an object each illuminated from a different lighting direction. Each pixel across the three photographs can then be incorporated into a linear system that also takes into account the positions of the three light sources, and this can be solved for the (x, y, z) surface normal (i.e., surface orientation) value at that position. Unless the object photographed is perfectly Lambertian (i.e., diffusely reflects all incoming light), calculated values for the surface normals will not be entirely accurate. One source of error is subsurface scattering of the light beneath the surface of the object, which obscures reflectance information. To circumvent this, the object could be made to appear less translucent by dusting it with diffuse powder, but this is not always an option. We have analyzed the impact of translucency on photometric normal estimation and have found that typical methods for improving accuracy are not applicable in this case. Instead, we propose altering the wavelength of light used in the system. Light penetration depth and scattering potential differ among the spectra for each material. We have found that ultraviolet light, because it penetrates less deeply into the surface of translucent material, can be used to improve results when used in the photometric stereo method.

SiFi: Exploiting VoIP Silence for WiFi Energy Savings in Smart Phones

Presenter: Andrew Pyles
Advisor: Gang Zhou
Co-Authors: Z. Ren, X. Liu
College of William & Mary,
Computer Science

Since one-third of a smart phone's battery energy is consumed by its WiFi interface, it is critical to switch the WiFi radio from its active or Constantly Awake Mode (CAM), which draws high power (726mW with screen off), to its sleep or Power Save Mode (PSM), which consumes little power (36mW). Applications like VoIP do not perform well under PSM mode however, due to their real-time nature, so the energy footprint is quite high. The challenge is to save energy while not affecting performance. In this paper we present SiFi: Silence prediction based WiFi energy adaptation. SiFi examines audio streams from phone calls and tracks when silence periods start and stop. This data is stored in a prediction model. Using this historical data, we predict the length of future silence periods and place the WiFi radio to sleep during these periods. We implement the design on an Android Smart phone and acheive 40% energy savings while maintaining high voice fidelity.

Unidentifiable Attacks in the Electric Power System

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

Electric power grid is a crucial infrastructure in our society and is always a target of malicious users and attackers. In this paper, we first introduce the concept of unidentifiable attack, in which the control center cannot identify the attack even though it detects its presence. Thus, the control center cannot obtain deterministic state estimates, since there may have several possible cases and the control center cannot simply favor one over the others. Furthermore, we present algorithms to enumerate all possible cases under unidentifiable attack, and propose an optimization strategy from the perspective of the control center to deal with unidentifiable attack, which is to find a solution such that the average damage by the attack is minimized. We briefly evaluate and validate our enumerating algorithms and optimization strategy.

A Tabu Search Approach to Tactical Runway Configuration Management

Presenter: Jennifer A. Thorne
Advisor: Rex Kincaid
College of William & Mary,
Computational Operations Research

Tactical Runway Configuration Management plans runway configuration (groups of runways) usage over a pre-specified time interval to minimize arrival and departure delays while taking into account constraints including flight patterns, taxi plans, aircraft, weather, and airport usage. Currently, an exhaustive recursive search is used to test each runway configuration and determine the best possible management scheme. A tabu search routine has been implemented to improve the speed of the search for a high quality management scheme. When applied to a metroplex (a collection of airports) and evaluated several times during the day, the Tactical Runway Configuration Management optimization routine must run efficiently in order to provide timely information to air traffic managers. An additional difficulty of Tactical Runway Configuration Management is adapting it to multiple airports. The fundamental goal remains the same for every airport: to select an airport configuration to maximize overall efficiency of the runways, airport surfaces, terminal airspace, and interaction of the airport with the National Airspace System. However, the way in which runway configuration decisions are made, airport surfaces are used, and terminal airspace is managed changes between airports. Despite these differences, a Tactical Runway Configuration Management optimization routine must be applicable to any airport (or metroplex) without much adjustment. Currently, the test cases are based on John F. Kennedy International Airport in NYC. We report the benefits of using a tabu search over a recursive one.

MobiShare: Flexible Privacy-Preserving Location Sharing in Mobile Online Social Networks

Presenter: Wei Wei
Advisor: Qun Li
Co-Author: F. Xu
College of William & Mary,
Computer Science

Location sharing is a fundamental component of mobile online social networks (mOSNs), but it also raises significant privacy concerns. The mOSNs collect a large amount of location information over time, and the users' location privacy is compromised if their location information is abused by adversaries controlling the mOSNs. In this paper, we present MobiShare, a system that provides flexible privacy-preserving location sharing in mOSNs. MobiShare is flexible to support a variety of location-based applications, in that it enables sharing locations between both trusted social relations and untrusted strangers, and it supports range query and user-defined access control. In MobiShare, neither the social network server nor the location server has a complete knowledge of the users' identities and locations. The users' location privacy is protected even if either of the entities colludes with malicious users. The evaluation results show that MobiShare consumes a very limited amount of system resources on the mobile devices, and the deployment overhead MobiShare imposes on the cellular towers is small.

Smartphone Per-application Energy Accounting Mechanism

Presenter: Fengyuan Xu
Advisor: Qun Li
College of William & Mary,
Computer Science

Smartphones keep penetrating the mobile phone market rapidly and already commanded 63 percent share in the United State according to a recent market report. Compared with their predecessor, featured phones, the large demand of energy has stretched their battery capacities to the limit. Frequent re-charging becomes an annoying part of daily smartphone usage. The energy waste of carelessly designed applications also intensifies this tension. Therefore, energy is a crucial resource to be managed on smartphones. In order to manage well, it is required to have good running-time knowledge of how each application consumes power. Existing solutions however are not fine-grained enough to support accurate energy accounting for each application, or need manual setup with the assistance of extra expensive equipment. In this work, we propose an auto-constructed fine-grained per-application energy accounting for smartphones using the battery interfaces with low accuracy and frequency inside them. Our solution traces subsystem I/O operations and configuration changes to capture smartphone power behaviors at low costs in terms of both energy and time, and calculate the power consumption at high rate based on its power model. This power model is initialized after installation in order to account for varieties of individual phone hardware and operations and can adapt changes while running. We also develop a user-space tool facilitating application developer for profiling their software energy drain. We believe our effort in this work is able to help optimizing the energy consumption of smartphones from directions of both kernel power management and user level applications.

Toward Automating Work Consolidation with Performance Guarantees in Storage Clusters

Presenter: Feng Yan
Advisor: Evgenia Smirni
Co-Authors: X. Mountrouidou, A. Riska
College of William & Mary,
Computer Science

With most of today's systems being highly distributed, from data centers to cloud and storage clusters, there is a prevalent need for robust methodologies for work consolidation to improve load balancing but also to optimize non-traditional performance measures. Such alternative measures may include power savings, e.g., it may be desirable to shut down a lowly utilized node by moving some or all of its work to another node. In this paper, we present a methodology for distributed work consolidation that keeps track of the workload in the various nodes of the cluster and makes intelligent decisions on how much work to move from a sender node to a receiver node in order to minimally "affect" the performance of the receiver node or alternatively limit any performance degradation due to consolidation in a controlled way. The proposed methodology is based on continuously monitoring the workload on sender and receiver nodes, collecting lightweight statistics in the form of histograms of coarse granularity, and deciding when and how to initiate the work transfer. Extensive experimentation using trace-driven simulation confirms the robustness of the methodology.

VProof: Lightweight Privacy-Preserving Vehicle Location Proofs

Presenter: Yifan Zhang
Advisor: Qun Li
College of William & Mary,
Computer Science

A common category of applications in Intelligent Transportation Systems (ITS) is that data about vehicles, drivers and road conditions are reported from vehicles to the ITS system operators for real time traffic control, roads maintenance and new traffic management strategies development. ITS system adopting these data collection applications are vulnerable to bogus data injection attacks, where malicious vehicles inject large amounts of fake data to the ITS system without actually presenting at the reported locations. We propose VProof, a privacy-preserving mechanism that can filter out bogus data injected by the adversary without using any heavy-weight PKI systems. We performed extensive experiments on actual road conditions to evaluate our solution. Our evaluations show that our scheme can effectively defend against the bogus data injection attacks while perfectly preserving users' location privacy.

Parallelizing Parsers via Speculative Execution

Presenter: Zhijia Zhao
Advisor: Xipeng Shen
Co-Author: B. Wu
College of William & Mary,
Computer Science

Parsers play important roles in compiler, interpreter, web browser, and many other syntactic analysis-based applications. However, the inherent serialization prevents it from being parallelized. Even though, nowadays, the multi-core processors become the mainstream for general computing. The deficiency of this “embarrassingly sequential” program turns out to be more serious, especially for the applications that process large amount of data. Recently, software-based speculative parallelization has shown effectiveness in parallelizing certain applications, but has not been considered for parallelizing parsers. This is because, inherently, parsers maintain a stack to store the symbols which have been parsed, however, it is technically challenging to predict multiple values in a stack. To circumvent this difficulty, the parsing grammar, in particular, Context-Free Grammar (CFG) is converted to regular grammar by modifying the CFG grammar slightly, so as to be handled by Finite State Machine (FSM). In this way, the parallel parsing problem becomes parallel FSM processing. In this work, we explore data-level parallelism to enable the parallel parsing via speculative execution. The key techniques we employed are lookback-based prediction and partial committing. To systematically explore this speculation scheme, we leverage probability theory to formalize the problem, and attempt to find the optimal design parameters for speculation. In experiment, we evaluate several parallel parsers produced by our techniques for given grammars (with restrictions), and the results show that, most parallel parsers can take advantage of modern multi -core processors, and produce near linear speedup.

Exploring Fitts’ Law in Web Browsing

Presenter: Nan Zheng
Advisor: Haining Wang
Co-Author: A. Polaski
College of William & Mary,
Computer Science

As one of the most influential laws in human-computer interaction for decades, Fitts’ law quantitatively models human pointing behaviors. However, the laboratory environments present in the majority of Fitts' law experiments lends doubt to its validity in a real-world GUI (Graphical User Interface) context. This paper attempts to stress-test Fitts’ law in the “wild”, namely, under natural web browsing environments, instead of restricted laboratory settings. In our study, more than 1,000 users’ mouse movement data are collected passively, during their online sessions of web browsing. Our analysis shows that, the averaged pointing times follow Fitts’ law very well, with linear correlations above 98%. However, in unaveraged raw data, we observe considerable deviations from Fitts’ law, with more than 50% of data appearing as outliers from predicted values. Based on the predicted pointing time from Fitts’ model, we further classify the pointing actions into fast, medium, and slow movements. We observe that, in natural browsing, a fast movement has a different error model from the other two movements, due to its open-looped nature. This is different from previous findings in restricted environments. A complete profiling on user pointing performance should be done in more details, for example, constructing different error models for slow and fast movements.

Soldiers of Jihad or Benign Combatants: Germany's use of Islamic Nationals in World War II

Presenter: Kit Crawford
Advisor: Richard Breitman
American University,
History

Historiography of Nazi-Islamic relations emphasizes political connections between Germans and Arabs in the 1930s, or the role of collaborators like Amin al -Husayni and Rashid al-Ghailani. Recent scholarship advances the old narrative but minimizes anti-Jewish sentiment and calls for jihad as encouraging the Nazi-Muslim connection. The extent that propaganda incorporated Islam into the Nazi Weltanschauung suggests a unique experience that shaped Muslim perceptions of the Holocaust. A common disdain - what scholars interpret as benign contempt, baleful indifference, or outright complicity - of Arabs for the Jewish question provided a basis for postwar Jew-hatred in the Middle East. Utilizing reports from officers who recruited and trained foreigners, my paper moves beyond ideology to examine Nazi utilization of Muslims and analyze the treatment and motivation of volunteers. Compared to British colonial troops, or French-African forces, the role of foreign Nazi soldiers is relegated to military enthusiasts. Academics concentrate on German reactions to foreigners (particularly Africans) in opposing armies. The idea of a "racial state" casts foreign volunteers as a novelty of wartime contingencies. Yet, scholars must examine how Nazis differentiated between supposedly racial inferiors and viewed Muslim recruits. Did the Nazi-Muslim experience differ from other volunteers and the ideals expressed in Nazi-Islamic propaganda? Did they succumb to Nazi ideology, or were the realities of life during wartime factors for enlistment? These questions connect the traditional story of Arab-German sympathy, the Muslim wartime experience, and the growth of Jew-hatred and Holocaust denial in the Middle East.

The Devil Beside You: Issues of Sense in *The Witch of Edmonton*

Presenter: Erin Farquhar
Advisor: Erika Lin
George Mason University,
English Literature and Folklore

Devious yet seductive, Dog acts as Elizabeth Sawyer's familiar in the Jacobean drama *The Witch of Edmonton*. Scholarly analysis has indicated that sociological and historical issues represent vital aspects of the play. Elizabeth Sawyer in particular as the "witch" has been referenced in regards to women's agency in early modern drama. Yet many of the acts perpetuated by Sawyer (events alluding to scenes of authority, power, or the supernatural) are instigated or enacted by this familiar (whom she calls Tom), thus positing doubt on Sawyer's identity as a witch and further what role Dog as a primary character poses in the play. Both physical entity and evil spirit, Dog's character accentuates two elements of the play: the mechanics of language, such as oaths or curses in addition to sensory facets, such as touch or sound, thus eliciting concrete parallels between the use of the supernatural and the dramatics of theater performance. However, this period's folklore as well as social discourse pertaining to animals has contributed by shaping Dog's complexity. I will be examining relevant historical context such as English laws about the familiar, supernatural lore about black dogs, or cultural facets of beasts and bestiality, and thus my subsequent analysis of this piece will be mutlti-disciplinary and inter-textual. In examining this play I will attempt to demonstrate that the combination of drama with the supernatural creates a meta-theatrical performance in which belief about witchcraft is artistically rendered, while concurrently providing a medium in which cultural anxieties can be explored.

