Fourth Annual
ACC Meeting of the Minds Conference

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Conference Schedule

Welcome to North Carolina State University and to the fourth annual ACC Meeting of the Minds Undergraduate Research conference. All of us in Wolfpack Country are pleased to host this continuing ACC opportunity for top undergraduate researchers and creative artists to showcase their work. We appreciate your faculty mentors who have taken substantial time and effort to prepare you for advanced study and exciting careers as knowledge builders within your discipline.

You will note that this program's directory is designed to enable you to continue interactions with the participating students and their campus directors. All of us in attendance do hope that you gain confidence in presenting your scholarly work and that you will gain new ideas from other students' work.

Congratulations on your academic achievement and for having been selected to participate. We hope that you will consider NC State for your graduate studies!

James L. Oblinger
Chancellor, NC State University

The "gold standard" in higher learning is American Ph.D. education. We are the envy of the world. Students from around the globe compete for cherished places in our programs. A primary characteristic of these programs is the coupling of concept and practice. Hypotheses emerge from theories. The validity of each hypothesis is tested against "real world" data. This is the core task of scholars, in the sciences and all disciplines.

The magic of American Higher Education is the early involvement of emerging young scholars in this cycle. Rather than "study philosophy," our most promising students "do philosophy." (Substitute chemistry or any other discipline for philosophy.) Our students do the work of scholars. They do research, usually guided by senior scholars. Through research they learn in depth the methods, theories, and conventions of the discipline.

The competitively chosen scholars presenting at this conference are among the best of the best . . . the best students at the best universities. The twelve presidents of ACC universities have made a commitment to endorse and highlight the work of undergraduate researchers, and to fund participation in this important annual conference. Congratulations to the scholars and special thanks to their mentors! We expect great things.

With admiration and appreciation,
David G. Brown, Coordinator, ACCIAC

In addition to serving as Vice Chancellor for Research and Graduate Studies, Dr. Terri L. Lomax is also a Professor of Plant Biology at North Carolina State University. She came to NC State in Fall 2006 as Dean of the Graduate School and Associate Vice Chancellor for Research. Before arriving at NC State, she was on assignment from Oregon State University to NASA Headquarters in Washington, D.C., where she served first as Director of the Fundamental Space Biology Program, then as acting Deputy Associate Administrator for Exploration Systems Research, and finally as Senior Policy Analyst and Senior Education Advisor. As a Professor in the Center for Gene Research and Biotechnology at Oregon State for 19 years, she founded and directed both a K-12 science outreach program, Science Connections, and the Program for the Analysis of Biotechnology Issues, which brought balanced information on topics such as genetic engineering to the public, press, and policy makers. Dr. Lomax's research has focused on understanding how hormones regulate plant growth and responses to the environment, from the molecular to the cellular to the whole plant physiological level, including measuring the response of tomatoes to spaceflight conditions. She has also studied university-industry relationships and the public good with respect to agricultural biotechnology.

John T. Ambrose was born in New York City but has lived in North Carolina for over 30 years. He received a B.A. in Biology from George Mason College (when it was part of the University of VA System) in 1968, an M.S. in Entomology from Cornell University in 1973, and a Ph.D. in Entomology (with concentrations in Apiculture and Social Insect Behavior) from Cornell in 1975. He came to NC State as an Assistant Professor and the Extension Apiculturist in February of 1975. In 2000 after 25 years at NC State, he retired from the department of Entomology and accepted a position in the Division of Undergraduate Academic Programs (DUAP) as Director of the First Year College. He is currently serving as the Interim Dean of DUAP and is an Alumni Distinguished Undergraduate Professor.

Prof. John Cavanagh is the William Neal Reynolds Distinguished Professor of Biochemistry at NC State University. He is an expert in protein structural biology, particularly in how bacteria are able to protect themselves. Prof. Cavanagh received his Ph.D. in Chemistry/NMR spectroscopy from the University of Cambridge in 1988. He has held positions as a Senior Research Associate at The Scripps Research Institute, Director of Structural Biology at the Wadsworth Center (New York State Department of Health), Associate Professor of Biomedical Sciences (SUNY) and Professor of Chemistry (Purdue). Since 2000 he has been Professor of Biochemistry in the Department of Molecular & Structural Biochemistry at North Carolina State University. Prof. Cavanagh has served on numerous NIH and NSF grant review panels. He is author or co-author of over 70 peer-reviewed research publications and co-author of the well-known and successful textbook "Protein NMR Spectroscopy." He has been awarded the Foulerton