An Analysis of Discourse & Disagreement: The American Medical Association following WWII

Presenter: James P. Furgol
Advisor: Daniel Ritschel
University of Maryland, Baltimore County, History

My paper examines the contentious debates on health care reform in U.S. and British society from 1945-50. In particular, this analysis juxtaposed the positions of the United States' American Medical Association (AMA) and National Medical Association and the United Kingdom's British Medical Association and Socialist Medical Association. From the 1940s, health care reform specialists have conducted numerous studies on the development of American and British health care. This study is unique because it focuses on the discourse utilized by these associations and the ideological values that largely fueled their efforts. In particular, I plan to focus on the AMA and its attempts to block government-directed health care reform. This study will include the AMA's proposed health care/insurance reforms as well as the actual successes/failures of such reforms. Specifically, I will discuss the AMA's perception of the doctor-patient relationship, method of remuneration, and how they viewed the doctor's status within society. This analysis reveals ideological values that propelled such views. By considering the AMA's tactics and values, this study delves into the actual degrees of conservatism and capitalism the AMA harbored. Such values expose a part of the U.S.'s post-WW II conservative sociopolitical context. The debate between the U.S. government and AMA demonstrates the contributions of the victors, the less successful and the outright losers in the U.S.'s health policy development. Subsequently, this analysis illustrates how the AMA successfully trumped the government's efforts to reform health care and how such successful tactics continues to influence contemporary debates.

The Ideal of Happiness in Marriage: Reactions to Marie Stopes' *Married Love*, 1918-1933

Presenter: Shannon E. Goings
Advisor: Kathrin Levitan
College of William & Mary, History

Viewed as one of the first true sex manuals of the twentieth century, Married Love is seen as a turning point by modern scholars in both British and American sexual ideology. Marie Stopes, a well-known paleobotanist, wrote the manual after the end of her first marriage, hoping to keep other married couples from making the same mistakes. Since it was such a popular manual, historians of sexuality examine it within historical discourse and describe it as a catalyst for newly developed ideas of sexuality during the 1920s-30s. This paper explores the different reactions to *Married Love*, hoping to understand why some groups became incredibly invested in Stopes' ideas while others vehemently condemned her philosophy. Using reviews, personal correspondence, and newspaper articles, this paper suggests that reactions to *Married Love* were incredibly nuanced, and deserve to be viewed as part of modern conceptions of heterosexual intercourse. *Married Love's* controversial support of contraception, along with its insistence on women's deciding roles on the frequency of sexual intercourse, were concepts that were not been publicly accepted by the great majority of people. Once discussed by Stopes and other experts however, portions of the public started to agree. The diverse reasons behind this agreement are difficult to identify. This paper will argue that *Married Love* and its reactions cannot be viewed without understanding Stopes' powerful public persona. Understood within the context of 1920s-30s Britain and America, *Married Love* and its reactions help to create a more accurate image of sexuality during the interwar period.

Advertising an Immigrant Food: Strategies in Macaroni Marketing, 1900 to 1960

Presenter: Melissa Gray
Advisor: Charles McGovern
College of William & Mary,
History

My research explains how and why advertisements for macaroni (pasta) products in the United States evolved between 1900 and 1960. Advertisements tell us not so much a history of the food in the US but show changes in food advertising and the meaning attached to new foods. I address how these changes related to perceptions of Italian immigrants in the US and efforts by advertisers to maintain their professional legitimacy. Using advertisements published in nationally-distributed magazines, newspapers and promotional cookbooks aimed at female, upper and middle-class audiences between 1900 and 1960, as well as archival sources from advertising firms, especially industry leader J. Walter Thompson Co., I evaluate the ways advertisers utilized developments in the scientific knowledge of food, food processing and the Italian origins of macaroni to sell an immigrant food. The emphasis of macaroni products as "nourishing" and "clean" between 1900 and 1950 disassociated the food from its Italian origins stigmatized early in the century by nutritionists and the Pure Food Laws of 1906. In the 1950s, advertisers sold macaroni as an "Italian" food, which helped admen to assert themselves as cultural authorities conveying cosmopolitan tastes to an American public requiring upgraded consumption habits. My findings indicate that, while food may be an accessible medium of expression in American consumer culture for minority groups, historically this has been facilitated, not simply by immigrant assimilation, but mediated and circumscribed by the interests of a non-ethnic, professional elite.

Initial Christian-Muslim Relations: Precedents for the Present

Presenter: Fatih Harpci
Advisor: Khalid Blankinship
Temple University,
Religion

Christian-Muslim relations have a complex history sometimes marked by war. Yet, equally in many cases Muslims and Christians have lived peacefully together. Our historical memories tend to favor conflicts over peaceful experiences. Through citing an essential factor in Islam and four important engagements between Muhammad and Christians in Arabia, I indicate historical precedents that may be helpful for the present. Persons in seventh century Arabia already had knowledge about Jesus. The essential Islamic factor underlying past and present Christian-Muslim relations is the Quranic affirmation of the previous prophets. Giving particular emphasis to Abraham, Moses and Jesus, Islam incorporates and directly links the Qur'an with the Christian tradition. The four precedent-setting engagements are respectively: Muhammad's relationship with Christians prior to his call to prophethood; his advising a group of persecuted Muslims to seek asylum with the Christian king of Abyssinia; his development of and principles enunciated in the Covenant of Madina through which Muslims, Christians, and Jews formed a single community that respected one another's faiths; and his welcoming a group of Christians from Najran in his mosque. It is equally true for Muslims as for Christians that the past of our relationship is still very much with us and contributes significantly to the present situation. Yet our historical memories contain more than negative episodes. The cited essential Islamic factor and the four precedents indicate that Christians and Muslims have historic foundational evidence that may be important to recover and build upon in the present for our futures.

"Tied Down by Precedent or the Rules of Inapplicable English Military Tactics": Indigenous Military Forces and European Concerns for Security in Mid Nineteenth Century Colonial Natal

Presenter: Jacob M. Ivey
Advisor: Joseph Hodge
West Virginia University,
History

This paper will attempt to understand the impact of indigenous military units on the security and organization of the British colony of Natal. The impact of these indigenous military units remains unclear as does the question of how these units existed within the colonial system and how they were perceived by European colonists. The historiography of this early period of British rule has been largely dominated by assumptions of peace and safety. These assumptions have only recently begun to be called in question. European and African groups used military forces to help produce a distinct method of understanding models of control within the colony. Evidence exists of a militarization of society that took place during this period in which colonial apprehension was only a part of the overarching idea of colonial security. The Afrikaner Boers, Volunteer Military corps, indigenous military forces, troops stationed at Fort Napier, and the Cape Mounted Rifles are all distinct pillars of control that existed within the colony. However, this particular paper will focus on how the indigenous military units were able to become one of those distinct elements of control within the colony, and how the European population responded to this situation. By creating a better understanding of the development and impact of these military structures within the colony, a clearer picture begins emerge in regards to the growth and progress within the colony as a whole.

Foolish Hearts and Immortal Souls: Religion and Marriage in the Early American Republic

Presenter: Lindsay Keiter
Advisor: Karin Wulf
College of William & Mary,
History

My paper explores the experience of one couple to argue that historians have neglected the importance of religion to conceptions of marriage in the early nineteenth century. After the Revolution, a constellation of beliefs about women's non-political contributions to the new republic reshaped women's responsibilities to the family, while still confining them to the domestic realm. Women were suddenly responsible not only for their children's education but for the salvation of their families. Concurrently, notions about marriage shifted to emphasize companionship and cooperation between spouses. To date, historians have paid little attention to how women's deeply-held spiritual beliefs figured in their decisions about marriage. I argue that Louisa Maxwell Holmes Cocke's Calvinist beliefs hindered her ability to accept newer notions about marriage that shifted religious authority in the home from men to women. After her conversion to evangelical Presbyterianism, Louisa accepted that like all of humanity, she was depraved; thus, she did not have the agency to ensure her family's salvation. During several discussions of her future role as her wife during their courtship, they consistently offered conflicting views. Her second husband, John Hartwell Cocke, embraced the new ideals. After their marriage, this disconnect created frequent conflicts, as John curtailed Louisa's religious activities and demanded she devote her energies to maintaining his family and plantation. Their sad example highlights the crucial role of religion in nineteenth-century understandings of marriage, and the especially high stakes women faced in selected a spouse.

The Doughboys in Their Own Words: Reconstructing the Narrative of the Battle of St. Mihiel

Presenter: Ben Plache
Advisor: Timothy Thurber
Virginia Commonwealth University, History

As currently written, the American World War I historiography interprets the War as an event to be explored in its greater cultural, social or political context. While important, such analyses frequently miss the human element inherent in any conflict, sanitizing the horror of the trenches into anesthetized, bloodless anecdotes that provide brief splashes of color within a bigger picture. In an attempt to correct this deficiency this paper will reinterpret the Battle of St. Mihiel through extensive close reading of primary source narratives authored by low-ranking frontline soldiers. Lasting from September 12, 1918 to September 15, 1918, St. Mihiel was the first independent American offensive, and the successful reduction of the salient was perhaps the high-water mark of the American Expeditionary Forces. These narratives will also be compared to newspaper articles covering the Battle from *The New York Times* in order to provide a contextualized counterpoint, as well as the contemporary public narrative. Through this comparison, a new portrait of the American doughboy emerges: often scared, yet determined; frequently undersupplied; and possessed of a complex moral code which allowed for pity and compassion for captured German soldiers, but also delight in the joy of pillaging German supplies. Above all, the American soldier fighting at St. Mihiel was most concerned with doing his duty. Despite the harsh conditions which threatened his survival and the horrific sights of battle, there exists within these narratives an overwhelming sense of duty: regardless of his indiscretions, the American doughboy did what was asked of him.

Guarding the Coast

Presenter: Casey S. Schmitt
Advisor: Brett Rushforth
College of William & Mary, History

The long and lucrative history of smuggling in the early modern era linked New World economies in defiance of imperial mandates. As British merchants gained increased legal and illegal access to Spanish American ports, Bourbon reformers adopted the anachronistic policy of coastal defense via privateering. My work addresses the history of Bourbon-era privateers and their role in the outbreak of the War of Jenkins' Ear. By reading British accounts of the supposed brutality they encountered at the hands of Spanish privateers against a tradition of Caribbean maritime depredations and widespread smuggling, my work illuminates the ways in which these high seas encounters challenged British naval supremacy and demonstrated the changing nature of Bourbon policy in the eighteenth century. Inter-imperial commercial relations between the Spanish and British in the Americas brought together a diverse group of actors who defied the mercantilist ambitions of their respective monarchies. My essay explores the nature of the contraband trade in an effort to demonstrate its necessity to the commercial survival of various Spanish and British American peripheries. Coastal privateers as a means of curtailing such prominent economic lifelines proved ineffective, yet the Bourbon experience of fighting a mercantile war against Britain forced that empire to reconsider their colonial policies leading to more drastic and altering reforms in the ensuing decades.

The Effeminate Enchanter: Folklore, Christianization, and the Presence of Male Witches in Late Medieval Germany

Presenter: Jaclyn Spainhour
Advisor: Erin Jordan
Old Dominion University,
History

Current historiographical discourse in medieval witchcraft has shifted towards the gendering of the witch. For decades, historians like Dyan Elliott have attempted to explain how the perception of the witch as particularly female arose during the Middle Ages and why it continues to be widely accepted. While Dyan Elliott effectively argues the feminization of witchcraft was deeply-rooted in perceptions of pollution and sexuality, she neglects the presence of accused male witches in medieval Europe. This paper seeks to begin where Elliott chose to end the discussion of witchcraft: the accused, convicted, and reprimanded male witches of medieval society. The central question will be: why were men accused of witchcraft and which cultural practices allowed for accusations against men to occur? I will argue the cultural compromise which arose from the Christianization of German communities allowed for men to be accused of witchcraft. In addition, a discussion of perceptions of gender and sexuality in German society will describe how men came to be perceived as effeminate and weak. Primary source material used will include German folktales and Church documents, with primary focus on folklore. Methodologically, I will dissect the folktales to explain gender relations and perceptions. In addition, secondary literature will be used to illustrate how Christianity forced many Germans to resituate their folk traditions in a Christian setting and what effect this had on their perceptions of witches. This study will provide insight into an interdisciplinary topic by addressing literature, history, and gender studies.

Slavery in the 1780s Backcountry: Redwell Furnace and Pine Forge

Presenter: Sarah Thomas
Advisor: James Whittenburg
College of William & Mary,
History

In the early Virginia backcountry, a diverse group of individuals lived, worked, and interacted every day at furnaces and forges. Redwell Furnace, north of Luray, and Pine Forge, north west of New Market, in Shenandoah County were the earliest and largest operations of their kind in the county. At these ironworking communities, people of Irish, African, and Germanic descent interacted on a daily, if not hourly, basis, making iron stove plates, andirons, plates, utensils, and other utilitarian objects. This diverse furnace population gradually developed in the shadow of the Massanutten Mountain during the late eighteenth century as more settlers migrated down the Great Wagon Road through the Shenandoah Valley. Ironworking became a dominant industry in the county, but also was prevalent throughout the Valley. In this talk, I will address the feasibility of mapping slavery on the landscape of late eighteenth-century ironworking communities Redwell Furnace and Pine Forge in Shenandoah Valley. While the documentary record shows that African Americans were very much present at Redwell Furnace and Pine Forge, it is difficult to read their presence on the landscape. Although there is no evidence to suggest that white and black workers cohabitated, the documentary record does suggest the possibility that whites and blacks had similar living situations at these early Southern backcountry sites.

"Won't You Help Me Raise 'Em, Boys?": Identity, Labor, and Defiance in the Work Songs of Virginia's Northern Neck Menhaden Fishing Industry

Presenter: Joshua W. Wilson
Advisor: Stephanie Finley-Croswhite
Old Dominion University,
History

Virginia's menhaden fishing industry has been linked with the Northern Neck region since the conclusion of the American Civil War. The men who were responsible for hauling in the large catches of the prized fish were predominantly African American and employed a large repertoire of work songs to assist them in their labors. With the introduction of mechanization into the menhaden industry, large work crews were no longer necessary for a successful catch as human labor was replaced by hydraulic lifts, powerboats, and pilot spotters. The purpose of this research project is to study the lyrical content, pace, and rhythm of the menhaden fisherman works songs in an effort to understand the world of the fishermen prior to mechanization. How did the menhaden fishermen use their songs to communicate with one another while espousing their concepts of masculinity, community, and work responsibility? In conducting this research I intend on interviewing and collecting lyrical content from the Northern Neck Shanty Singers as well as analyzing archival materials available at the Reedville Fisherman's Museum. I intend to show the power of the work song as a means of exploring personal independence, identity, and community while simultaneously challenging the racial and social hierarchy of the rural area. The research conducted within this project will provide a critical analysis of a cultural musical institution that is quickly eroding and will act as a preservation of a dying musical art synonymous with the working class of the Northern Neck.

Characterization of anisotropic surface morphology in epitaxial superconducting thin films by wavelet analysis

Presenter: Douglas B. Beringer
Advisor: R. Ale Lukaszew
Co-Authors: J. Hackett, Z. Li, W. Roach
College of William & Mary,
Physics

Surface morphology and interface roughness are critical factors impacting the ultimate performance of many thin film materials and nano-scale devises. Next generation superconducting radio frequency (SRF) materials for particle accelerator cavities depend upon the ability to tailor and finely control the microstructure and morphology of superconducting/ insulating/superconducting (SIS) multilayer thin film structures. The evolving surface of grown epitaxial thin films, influenced by nucleation and growth kinetics, may exhibit dendritic or fractal patterning where the resulting anisotropic features dominate a coarsening morphology. As such, a quantitative understanding of superconducting thin film morphology and the thin film deposition parameters leading to optimal SRF surfaces is desirable. Quantitative characterization of surface morphology is typically achieved with Fourier transform (FT) analysis and fractal characterization; however, this approach suffers intrinsic limitations as the FT is localized in the frequency domain and therefore cannot differentiate between specific features with isolated spatial coordinates. Wavelet analysis transcends these limitations by effectively isolating and quantifying surface features belonging to a designated length scale, thus enabling independent analysis of local surface features with varied spatial resolutions. Here we present our work with surface characterization by wavelet analysis of epitaxial superconducting Nb and NbN thin films.

Charmed Bottom Hadron Spectroscopy

Presenter: Zachary S. Brown
Advisor: Konstantinos Orginos
Co-Author: S. Meinel
College of William & Mary,
Physics

The arena of doubly and triply heavy hadrons remains experimentally unexplored to a large extent. This has led to a great deal of theoretical effort being put forth in the calculation of mass spectra in this sector. Although the detection of such heavy particle states may lie beyond the reach of experiments for some time, it is interesting to compare results between lattice QCD computations and continuum theoretical models. Several recent lattice QCD calculations exist for both doubly and triply charmed as well as doubly and triply bottom hadrons. In this work we present the first lattice calculation of the mass spectrum of doubly and triply heavy hadrons including both charm and bottom quarks. The wide range of quark masses in these systems require that the various flavors of quarks be treated with different lattice actions. We use domain wall fermions for 2+1 flavors (up down and strange) of sea and valence quarks, a relativistic heavy quark action for the charm quarks, and non-relativistic QCD for the heavier bottom quarks. The calculation of the ground state spectrum is presented and compared to current continuum calculations. A future outlook includes treating the bottom quarks as relativistic in addition to the charm.

Effects of a Gaussian Potential Barrier on a Propagating Wavepacket: An Introduction to Quantum Pumping

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

We wish to study the possibility of pumping ultracold atoms via multiple time-oscillating Gaussian potential barriers. We chose to begin our analysis by rigorously studying the effects of a single Gaussian barrier, the knowledge of which we will extend to cases with multiple barriers. We use classical, semi-classical, and quantum mechanics to examine a propagating wavepacket that encounters a time-oscillating Gaussian potential barrier. The wavepacket can be transmitted, reflected, or partially reflected and partially transmitted. The final wavefunction is constructed both semi-classically and quantum mechanically, and we examine the agreement between these two methods. Care has been taken in the semi-classical method to produce a wavefunction which is valid in the vicinity of caustics, as well as in classically-forbidden regions. We also examine how well classical mechanics describes the behavior of the system. Various parameters of the system are also changed, in order to determine their effects on transmission and reflection. These parameters include the frequency and height of barrier oscillation, and the initial wavepacket momentum.

Hamiltonian Monodromy

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

We say that a system exhibits monodromy if we take the system around a closed loop in its spectrum space, and we find that the system does not come back to its original state. We report a method for experimental realization of a newly discovered dynamical manifestation of monodromy by investigating the behavior of atoms in a trap. The trapping potential has long range attraction to and short range repulsion from the center. Calculations include two parts. First, we consider atoms as classical particles for which we can choose any desired set of initial conditions. As was shown previously for different systems, when we take the system around a monodromy circuit, a loop of initial conditions evolves into a topologically different loop. Second, we incorporate the limitations that would appear in experimental implementation. The atoms have a range of initial angles, initial angular momenta, and initial energies. Our work shows how real atoms can be driven by real forces around a monodromy circuit, and thereby shows how one can observe dynamical monodromy in a laboratory. Finally, we extend classical dynamical monodromy to quantum dynamical monodromy by examining wave function evolution under comparable conditions.

Precision Polarimetry in Measurements of the Proton's Weak Charge

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

Our current best theory describing the interactions of fundamental particles is called the Standard Model, which describes to good precision all fundamental forces relevant at subatomic scales: the strong, electromagnetic and weak force. The weak force, as the name suggests, is substantially weaker than the other three and carries its own type of charge referred to as the weak charge. Probing the weak force usually requires the use of accelerators capable of accelerating particles to several hundred GeV, an energy comparable to the mass of the weak charge carrying particles. By exploiting the fact that the weak interaction violates parity, we are able to probe the weak charge at much smaller energies. Through the Qweak experiment presently running at Jefferson Lab we aim to measure the proton's weak charge to a high precision of 4%. We will test the validity of the Standard Model by searching for evidence of newer physics that the Standard Model cannot explain. We achieve this by accelerating a longitudinally polarized electron beam to 1.16 GeV, scattering it off a large liquid hydrogen target. By flipping the polarization direction relative to the motion of the electron we can probe the weak charge of the proton. To achieve our goal of 4% error, we need to measure the polarization of the beam to a precision of 1%. We achieve this by using a combination of Møller and Compton polarimeters. The latter will be the focus of this talk.

Use of the High Resolution Spectrometers for the g2p Experiment at Jefferson Lab

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

While considered to be a fundamental particle, the complex inner structure of the proton means there are still gaps in our knowledge of this constituent part of the nucleus. The proton's composition of quarks and gluons, which exhibit many-body interactions, makes scattering an electron off of a proton much more complicated than a point-like particle. The response of a nucleon in an inclusive elastic electron scattering experiment can be described by four structure functions; f1, f2, g1, and g2. These functions cannot be determined analytically, but instead must be determined experimentally. The last of these functions, g2, describes the spin structure of a nucleon when immersed in a transverse magnetic field. Due to the difficulty of measuring g2 for the proton (g2p), little is known about it. Experiment E08-027, scheduled to run in Hall A at Thomas Jefferson National Lab in the spring of 2012, aims to increase the limited knowledge of this structure function. The g2p experiment uses an ammonia target, polarized in a transverse magnetic field. An electron beam is incident upon the target, and the scattered electrons are collected by a pair of near-identical high resolution spectrometers (HRS). Each HRS features a stack of several different detectors, used for identifying scattered particles and tracking their path through the spectrometer. This talk will briefly discuss the theory behind the g2p experiment and will focus on the structure and function of the Hall A spectrometers.

Inclusive Measurements with MINERvA

Presenter: Joshua D. Devan
Advisor: Jeffrey Nelson
College of William & Mary, Physics

MINERvA is a neutrino scattering experiment at the Fermi National Accelerator Laboratory outside Chicago, Illinois. MINERvA is designed to measure neutrino cross-sections, final states and nuclear effects on iron, lead, carbon, liquid helium and water targets to reduce systematic uncertainties in neutrino oscillation experiments such as MINOS and NOvA. Neutrino scattering also provides a unique probe of the nucleus, complementary to electron scattering experiments, such as those at Jefferson Lab. The MINERvA detector is constructed of fine strips of solid plastic scintillator, allowing for tracking of individual particles and calorimetric energy reconstruction of particle showers. MINERvA is actively working towards producing charged-current inclusive neutrino cross-sections on plastic scintillator and the nuclear targets. To that end, we present the observed neutrino and anti-neutrino energy spectra in several beam configurations.

Preliminary analysis of results and performance of a scanning quartz Čerenkov detector with a 1 x 1 cm^2 active area in the Q_{weak} experiment

Presenter: James F. Dowd
Advisor: David Armstrong
College of William & Mary, Physics

Q_{weak}, an experiment currently running at the Thomas Jefferson National Accelerator Facility, will make the first direct measurement of the proton's weak charge, $Q_w^p=1-4\sin^2\theta_W$, with a combined statistical and systematic precision of approximately 4%. This precision on Q_w^p is attained via a measurement of parity-violating asymmetry in elastic electron-proton scattering at a forward angle with low four-momentum transfer, Q^2~0.026 GeV^2/c^2. This will allow for an extraction of the weak mixing angle, $\sin^2\theta_W$, to approximately 0.3%. In the Standard Model of electroweak interactions, the weak mixing angle is well predicted. The final Q_{weak} results, in conjunction with existing measurements will both probe and constrain the possibility of new physics beyond the Standard Model to the multi-TeV energy scale. The low-current tracking system measures Q^2 and the profile of scattered electrons. The experimental apparatus consists of a liquid hydrogen target, vertical drift chambers (VDC's), a magnetic spectrometer, horizontal drift chambers (HDC's) and a quartz Čerenkov focal plane scanner (FPS) with an active area of 1 x 1 cm^2. Eight large quartz Čerenkov detectors form the main detector system for the high-current parity-violating asymmetry measurement. The tracking system runs at currents up to 100 nA. The asymmetry measurement runs up to 180 μA, where the HDC's and VDC's are inoperable. The FPS operates at all beam currents and will be used to extrapolate Q^2 and electron scattering profiles over the three orders of magnitude difference in current between low and high current modes. Preliminary analysis of FPS results and performance will be presented.

Sterile Neutrino Search with the MINOS Experiment

Presenter: Alena V. Gavrilenko
Advisor: Patricia Vahle
College of William & Mary,
Physics

MINOS, Main Injector Neutrino Oscillation Search, is a long-baseline neutrino oscillation experiment in the NuMI muon neutrino beam at the Fermi National Accelerator Laboratory in Batavia, IL. It consists of two detectors, a near detector positioned 1km from the source of the beam and a far detector 734km away. MINOS is primarily designed to observe muon neutrino disappearance. By comparing the reconstructed neutrino energy spectra at the near and far detectors, neutrino oscillations have been observed. The Standard Model of Particle Physics predicts that neutrinos may oscillate into one of three active flavors as they propagate through space. An analysis is presented to search for neutrinos oscillating into a hypothetical fourth (sterile) flavor which does not interact via any known Standard Model interactions. Oscillations into the sterile flavor may be observed if a deficit in neutral current (NC) interactions is visible at the far detector.

Searches for New Physics with the MAJORANA DEMONSTRATOR

Presenter: Graham K. Giovanetti
Advisor: John Wilkerson
Co-Authors: P. Finnerty, R. Henning
University of North Carolina, Chapel Hill,
Physics and Astronomy

In the last decade, experimental results from the direct detection of solar and atmospheric neutrinos have provided convincing evidence that neutrinos have mass. This is a clear indication that the Standard Model, which includes only a massless neutrino, is incomplete and opens many experimental questions about the neutrino's intrinsic properties. Current theoretical descriptions for the generation of neutrino mass and the relative smallness of the neutrino mass scale favor a neutrino that is its own anti-particle, a possibility originally suggested by Ettore Majorana. The MAJORANA collaboration is building the MAJORANA DEMONSTRATOR, an array of high purity germanium detectors that will perform a precision, low-background search for neutrinoless double-beta decay in 76Ge that is sensitive to the Majorana nature of the neutrino and the absolute neutrino mass. As part of this effort, we have deployed a modified, low-background broad energy germanium detector at the Kimbalton Underground Research Facility in Ripplemeade, VA. With this detector, we are investigating detector performance at low energies, data acquisition electronics and software, and data analysis techniques for the MAJORANA DEMONSTRATOR. Because of its sub-keV energy threshold, this detector is potentially sensitive to non-Standard Model physics, including interactions with weakly interacting massive particles, a dark matter candidate. I will present recent results from this detector.

All-atomic generation and manipulation of squeezed vacuum in hot Rb vapor

Presenter: Travis S. Horrom
Advisor: Eugeniy Mikhailov
Co-Authors: G. Romanov, I. Novikova,
College of William & Mary,
Physics

The interactions of light with atoms can effect large changes in the properties of the light, modifying the polarization, transmission, and noise of the light signal. A primary example is electromagnetically induced transparency (EIT), a well-known interaction in atomics which causes frequency dependent changes in the transmission of light through an atomic medium. Another area of interest is in the production of squeezed light through atomic nonlinear interactions. Squeezed light is a special quantum state where the noise of the electromagnetic signal caused by quantum fluctuations can be altered and reduced to levels lower than that of normal laser light. In this experiment, we study a combination of these two phenomena, demonstrating control over the noise spectrum of squeezed vacuum by passing it through Rb vapor under conditions of EIT. We generate squeezed vacuum using an effect known as polarization self-rotation in one atomic vapor, and monitor the squeezed and antisqueezed noise quadratures as the vacuum field propagates through a second vapor. By controlling the transmission properties through this vapor using effects such as EIT, we can demonstrate 'frequency filtering' of the quantum noise. This all-atomic control of noise is applicable to gravitational wave interferometers and quantum memory systems.

The Q-weak Experiment: First Precision Measurement of the Proton's Weak Charge

Presenter: Joshua R. Hoskins
Advisor: David Armstrong
College of William & Mary,
Physics

The Standard Model (SM) had been extremely successful in its description of the comprehensive list of phenomena in Nuclear and Particle physics, however despite its phenomenological success, it is likely a low-energy approximation of a more complete theory. For instance, gravity is not included in a quantized form. Though it is possible to describe gravity in Quantum Field Theory through the exchange of gravitons, the theory breaks down at very high energies, i.e., at the Planck scale. For this, and many other reasons, there is a strong interest in physics beyond the Standard Model. The Q-weak experiment, now running at Jefferson Laboratory, is designed to make the first precision measurement of the protons weak charge. I will give an introduction to parity violating physics as well as an overview of the precision test of the Standard Model being performed by the Q-weak experiment.

Infrared and Optical Microspectroscopy of Vanadium Dioxide Microcrystals

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

Vanadium Dioxide (VO_2) undergoes a phase transition at a temperature of 340K between an insulating monoclinic M_1 phase and a conducting rutile phase. Accurate measurements of the electronic properties and phonon parameters of VO_2 are needed to uncover the driving mechanism of the phase transition in this correlated system with strong interactions. Previous infrared experiments had used either bulk single crystals or thin films. Bulk single crystals tend to crack or break as they go through the phase transition, making accurate measurements difficult. Phonon parameters of VO_2 are difficult to extract from thin films on ionic substrates. Recently, it has become possible to grow single domain VO_2 microcrystals on oxidized Silicon substrate. We performed infrared micro-spectroscopy on these microcrystals in the spectral range between 200 cm^{-1} and 6000 cm^{-1} and have been able to obtain the VO_2 phonon properties. In addition, unlike previous thin films, these microcrystals have distinct orientations. This allows us to obtain the anisotropy of electronic and phonon properties of the crystals as opposed to simply measuring the average of these properties. One interesting aspect of these microcrystal samples is that they are under strain. This alters the properties of the material, especially around the phase transition. We report on the design of a micro -ellipsometry setup for ultraviolet, visible, and near infrared spectral ranges to obtain the electronic properties of these microcrystals above 6000 cm^{-1} with a spot size of 10µm.

Quantum pumping with ultracold atoms

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

In electronics, current is generally induced by applying a voltage bias (such as a battery) to a circuit. However, theorists have proposed that one could instead produce a current using localized time-varying potentials without an applied bias. Quantum pumping is the transport of electrons from one location to another with such potentials. Unfortunately, due to the strength of the Coulomb interaction in solid state systems, these theories have been difficult to confirm experimentally. Rather than studying electron transport, we are interested in the analogous process for neutral atoms: Can ultracold atoms be pumped from one reservoir to another without an external potential difference? One proposed scheme called the turnstile pump uses two time-dependent barriers. Transport can be generated through both classical and quantum effects. The coherence of ultracold atoms allows us to probe the uniquely quantum aspects of pumping and even study systems in which pumping is classically forbidden. We compare classical and quantum numerical simulations of single- and double-barrier systems to determine an experimental setup for pumping ultracold atoms. We present the classical aspects of pumping as well as progress towards experimental observation in the Ultracold Atomic Molecular and Optical Physics Laboratory at William and Mary.

Aluminum backgrounds in the Qweak Experiment

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

The Standard Model of particle physics has been extremely successful in describing particle interactions in a wide-ranging regime of energy scales. Low-energy, parity-violating experiments enable high-precision experimental tests of Standard Model predictions. One such investigation is Qweak, an experiment currently underway at Jefferson Lab. Qweak uses parity-violating elastic electron-proton scattering to measure the proton's weak charge to within 4% precision, providing confirmation in Standard Model predictions or providing tighter constraints on emerging "new physics" theories. The desired 4% constraint on Qweak requires tight bounds on systematic uncertainties and background determination. The Qweak liquid hydrogen target utilizes two aluminum windows, which provide the largest background signal contributions in the experiment. Although the aluminum scattering rates are small compared to the hydrogen target, the parity-violating asymmetry of aluminum is approximately ten times larger than the physics asymmetry. This disparity stems from the relative size difference from e-p coupling versus e-Al coupling. This asymmetry has never before been measured, so dedicated aluminum asymmetry measurements are being performed to provide the required precision for Qweak. These measurements are of significant interest and stand-alone in their own right. Not only do we need to determine the parity-violating asymmetry from aluminum, we also need to precisely determine the fraction of detected events coming from the target walls. This contribution, known as the dilution factor, is a challenging measurement in itself. This talk will briefly present initial measurements of the aluminum asymmetry and target cell dilution factors.

Perturbative lattice QCD with anisotropic clover action.

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

In this work, we apply methods of perturbation theory to lattice quantum chromodynamics (QCD) in order to investigate the momentum distribution of quarks inside hadrons at high momentum transfers. Quark distribution amplitudes in mesons can be extracted from quark bilinear operators, and the main focus in our research is on renormalization of these operators in order to relate results of lattice calculations to experiment. In baryons, the corresponding quark distribution amplitudes are related to matrix elements of three-quark operators. The Hall B experiment in Jefferson Lab, which studies the spectrum of excitations of hadrons, has collected a wealth of data, and the investigation of the transition form factors to excited states, which at high momenta can be related to these amplitudes, is a key component of its future plans. However, obtaining an accurate resolution of excited states using methods of lattice QCD is not a trivial problem due to faster decay of excited-states correlation functions in Euclidean space in comparison with those of ground states. To avoid this difficulty, anisotropic lattices with a finer temporal discretization can be used. In current research, we do lattice spectroscopy by performing perturbative calculations of renormalization parameters using an improved anisotropic Sheikholeslami-Wohlert ("clover") action with stout-link smearing.

Temporal resolution limit in TOF ionization desorption

Presenter: Guangzhi Qu
Advisor: William Cooke
College of William & Mary,
Physics

Since late in the last century, laser ionization desorption has been widely used technique for molecular analysis of biochemicals, such as peptides and proteins. Among those various mass analyzers, Time of Flight (TOF) analyzer is commonly employed to record the entire mass spectrum for each single laser shot. Although the TOF ionization has been widely used, the mechanics which limits the temporal resolution is not entirely understood. We have used novel liquid, Room Temperature Ionic Liquid (RTIL) as a matrix to study the limits on temporal resolution in our new top down illumination laser TOF ionization system. The RTIL provides a stable surface that automatically recovers after a laser shot, whereas the conventional solid matrix becomes burned and pitted after several laser exposures. Data from individual laser shot how that in laser shots where many ions are produced, some of them arrive with very large time delay, showing they have lost as much as 1% of the energy the accelerating field provides. However, the average ion energy for any given mass does not change appreciably. For ions with mass equal to or greater than the primary ion, the slow ions show a very distinctive cut-off at late times. This cut-off is also dependent on the total number of ions produced in the laser pulse. This shift in arrival times appears to the primary cause of the reduction of instrument resolution for laser pulsed ion TOF measurements.

Construction and comparison of γZ-structure function models

Presenter: Benjamin C. Rislow
Advisor: Carl Carlson
College of William & Mary,
Physics

The Q-weak experiment at Jefferson Lab aims to perform a 4% measurement of the proton's weak charge by examining the asymmetry of scattered electrons off a proton target. To obtain this desired precision, all radiative corrections must be well understood. Recently, there has been some disagreement in the calculation of the exchange of a photon and Z-boson, the γZ-box correction, caused by differing models of the γZ-structure functions. Structure functions describe the behavior of the proton under the exchange of different particles. γZ-structure functions have yet to be measured directly and present models rely on the modification of existing fits to γγ-structure function data. All models give approximately the same result for the γZ-box correction, within uncertainties, but one would like to reduce the uncertainties. The models yield different predictions for the PVDIS experiment at Jefferson Lab and the upcoming results may provide a first test on the robustness of the differing modifications. We present our modifications to the γγ-structure functions and our prediction for the asymmetry measurement at the PVDIS kinematics. We also compare our prediction to those of competing models and find that disagreements are most striking at energies lower than what is probed by the present PVDIS experiment. Thus, future experiments at lower energies are desired to assist in the testing of the models.

How (not) to explain the speed-up of quantum computation

Presenter: Philipp Roser
Advisor: Antony Valentini
Clemson University,
Physics and Astronomy

Ever since its birth about two decades ago, the field of quantum computing has received a lot of attention from theorists and experimentalists alike. Exploiting features of quantum mechanics allows us to exponentially speed up certain types of computations, such as the factorization of large numbers, which forms an important part of modern cryptography. But which features are those exactly? Which aspects of quantum mechanics is it that we are exploiting? Several claims have been made, ranging from the existence of parallel universes to entanglement and the “wave-like” behavior of quantum mechanics. Yet none of these answers are entirely satisfactory, either because they presuppose a particular “interpretation” of quantum mechanics, such as Everett's *Many-Worlds Theory*, or because they are too vague in their explanation. With this theoretical research question in mind I pursue two lines of argument: Firstly, looking at the particular counter-example of de Broglie-Bohm Pilot-Wave Theory I provide specific reasons why the notion of many-worlds in particular does not help us to understand the speed-up of quantum computing relative to classical computing any better. Secondly, I argue that perhaps we're asking the wrong question. Instead of “how does quantum mechanics speed up computation” we should ask: “How does classical mechanics slow down computation?” I seek the answer to this question by looking at how the given dynamics (quantum or classical) limit the types of expressible questions, i.e., the types of questions we can ask a computer.

Enhancement of MS Signal Processing For Improved Cancer Biomarker Discovery

Presenter: Qian Si
Advisor: William Cooke
College of William & Mary,
Physics

One of the hopes for early detection of cancer is that some biomarker proteins may be produced in detectable quantities even at the earliest stages of the disease. The most common method for detecting such blood-borne biomarkers is Matrix Assisted Laser Desorption/Ionization (MALDI) a kind of time-of-flight mass spectrometry. The Eastern Virginia Medical School group has collected clinical samples of blood from healthy patients and from patients with Acute T-cell Leukemia (ATL), and have produced spectra using MALDI-TOF. The aim of this project is to identify the maximum number of mass peaks within this collection of spectra that might be ATL biomarkers. However, the raw data that MALDI produces usually requires significant pre-processing before it can be used to identify biomarkers. Our research was focused on developing statistical algorithms and creating data mining tools for computationally improved signal processing for mass spectrometry data. The goal is to transform the raw data into a high quality representation of the mass spectrum, so that the most important proteome constituents can be quantified. The identification method consists of essentially three major steps: First, we identify mass peaks in each spectrum, separating them from the noise and background. Second, we align the various spectra to combine their mass peaks combine and identify a master list of peaks that should have been found in each spectrum. Finally, we generate a list of the signal amplitude for each of these mass peaks in each spectrum. At this point, other analysis will find the important peaks and patterns of peaks to identify the biomarkers.

Bright squeezed light from a whispering-gallery mode resonator via second harmonic generation

Presenter: Matt T. Simons
Advisor: Irina Novikova
College of William & Mary, Physics

Optical nonlinear frequency conversion allows the generation of non-classical optical states that are necessary for realizing optical quantum information communication and computation. We extend this idea to whispering-gallery mode resonators (WGMRs), exploiting their high quality factors in order to reduce the input power, optical mode bandwidth, and experimental complexity. Our research focuses on the generation of bright squeezed light from second harmonic generation (SHG), a nonlinear process in which two photons of an infrared optical field are converted into one green photon. This single-step process offers many advantages over traditional methods, which typically involve two stages of nonlinear frequency conversion. We demonstrate theoretically that SHG in a whispering-gallery mode resonator can reduce fluctuations in the infrared field below the standard quantum limit. This is shown using quantum calculations of a photon field in a WGMR cavity in the presence of a two-photon conversion process. With appropriate experimental parameters, we predict noise suppression by a factor of 5 compared to the classical limit. We also report on the experimental progress using crystalline whispering-gallery mode resonators made from magnesium oxide-doped lithium niobate ($MgO:LiNbO_3$). Previously, we demonstrated naturally phase-matched SHG inside our WGMRs. Now we will demonstrate that the output from our WGMRs, when operating at the conditions for SHG, behaves non-classically. This is a step towards a low-power, simple source of quantum light.

Many-body effects in cobalt adatoms absorbed on graphene

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

Graphene is a single layer of carbon atoms densely packed in a honeycomb crystal lattice. Since its discovery, graphene has been the subject of intense research efforts, due to its unique and exceptional intrinsic properties. Structurally, graphene is the strongest, the stiffest and the most stretchable crystal ever created. Electronically, due to its linear dispersion at Dirac point, it has the highest electron mobility and current density at room temperature. Graphene is also considered to have promising applications in designing spintronics devices. However, external methods are required to induce magnetism, since pure graphene is nonmagnetic. One proposal is to adsorb transition metal atoms to provide localized magnetic moments. Several theoretical and experimental studies have examined cobalt (Co) adatoms on graphene. Calculations of Co/graphene systems have largely been done at the density functional theory (DFT) level, with local or semi-local functionals and with an empirical Hubbard on-site repulsion U (LDA+U). However, the applicability of methods based on independent-electron approximations in such systems is unclear, where electron correlation effects can be significant. We use auxiliary-field quantum Monte Carlo (AFQMC), in combination with DFT and quantum chemistry methods, to examine the effects of electron correlation in Co/graphene systems, without adjustable parameters. Binding energy curves for Co/graphene and model structures will be presented, and their implications on the electronic and structural properties will be discussed.

Simultaneous Bulk and Surface Plasmon Resonance and Radiative Polaritons excited in RuO_2 films grown on glass and on TiO_2 (001)

Presenter: Lei Wang
Advisor: R. Ale Lukaszew
Co-Authors: C. Clavero, K. Yang, E. Radue, G. Scarel
College of William & Mary, Physics

Conducting oxides have a much lower carrier concentration as compared to metals, giving rise to a lower plasma frequency which lies in the infrared (IR) region. In particular, RuO_2 has a lower plasma frequency of 3.3eV as compared to the plasma frequency of Au (9eV). This unique feature of conducting oxides allows for simultaneous observation of surface and bulk polariton modes in the IR range. Here we have investigated bulk and surface plasmons as well as radiative polaritons in RuO_2 thin films. The RuO_2 thin films investigated were grown using DC magnetron sputtering on glass and TiO_2 (001) substrates. We have used X-ray Diffraction and Reflection High-Energy Electron Diffraction to characterize the microstructure of these samples. Four-point probe was used to investigate the electrical conductivity properties and ellipsometry was used to characterize the optical properties of the films. The optical measurements were carried out using HeNe red laser (632nm) and IR laser (1520nm) radiations to illuminate RuO_2 thin films. We will show that bulk plasmons can be excited in RuO_2 thin films in the visible red region, while simultaneous bulk plasmons as well as surface plasmons excitation are observed in the IR region. Besides, we also investigated radiative polaritons in the middle IR region (20-2.2um) using Fourier Transform Infrared spectroscoy. We will show the substrate influence on the radiative polaritons by measuring films grown on glass and on TiO_2 (001).

Apertureless scanning near- field infrared microscopy with a broadband light source

Presenter: Peng Xu
Advisor: Mumtaz Qazilbash
Co-Author: N. Penthorn
College of William & Mary, Physics

The spatial resolution of conventional infrared microscopy is nearly equal to the wavelength of infrared light (about 1 micrometer to 1 mm) and is determined by the Abbe diffraction limit. It is possible to overcome the Abbe diffraction limit and obtain nanoscale spatial resolution with apertureless scanning near-field infrared microscopy. We propose a design of a scattering- type scanning near-field infrared microscope (s-SNIM) based on an atomic force microscope (AFM) tip illuminated with broadband light source. The amplitude and phase spectra of the near field signals at different frequencies are measured simultaneously and contain information of the near field interaction of the tip- sample system. The amplitude and phase spectra can be modeled to obtain the complex dielectric function of the sample with 20 nm spatial resolution. The pure near -field optical contrast is achieved with lock-in detection and pseudo-heterodyne method which suppress unwanted background. This design is advantageous compared to measuring the spectra by scanning different frequencies. The broadband s-SNIM will become an extremely useful analytic tool for identification and investigation of conduction phenomena, chemical components, surface plasmons, and surface phonon polaritons on nanometer length scales.

Atom Chip Microwave and RF Microtraps for Ultracold Atomic Applications

Presenter: Austin Ziltz
Advisor: Seth Aubin
Co-Author: M. Ivory
College of William & Mary,
Physics

We present progress towards the development of microwave & radio frequency (u/RF) potentials using atom chip technology for novel trapping and interferometry of ultracold potassium atom. Atom chips are capable of generating steep u/RF potentials that are inherently conservative, spin-dependent and can be combined with DC magnetic Feshbach resonances and confinement-induced resonances to tune atom-atom interactions and form ultracold molecules. Trap dimensionality can also be continuously tuned from 1D to 3D. Applications of spin-dependent u/RF potentials include high accuracy interferometry, isothermal sympathetic cooling, atomtronic devices as well as spin-charge separation. We have completed a dual-species cooling, trapping and transport apparatus for the production of degenerate gases. The system includes a first generation, modular 'chip stack' apparatus which allows for control of both DC and u/RF signals in vacuum. Ongoing research into the difference between traditional DC magnetic and u/RF potentials has led to a better understanding of u/RF potential roughness. We focus on the theory of atom chip-based u/RF microtraps (u/RF traps) and compare to DC micromagnetic traps. In our u/RF trap geometry, potential roughness is suppressed by selection rules as well as the characteristic shape of the deviations compared to equivalent micromagnetic DC chip potentials.

Once Upon a Time The Hiker Turned Right: Assessing the Effectiveness of Narrative in Wayfinding Directions

Presenter: Aimee J. Brasseur
Advisor: Michael Klein
James Madison University,
Technical and Scientific Communication

Contrary to popular belief, one finds narrative in disciplines other than literature. One such field is technical communication. Many scholars in technical communication, however, find it challenging to accept narrative as important to their field even though practitioners already use this writing style in genres such as legal writing and medical writing. The focus of this presentation is the genre of writing called wayfinding directions, which are directions to get from one location to another. In this method of communication, it is essential that readers understand the directions they receive in order to successfully reach their destination. By conducting this study, the researcher hoped to discover the effectiveness of including narrative in wayfinding directions. To answer this question, she created three versions of wayfinding directions for a fictional hikeónarrative, bulleted, and a combination of both narrative and bulleted. Then, through a sequential mixed methods research design, she collected data through the use of two quantitative exams. The first exam tested reading comprehension, while the second exam tested retention. A qualitative survey was then administered to supplement this data. The researcher expected to find that that while writing style in wayfinding directions would not affect reading comprehension, the use of narrative in wayfinding directions would improve retention.

Situational Framing & Effect on Prejudicial Confrontation

Presenter: Kevin Cavanagh
Advisor: Cheryl Dickter
College of William & Mary,
Psychology

Previous research has established that self-reported levels of racism have declined over the past few decades but studies show that being exposed to prejudicial comments create negative emotional experiences in individuals who are targets of the comments as well as non-targets. Confronting the individual who makes the racist comment has been shown to be an effective strategy, in that it increases self-directed negative affect in commenters, which reduces prejudice and prevents the commenter from making future inappropriate comments. However, previous research suggests that individuals are often reluctant to confront individuals who make prejudicial comments. Due to the positive effects of confrontation, studying the factors that lead people to confront is particularly important. The current study examines how confrontation is affected by situational framing, based on previous work demonstrating that people will engage in strikingly different behaviors based on how positively or negatively a situation is framed. In addition, this work extends previous evidence that positive and negative perceptions of the commenter can influence confronting behavior. The current study examines non-target college students' responses to racist comments that are either positively or negatively framed, using Facebook as a communication medium. It is hypothesized that participants will confront more often and more strongly when the racist remark is negatively framed compared to when it is positively framed. This research will extend previous work examining factors that lead non-targets to confront racist remarks, and has implications for informing diversity training and multicultural education.

Do social constraints moderate the relationship between perceived life threat and posttraumatic stress following a mass shooting event?

Presenter: Katharine Donlon
Advisor: Russell Jones
Co-Authors: A. Smith, K. Amatya, S. Anderson
Virginia Tech,
Clinical Psychology

Posttraumatic stress (PTS) can occur after a trauma, and is characterized by symptoms of re-experiencing, hyperarousal, and avoidance. PTS often results from perceiving that one's well-being, or the well-being of someone close to him or her, is threatened. The Virginia Tech shootings were traumatic for students, with nearly 15% reporting significant symptoms of PTS. This study examines the role of social constraints on PTS. Social constraints are the belief that one's social network is unavailable, or unsupportive, in a time of need. Social constraints are an understudied construct, though the literature suggests it may contribute to the development of PTS by inhibiting individuals from fully processing the traumatic event. Data was obtained from a large-scale survey distributed to the students enrolled at Virginia Tech at the time of the shootings. Data was collected three months following the shootings. A total of 4,639 students responded to the survey. It is anticipated that social constraints will moderate the relationship between perceived life threat, and the association between perceived threat and PTS will be stronger at higher levels of social constraints. The findings from this study have the potential to critically examine the role of social support in the aftermath of trauma. Specifically, it will be important to understand whether or not perceptions of social constraints contribute to increased distress. It is likely that social support is a critical factor to consider when designing secondary prevention strategies following trauma.

The Development of Children's Understanding of Jail

Presenter: Johanna B. Folk
Advisor: Danielle Dallaire
College of William & Mary,
Psychology

Over two million children in the United States have a parent in jail or prison (*U.S. Department of Justice, 2007*), but little is known about children's understanding of incarceration. The limited research in this area suggests that children base their perceptions of prison on their own experiences, their imagination, or stories provided by their incarcerated parent (*Council of Crime and Justice, 2006*). The goal of the current study is to begin filling this gap in the literature by examining the development of children's understanding of jail. 110 at-risk school-age children (M = 11.03, SD = 1.89) and their parent/guardian have participated. Of the participants, 77% are Black and 32% had experience with parental incarceration (PI). All children completed a 14-question Understanding of Jail Interview, which consisted of open-ended and yes/no response type questions. Children's responses have been coded to quantify them for complexity. Some dimensions of coded responses include the type of attributions children make for why a person is in jail and how children perceive people are treated in jail. Preliminary analyses suggest numerous age effects, as well as interactions between age and history of PI. Younger children who have experience with PI tend to show greater complexity in their responses than younger children who have not experienced PI. Knowing what children understand about jail may be useful information for the caregivers of children with incarcerated parents, who are often left to explain the absence of a parent to a child. This information could provide them with a basis to begin talking to the child to help them understand and adjust to the separation.

Implicit Affective Responses to Smoking-Related Cues in Individuals with a History of Parental Smoking Behavior

Presenter: Patrick J. Hammett
Advisor: Catherine Forestell
College of William & Mary,
Psychology

Recent research has identified the college age population as a demographic with particularly high risk for developing tobacco dependency. This trend is especially troubling as addictive behaviors that develop in college can cascade into lifelong struggles with addiction. As such, research geared toward the elucidation of the cognitive processes that underlie the development and maintenance of addictive behaviors is important. One domain of addiction research that has proven promising explores the influence of implicit affective responses to drug-related environmental cues has on future intake behavior. Towards this aim, the present study explores the effects of previous exposure to parental smoking behavior on cortical lateralization and implicit affective responses to smoking-related cues. Eighty college participants with smoking and non-smoking parents were recruited for this study. Two measures were employed to assess implicit affect. First, the Affect Misattribution Procedure (AMP) which involves the presentation of a series smoking and neutral primes followed by Chinese pictographs. Second, the startle blink procedure which measures the magnitude of blink responses to white noise bursts following smoking and neutral cues. An EEG measure was also used to record levels of cortical lateralization during the presentation of smoking and neutral cues in order to assess approach and avoidance motivational tendencies. Based on the findings of previous addiction research, it was hypothesized that participants with family histories of parental tobacco use would exhibit more positive implicit affective responses, as well as increased left cortical activation, to smoking-related cues than participants without such histories.

The effects of graphic warning labels on implicit affective responses to smoking-related images

Presenter: Anna K. Harris
Advisor: Catherine Forestell
College of William & Mary,
Psychology

Despite extensive knowledge of the risks of cigarette smoking, tobacco addiction remains prevalent in our society, with 20% of Americans reporting that they smoke. Countries such as Australia and Canada have required graphic warning labels on cigarette packs since the early 2000's, and research has shown that, compared to text-only labels, these labels invoke stronger emotional and cognitive responses in smokers. In September 2012, the U.S. will also begin to require the use of similar labels, and research on the effects of these new labels is needed in order to determine how they affect smokers. The proposed study examines how graphic warning labels affect implicit affective responses to smoking-related stimuli in daily smokers, occasional smokers, and nonsmokers. Because self-reported affective responses for stigmatized activities such as smoking are often misreported, an implicit measure is ideal for honest, accurate responses. An affective misattribution procedure will gauge implicit emotional responses in the three groups after exposure to either the warning labels or a set of matched controls. Participants will rate ambiguous stimuli as either pleasant or unpleasant after very brief exposure to smoking-related stimuli and matched non-smoking-related stimuli; these ratings reflect the affective response to the initial stimuli. We predict that daily smokers will show more negative affect toward the smoking cues after exposure to the warning labels compared to the other groups, who will show consistently negative affect toward smoking cues regardless of label exposure.

Electrophysiological Evidence for Scalar Variance in Temporal Processing

Presenter: Jamie N. Hershaw
Advisor: Paul Kieffaber
College of William & Mary,
Psychology

Overt timing behaviors frequently exhibit properties of scalar variability, wherein the variability of reproduced temporal intervals increases linearly as a function of interval duration. Scalar expectancy theory (SET) attributes this property of scalar variability to the internal clock, memory, and decision-making components of SET. Previous research has encountered difficulty isolating sources of variability and evidence for scalar variability in the neural correlates of temporal processing is sparse. The goal of the current research was to determine whether omission-evoked brain potentials (OEPs) would exhibit scalar variability consistent with SET. Participants performed a finger tapping task in which they tapped in sync with tones separated by 350, 450, 550, or 650ms intervals, and continued tapping with the same intervals when the tones were omitted. This paradigm enabled us to isolate the memory component of SET. Results demonstrated that the width of the latency increased as the inter-tone interval increased. Furthermore, the onset latency, but not the offset latency, of OEPs exhibited scalar variability. This suggests that scalar variability in the memory component of SET is a result of subjective shortening—a phenomenon whereby memory of intervals decays as time since memory formation increases. Correlations analyzing the relationship between tapping behavior and neural activity suggest that behavioral variance is likely attributed to other components in addition to memory. This research is among the first to report scalar variability in the memory component of SET as indexed by brain potentials and demonstrates the utility of electrophysiological methods to complement traditional behavioral measures of SET.

Student-Instructor Interactions: Identifying Predictors of Out-of-Class Helping Behavior

Presenter: Sarah J. Kerper
Advisor: Jenessa Steele
Co-Authors: T. Kennedy, A. Cox, V. Morris
Radford University,
Psychology

Out-of-class communication often involves students meeting with instructors during office hours, about an academic problem, which ends in self-disclosure of personal problems as a form of help-seeking. Although this interpersonal exchange occurs often, little research exists which examines potential predictors of faculty helping behavior in this context. The present study adds to psychological research on prosocial behavior and communication research by assessing the nature of helping interactions between instructors and students. Specifically, instructors' self-efficacy in dealing with student personal problems and empathy toward students was expected to positively relate to instructor prosocial tendencies. In addition, internal causal attributions were expected to negatively relate to instructor prosocial tendencies, whereas external causal attributions were expected to positively relate to instructors' prosocial tendencies. Approximately 700 instructors at Radford University were asked to participate in the study. Questionnaires included a demographic inventory and separate measures assessing empathy, causal attribution, self-efficacy, and prosocial tendencies. All responses remained anonymous and confidential. Most of the hypotheses were supported, revealing a significant negative relationship between instructors' internal causal attributions and prosocial tendencies ($r(90)= -.22$, $p<.05$). There were also significant positive relationships between empathic concern and prosocial tendencies ($r(90)= .51$, $p<.01$) and self-efficacy and prosocial tendencies ($r(90)= .53$, $p<.01$). These findings indicated that instructors were less helpful in situations where students were deemed responsible for their personal problems and more helpful in situations where they were more empathetic towards the student, as well as when instructors felt self-efficacious in helping students.

Early Attention to Racially Ambiguous Faces

Presenter: Julie A. Kittel
Advisor: Cheryl Dickter
College of William & Mary, Psychology

Although the multiracial population in the United States is growing, little research has investigated how early implicit attention is directed to faces that cannot be easily placed into one racial category. Previous work in our lab indicated that stereotypical information influenced implicit attention to racially ambiguous faces, but no work has examined the link between this processing and prejudicial behavior. This study aims to examine the link between implicit attention to racially ambiguous faces and prejudicial behavior. Participants will complete two behavioral tasks in which they will provide racial majority and minority individuals with ratings on their competency for a job and decisions about sentencing following judicial conviction. Then, participants will categorize a series of White, Black, and racially ambiguous faces while EEG data are collected. In addition, participants will complete several personality measures, including the Motivation to Appear Unprejudiced Scale, which we expect to predict attention to racially ambiguous faces. Furthermore, we expect that individuals who direct greater attention to racially ambiguous faces will exhibit more prejudicial responses on the behavioral tasks.

Challenging Radical Constructivism: Introducing a Brain-Hemispheric Model for Cultural Domain Relations

Presenter: Eric A. La Freniere
Advisor: Sheena Rogers
James Madison University, Writing and Rhetoric

In a hyper-connected world, the division between the sciences and humanities seems not just quaint, but deleterious. Radically shifting environments demand radical adaptability, which requires access to the broadest spectrum of language, knowledge, and methodology. Radical constructivism's solution to the cultural domain divide is to collapse the sciences into the humanities by declaring the sciences genres. That move has failed to impress scientists, in particular. By treating all knowledge as a language game in which words signify nothing beyond themselves, radical constructivism has actually deepened the divide between the sciences and humanities. This spoken-visual presentation examines the hermeneutical basis of the genre model for cultural domain relations, before presenting an alternate model based on brain-hemispheric interaction. As is widely known, cognitive function is asymmetrical: the left hemisphere of the cerebral cortex specializes in word-grammatical linguistic abstraction, the right in image-contextual sensory gestalt. An ideal relationship between the humanities and sciences is analogous to the relationship between the brain's hemispheres: a non-mutually exclusive binary rooted in complementary, interactive cognitive centers. Each domain has its own emphasis and authority: the humanities have language, the sciences observation. And just as words and images interact to generate the simple concepts and utterances from which increasingly abstract and eventually recursive language emerged, so the humanities and the sciences interact to generate increasingly complex and eventually reflexive culture. Interdisciplinarity is a brain-evolutionary imperative.

Age-related changes in the neural correlates of temporal decision-making

Presenter: Cutter A. Lindbergh
Advisor: Paul Kieffaber
College of William & Mary, Psychology

Nearly every psychological model that has been proposed to account for the ability to keep track of time involves a clock component, a memory component, and a decision component. Although older adults have been shown to exhibit behavioral deficits in mental timekeeping, there has been a paucity of research mapping the origins of these deficits to specific components of the temporal processing system. The present study employed electroencephalography to determine the integrity of the temporal processing system during aging as well as the specific component(s) that may play a role in age-related timing dysfunction. Twenty older adults and twenty younger adult controls completed a temporal bisection task, which required temporal judgments to be made about visual stimuli ranging from 1250 to 3000 milliseconds (ms) in duration. Significant abnormalities in event-related brain potentials at 200 to 700 ms post stimulus offset were observed in older adults. This finding suggests that the behavioral timing deficits observed in older adults have their origins in the decision-making component of the temporal processing system.

Flavor-Flavor and Flavor-Calorie Conditioning in Children

Presenter: Victoria H. Marshall
Advisor: Catherine Forestell
College of William & Mary, Psychology

Research with animal-models has demonstrated that flavors become more positive when paired with sugar in a Pavlovian conditioning paradigm. In these studies one flavor (CS+) is mixed with a sweet-tasting and/or caloric reinforcer and a different flavor (CS-) is mixed with a noncaloric source such as water. After repeated trials, animals demonstrate a preference by consuming more of the CS+ relative to the CS- in two-bottle tests. Because the mechanisms involved in conditioning flavor preferences in children are still unclear this study assessed the relative strength of associations formed between a flavor cue and sweet taste, and associations between the flavor cue and the calorific reinforcement in a sample of 32 children between the ages of 4-12 years. While one group of children received one flavor of ice tea paired with either a sweet tasting reinforcer (aspartame), another group received calorific, sweet-tasting reinforcer (sucrose). For both groups a second flavor of ice tea (CS-) is mixed in water on alternate days of the home-exposure. When children's relative consumption of the CS solutions was measured to determine whether preference shifts occur as a function of conditioning, results indicated that only children younger than 10 years acquired preferences for the flavor paired with sucrose relative to the CS-. These findings suggest that younger children can acquire flavor-calorie associations and contribute to better evidence-based strategies to overcome obesity.

Una Red Social: Peer Support for Improved Diabetes Self-Management in Real del Monte, Mexico

Presenter: Christa Martens
Advisor: Edwin Fisher
Co-Authors: S.Weller, C. Chu, A. Fitzgerald
University of North Carolina, Chapel Hill, Health Behavior and Health Education

A collaboration between Peers for Progress of the American Academy of Family Physicians Foundation, the ReMeDi diabetes clinic in Real del Monte, Mexico, and MPH students from the UNC Gillings School of Global Public Health, this project aimed to examine the links between diabetes self-management and peer support in a rural town in Mexico. Reflecting global trends, the prevalence of diabetes in Mexico is 10.1%. In the state of Hidalgo, where the town of Real del Monte is located, diabetes was the fifth leading cause of death in 2000. The UNC team conducted an in-depth community assessment, through focus groups and interviews, to better understand key features of the experience of diabetes and its management in Real del Monte. Qualitative analyses uncovered the following themes: barriers and facilitators to effective diabetes management, gaps in current health services, and an expressed need for, and interest in, social support. These findings are currently being used to inform the development of a program that will improve social support, self-efficacy, knowledge, skills, and reduction of stigma in order to achieve improved diabetes self-management in the Real del Monte community.

How do we infer causation? How should we?: The use of the correlational technique is lay perception and scientific inference

Presenter: Chris C. Martin
Advisor: Todd Thrash
College of William & Mary, Psychology

Humans use the concept of causation all the time to explain why events occur. Psychological research from the last half century has shown that people infer causation by using certain cues or contrasts. The cues include property transmission, temporal continuity, spatial continuity, temporal contiguity, covariation and similarity; and the contrasts include probabilistic comparisons of effect cases and non-effect cases (*White, 1995*). In the sciences and social sciences, one of the predominant ways for making causal inferences has been to first establish a correlation between the putative cause and effect, and then eliminate spurious explanations. We will show how lay psychological tendencies may cause scholars to overly rely on this technique, even though it is flawed. We will show how this overreliance may occur because the correlational technique is similar to the lay perceptual technique, making the non-obvious flaws of the correlational technique hard to detect. Using our review of recent psychological literature, we will show how new scientific discoveries have been made when these flaws were addressed, and we will suggest improvements to the correlational technique that scientists and social scientists should consider.

"Put A Smile On": Children's Use of Display Rules during a Disappointing Task

Presenter: Jennifer A. Poon
Advisor: Janice Zeman
College of William & Mary, Psychology

Display rules are context-dependent guidelines that dictate the propriety of expressed emotions and behavior that are learned and strengthened during childhood. Children's use of display rules has been associated with emotion regulation (ER) abilities, social skills, psychopathology, and is mediated by age and gender. Empirical support for display rule use among children in high-risk environments is sparse. The disappointment task paradigm (DTP) is used to assess display rules, wherein children are presented with a disappointing gift and then their response to the gift is observed. In a sample of 79 children of incarcerated mothers, the disappointment task paradigm (DTP) was employed to assess display rule usage (DRU). Specifically, the current study investigated age and gender differences in ER as indexed by the DTP, the validity of the DTP using maternal reports of children's ER skills, and the potential relationship between caregivers' reports of children's externalizing and internalizing symptoms and social competency and DRU. Results indicate that older children are more likely to use display rules and took longer respond to disappointing gifts. Regressions revealed that mothers' reports of children's ER abilities predict children's DRU. Partial correlations suggest that DRU was negatively correlated with internalizing problems and social problems. These findings mirror those of normative samples. However, the absence of association between externalizing behaviors and display rule use in a high-risk sample warrants further research in order to understand differences in psychosocial adaptation in high-stress environments relative to normative environments.

Studies of Attention in Autism to Social and Non-social Stimuli

Presenter: Antoinette Sabatino
Advisor: Gabriel Dichter
University of North Carolina, Chapel Hill, Psychology

Autism is a pervasive, neurodevelopmental disorder characterized by deficits in three domains: significant impairments in language, social deficits, and restricted and repetitive behaviors. Narrowed interests, perseverative patterns of attention and reduced visual exploration have been conceptually linked to repetitive behaviors in autism, specifically what are known as circumscribed interests (CI) within a narrow range of subject areas. Individuals with autism that have CI partake in activities around their interest (collecting, manipulating, reading, playing, conversing, etc.) that interfere with an individual's functioning. This study will investigate visual exploration and cognitive control over attention of images related to CI that are essential for behavioral and brain development in children with autism. Patterns of reflexive and consciously controlled visual attention will be studied to determine if CI in autism are associated with unique patterns of visual attention not seen in typically developing children. Previous eye-tracking research has investigated responses to categories of images reflecting CI that capture attention during passive viewing tasks. Children and adults with autism display an attentional bias towards certain categories of nonsocial images (e.g., train, automobiles, electronic devices, computers). This bias has been conceptualized to reflect an increased salience of nonsocial images relative to social images (e.g., faces) or other, more commonplace, nonsocial information (e.g., furniture, clothing, dishes). Our research group is currently conducting studies to extend these findings regarding atypical patterns of attention to social and nonsocial information in children with autism.

The Effect of Current and Anticipated Resources on Mate Preferences

Presenter: Gregory A. Shuler
Advisor: Lee Kirkpatrick
College of William & Mary,
Psychology

The research literature on mate selection shows that when considering the attractiveness of a prospective mate, women place a higher value on financial resources than do men. Furthermore, a positive relationship has been shown to exist between a woman's socioeconomic status (SES) and the magnitude of this particular preference. The present study has two goals: First, the study will use an improved methodology to examine if this effect has been underestimated in the research literature. Second, the study will examine whether past SES or anticipated SES is more predictive of an increased preference for men with resources by measuring them both separately. Traditionally, the items that have been used to measure participant SES in mate preference studies have been aggregated to form a single composite measure of SES that includes both past and anticipated financial resources. The present study will delineate between past and anticipated SES and analyze them separately to determine which SES status is more predictive of a shift in preference for a mate with financial resources. I expect, consistent with evolutionary theory but contrary to social-roles theory, that past SES will predict a preference for a mate with resources more strongly than personally anticipated financial prospects. I also anticipate that the current study will find a greater effect size than what has been reported in the literature by using an improved methodology to more accurately measure the size of this effect.

Categories of Intervention in Structural Family Therapy

Presenter: Sydney Tafuri
Advisor: Michael Nichols
College of William & Mary,
Psychology

My research in progress involves categorizing the types of interventions system-oriented family therapists make in order to move clients from a linear and blaming perspective of their problems to a systemic perspective that takes into account the various family members' contributions to their mutual problems. This involves watching taped structural family therapy sessions conducted by experienced systems-oriented family therapists and categorizing all of their interventions as well as developing frequencies of these interventions. The clinical sample was drawn from a collection of family therapy sessions that were videotaped and compiled by the Minuchin Center for the Family in New York. We have begun categorizing interventions based on methods and techniques the therapist uses in the sessions and recording therapists' key dialogue to put the interventions into categories. In the second phase of this study to be conducted in the Fall of 2012, undergraduate raters will be recruited and given a copy of these interventions and will rate the extent to which clients understand and accept what the therapist says on a seven-point, Likert-like scale with each numerical value paired with a description to represent the continuum of clients' understanding and acceptance rates. Findings from this study will contribute meaningful information about productive therapy strategies to treat families and will contribute to the teachings and upbringing of future family therapists.

Take Me Away: Escape Drinking and Attentional Bias to Alcohol Cues in College Students

Presenter: Chelsie Young
Advisor: Cheryl Dickter
Co-Author: C. Forestell
College of William & Mary,
Psychology

The present study explored the role motivation plays in contributing to attentional bias to alcohol cues in college students. It was hypothesized that escape drinkers; those who seek out alcohol to relieve dysphoric mood (n = 76), would show a greater attentional bias to alcohol cues compared to non-escape drinkers (n = 65). A dot-probe reaction time task was used, which featured pictures of alcohol-related and non-alcohol-related stimuli. Results suggested that escape drinkers show an attentional bias to alcohol cues relative to non-alcohol cues at 500 ms presentation time when stimuli contained a human element, as well as an attentional bias to alcohol cues relative to non-alcohol cues at 2000 ms presentation time when stimuli did not contain a human element. Regression analyses revealed that escape drinking predicted attentional bias over and above the effects of alcohol consumption and risk. These results suggest that motivation for drinking, particularly to escape negative emotion states, impacts attentional bias. Further research concerning the link between attentional bias and escape drinking is warranted.

Effect of Intrabasalis Orexin-A Administration on Attentional Performance in Rats

Presenter: Kristin N. Zajo
Advisor: Joshua Burk
College of William & Mary,
Psychology

Orexins are neuropeptides released from neurons which are primarily localized in the hypothalamus and contiguous perifornical area. These orexinergic neurons project to several brain regions including cholinergic neurons in the basal forebrain, which are known to be important in normal attentional performance in rats. Our previous research demonstrated that orexin receptor blockade impairs attention and that centrally administered orexin A enhances attentional performance. The goal of the present study is to examine whether the basal forebrain mediates the attention-enhancing effects of orexin A. Male FBNF rats were trained on a task which demands sustained attention to discriminate brief, variable visual signals. After stable performance levels were established, rats received bilateral guide cannula implanted into the basal forebrain. Postsurgically, rats were trained in a version of the task in which attentional demands were augmented by a flashing signal at the back of the chamber during the middle block of trials to increase background noise. It is expected that intrabasalis orexin A will improve attentional performance compared to vehicle administration. Through these findings, we expect to gain a better understanding of the neural circuitry underlying the attention-enhancing effects of orexins.

The impact of social media policy guidelines on the Florida Department of Health's use of Twitter®

Presenter: Bobby DeMuro
Advisor: Susan Randolph
Co-Author: C. Meeks
University of North Carolina, Chapel Hill, Public Health

Social media is a powerful tool governments use to reach citizens. State health departments, specifically, leverage social media to improve delivery of public services and promote health outcomes, while creating policies to accommodate the shifting communication patterns that "encourage proper use and to mitigate the risks of social media tools" (*Hrdinova, et al., 2010*). Public policies on state social media use promote messages to enhance citizens' understanding of health information (*Nutbeam, 2000*), while mitigtating risk in health communications (*Hawn, 2009*). Unfortunately, the effectiveness of government social media policies vis-à-vis citizen engagement has not been researched, and the social media landscape is ever changing. The state of Florida is a unique case, with an explicit and well-developed social media policy and active Twitter use by the health department. Furthermore, Florida is a state in crisis. Compared to the national average, a significantly higher percentage of Florida citizens are both obese and uninsured (*Kaiser Family Foundation, 2010*). The objective of this research was to determine how state social media policy impacts the Florida Department of Health's use of Twitter to promote positive health outcomes. Research compared Florida's social media policy to the Center for Disease Control's guidelines, and qualitatively analyzed policy implementation for health promotion on the department's Twitter account. While social media is changing the way Florida's health department communicates, policy is primarily oriented towards mitigating risk, with secondary emphasis on health promotion, perhaps at the expense of citizens' health.

Measuring the Impacts of the National Flood Insurance Program

Presenter: James P. Howard
Advisor: Scott Farrow
University of Maryland, Baltimore County, Public Policy

The National Flood Insurance Program (NFIP) was created by Congress in 1968 to provide insurance and prevention against flood risk and to shift some rebuilding costs off the federal budget. The program, administered by the Federal Emergency Management Agency (FEMA), includes a flood mitigation grants component available to communities and a financial insurance component available to individuals and businesses. The program has been criticized for its environment and economic impacts. This presentation will provide a interdisciplinary retrospective benefit-cost analysis of the NFIP from the period 1993 through 2003, covering data available from FEMA for the program. The paper evaluates the impacts of both the flood mitigation program and the financial insurance component to estimate the net benefit to society during the time frame. The impacts include direct financial transfers, shifts in the consumer surplus, increased cost of building maintenance in flood hazard areas, and environmental changes. The results of this research inform interdisciplinary and policy questions about the NFIP including whether the program should be restructured, whether Congress should enact additional natural disaster insurance programs, or how the benefits and costs of the NFIP extend into the future. The results also provide the baseline for determining how the benefits and costs of the program are allocated among social classes.

An Evaluation of Fiscal Policy Effectiveness during Banking Crises

Presenter: Andrea S. Schirokauer
Advisor: Robert Bednarzik
Georgetown University,
Georgetown Public Policy Institute (GPPI)

The late 2000s banking crisis and the attendant surge in fiscal stimulus packages among the world's major advanced economies have exposed economists' divergent views and taxpayers' skepticism on the effectiveness of fiscal policy on the economy. The intersection of fiscal stimulus and banking crisis recovery poses important questions as public debt levels build up to staggering heights owing to the occurrence of banking crises, and there is well-documented evidence that financial crises and associated fiscal stimulus contribute significantly to this phenomenon. Based on an unbalanced panel of 20 OECD countries for the period 1970-2009, this study examines whether during banking crises, changes in governments' cyclically-adjusted primary fiscal balances have a significant asymmetric effect on shortrun economic growth, that is, whether this effect is different from that observed during more "normal" circumstances. Results suggest that fiscal stimulus is likely to have such an asymmetric effect on growth both in the year following a banking crisis and two years after. However, over longer time horizons, other factors operating through monetary policy appear to be more important.

The Public Funding of Land Conservation Programs in Virginia

Presenter: Thomas R. Vargas-Castro
Advisor: Sarah Stafford
Co-Authors: J. Gore, T. Lam
College of William & Mary,
Public Policy

We conducted a study to identify the state of publicly funded land conservation programs in the Commonwealth of Virginia for The Nature Conservancy. The study looks at three questions. First, how many localities have publicly funded land acquisition programs and purchase of development rights (PDR) schemes in Virginia? Second, to what extent are these land conservation programs influenced by State and Federal Chesapeake Bay regulations? Third, what motivates localities to establish land conservation programs? We administered a Qualtrics-designed online survey to collect information on these programs and ran a probit regression to help give statistical significance to our findings. We find that 17 localities have land acquisition programs, and 11 have PDR schemes; five have both. In addition, we find that the role of federal and state regulations is unclear. Finally, our probit models shows that per capita is a statistically significant variable. In the final analysis we conclude that a relatively high per capita income increases the likelihood a locality institutes a land conservation program. The role of federal regulations, public interest, and the desire to preserve agricultural lands are also important motivating factors.

Outcomes-Based Evaluation of AP Training and Incentive Programs

Presenter: Rebecca E. Wittenstein
Advisor: Paul Manna
Co-Authors: L. Parker, B. Karcher
College of William & Mary,
Public Policy

Our research evaluates the Advanced Placement Training and Incentives Programs currently in use in 65 Virginia high schools. These schools received grants provided by Virginia Advanced Study Strategies (VASS), an educational non-profit seeking to raise student participation and achievement in Virginia high school AP programs in English, Math, and Science. We attempted to measure the effect of the AP training and incentive program when it is coupled with financial incentives for qualifying scores (scores of 3, 4, and 5) on the end of year AP exams. This research evaluates the effects of program participation on student achievement. The evaluation scheme analyzes two levels of outcomes: individual student AP exam scores as well as school-level averages from 2007-2011. Our analysis indicates that the number of qualifying scores in AP classes in VASS schools increased after implementation and that the number of students taking AP courses has generally increased. Further, statistical tests demonstrate that the number of qualifying scores increase for each cohort of schools admitted to the program. Demographic data indicate that with each year a school participates in the VASS program AP course enrollment becomes more reflective of the racial demographics within the school; we are testing if program participation increases opportunities for traditionally underrepresented populations. We recommend that VASS develop a more robust evaluation scheme to be implemented when the program has matured and to link student high school achievement data to their postsecondary and workforce performance to determine any long term effects attributable to the program.

Notes

ARTS & SCIENCES

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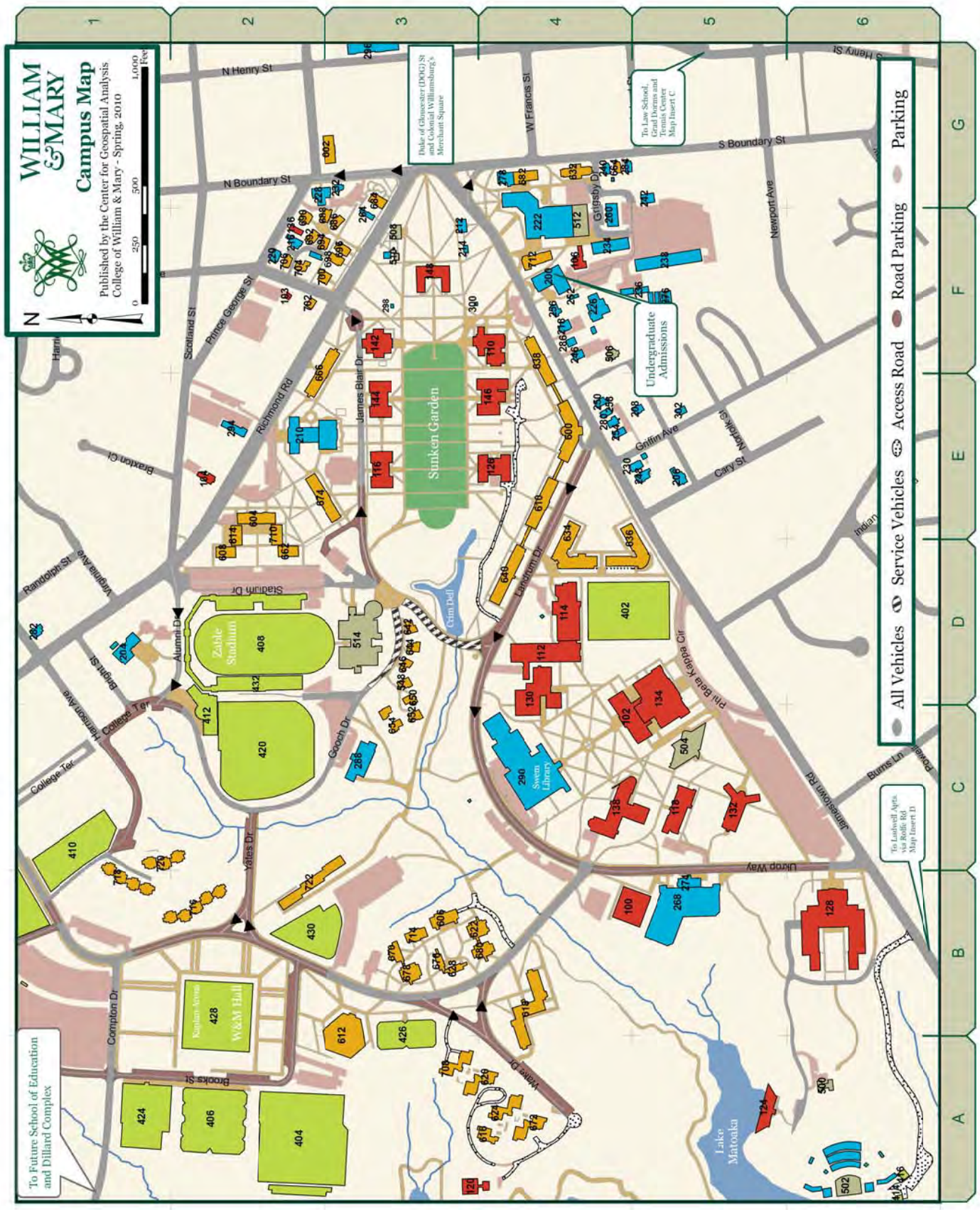
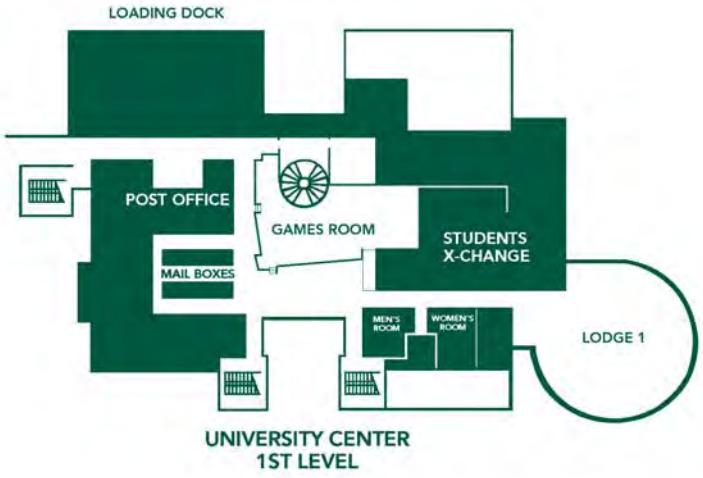
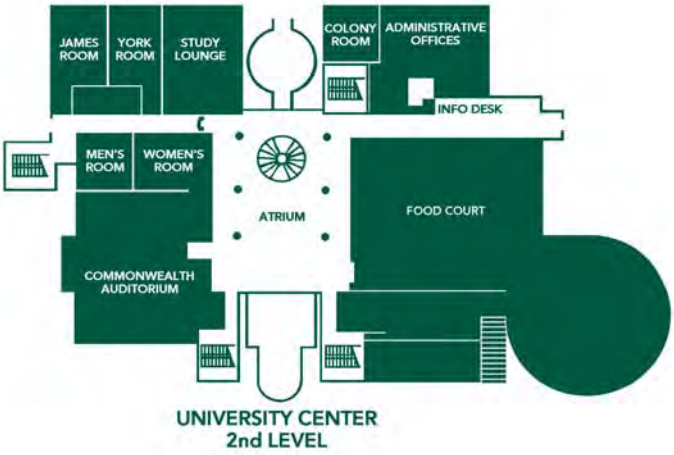
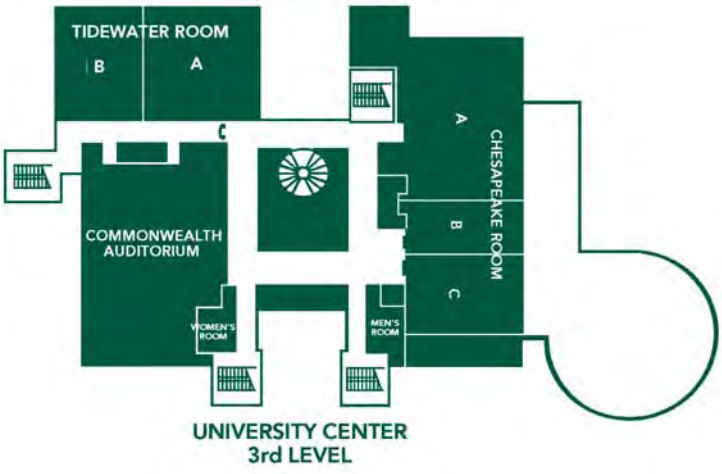

WILLIAM & MARY
Campus Map
Published by the Center for Geospatial Analysis
College of William & Mary - Spring, 2010
N
0
250
500
1,000 Feet
All Vehicles
Service Vehicles
Access Road
Road Parking
Parking
N Henry St
N Boundary St
S Boundary St
W Francis St
Scotland St
Prince George St
Richmond Rd
James Blair Dr
Sunken Garden
Griggsby Dr
Newport Ave
Undergraduate Admissions
Griffin Ave
Cary St
Landrum Dr
Crim Dell
Stadium Dr
Zable Stadium
Alumni Dr
Bryan St
College Ter
Harrison Ave
Gooch Dr
Yates Dr
Compton Dr
Brooks St
Kaplan Arena
W&M Hall
Ukrop Way
Jamestown Rd
Phi Beta Kappa Cir
Swem Library
Lake Matoaka
Boxwood Rd
Indian
To Future School of Education and Dillard Complex
To Law School, Grad Dorms and Tennis Center Map Insert C
To Ludwell Apts via Rolfe Rd Map Insert D
Duke of Gloucester (DOG) St and Colonial Williamsburg's Merchant Square

MAP#	BUILDING	GRID
	ACADEMIC	
100	Adair Hall	B4
102	Andrews Hall	C4
	Blow Memorial Hall (#210)	E2
103	Bozarth Garage	F2
104	ARC (#224)	E2
106	Ceramics Studio	F4
108	Endocrinology (Pop) Lab.	Ins C
110	Ewell Hall	F4
112	ISC1 (Integrated Science Ctr.)	D4
114	ISC2 (Integrated Science Ctr.)	D4
116	James Blair Hall	E3
118	Jones Hall	C5
120	Keck Environmental Field Lab	A3
122	Marshall-Wythe Sch. of Law	Ins C
124	Matoaka Art Studio	A5
126	McGlothlin-Street Hall	E4
128	Miller Hall (Mason Sch. of Business)	B6
130	Millington Hall	C3
132	Morton Hall	C5
134	Phi Beta Kappa Memorial Hall	D5
136	Prince George House	F2
138	Small Hall	C4
140	Sch. of Education (Future Site)	Ins B
142	Tucker Hall	F3
144	Tyler Hall	E3
146	Washington Hall	E4
148	Wren Building	F3
	ADMIN & SUPPORT SERVICES	
200	Admission (Undergraduate)	F4
202	Alexander Galt	Ins A
204	Alumni House	D1
206	Bell Hall	E5
208	Blank House	E5
210	Blow Memorial Hall	E2
212	Brafferton	F3
214	Brafferton Kitchen	F3
216	Braxton House	F2
218	Bridges House	F4
220	Bull House	F2
222	Campus Center	F4
	ARC (#104)	
226	Child Care Center	F4
228	College Apartments	F2
230	Corner House	E4
232	Davis House	G3
	Ewell Hall (#110)	
234	Facilities Mgmt. Admin.	F4
236	Facilities Mgmt. Annex	F5
238	Facilities Mgmt. Shops	F5
240	Facilities Safety	F4
242	Facilities Supervisors	F5
244	Gabriel Galt	Ins A
246	Graduate House	F4
248	Grigsby House	E5
250	Holmes House	E4
252	Hoke House Annex	F4
254	Hornsby House	E4
256	Hoke House	F4
258	Lambert House	E4
260	Main Power Plant	F4
	Marshall-Wythe Sch. of Law (#122)	Ins C
264	Military Science	F3
266	Minson Galt	Ins A
268	Parking Deck	B5
270	Patrick Galt	Ins A
272	Patrick Galt Annex	Ins A
274	Police and Parking Services	B5
276	Quonset Huts	F5
278	Reves Center	G4
280	Rowe House	E4
282	Savage House	D1
284	School Leadership Institute	F4
286	Stetson House	F4
288	Student Health Center	C3
290	Swem Library	C4
292	Swem Off-Site Storage	Ins A
294	Thiemes House	E2
296	W&M Bookstore	G3
298	Wren Outbuilding North	F3
300	Wren Outbuilding South	F3
302	Young House	E5
	ATHLETICS & ATHLETIC FIELDS	
400	Albert-Daly Field	Ins A
402	Barksdale Field	D4
404	Busch Field	A2
406	Busch Tennis Courts	A2
408	Cary Field	D2
410	Intramural Fields	C1
412	Laycock Football Center	C2
414	Matoaka Boat House	A6
416	Matoaka Boat House 2	A6
418	McCormack-Nagelsen Tennis Ctr.	Ins C
420	Montgomery Field	C2
422	Plumeri Park	Ins A
424	Rec Sports Center	A1
426	Tennis Courts	B3
428	W&M Hall & Kaplan Arena	B2
430	Yates Field	B2
432	Zable Stadium	D2
	ARTS & EVENTS	
	Alumni House (#204)	
500	Amphitheatre Ticket Office	A6
	Campus Center (#222)	
502	Lake Matoaka Amphitheatre	A6
504	Muscarelle Museum of Art	C5
	Phi Beta Kappa Memorial Hall (#134)	
506	Plumeri House	F4
508	President's House	F3
510	President's Guest House	F3
512	Trinkle Hall	F4
514	Sadler Center	D3
	W&M Hall & Kaplan Arena (#428)	
	Wren Building (#148)	
	STUDENT HOUSING & SERVICES	
600	Barrett Hall	E4
602	Brown Hall	G2
604	Bryan Hall	E2
606	Cabell	B3
608	Camm	D2
	Campus Center (#222)	
610	Chandler Hall	E4
612	Commons Dining Hall	A2
614	Dawson	E2
616	Dinwiddie	A3
618	Dupont	B4
620	Fauquier	A3
622	Giles	B3
624	Gooch	A4
626	Graduate Housing	Ins C
628	Harrison	B3
630	Hughes Hall	Ins A
632	Hunt Hall	G4
634	Jamestown North	D4
636	Jamestown South	D4
638	Jefferson Hall	F4
640	Landrum Hall	D4
642	Lodge 2: The Daily Grind	D3
644	Lodge 4	D3
646	Lodge 6	D3
648	Lodge 8	D3
650	Lodge 10	D3
652	Lodge 12	C3
654	Lodge 14	C3
656	Lodge 16	C3
660	Ludwell Apts: 100-700	Ins D
662	Madison	D2
664	Meridian Coffee House	G4
666	Monroe Hall	E3
668	Munford Hall	Ins A
670	Nicholas	B3
672	Nicholson	A4
674	Old Dominion	E2
676	Page	B3
678	Pleasants	B3
680	Preston	B3
682	Reves Hall	G4
	Sadler Center #514	
684	Sor. 1: Kappa Kappa Gamma	F3
686	Sor. 2: Alpha Chi Omega	F3
688	Sor. 3: Chi Omega	F2
690	Sor. 4: Tri Delta	F2
692	Sor. 5: Pi Beta Phi	F2
694	Sor. 6: Kappa Delta	F2
696	Sor. 7: Delta Gamma	F3
698	Sor. 8: Phi Mu	F3
700	Sor. 9: Kappa Alpha Theta	F2
702	Sor. 10: Bozarth	F2
704	Sor. 11: Gamma Phi Beta	F2
706	Sor. 12: Delta Phi (Mullen)	F2
708	Spotswood	A3
710	Stith	E2
712	Taliaferro Hall	F4
714	Tazewell	B3
716	Units (Fraternity) A,B,C,D,E	B2
718	Units (Fraternity) F,G,H,J	B1
720	Units (Fraternity) K,L,M	C1
722	Yates	B2

Meeting Space at the Sadler Center







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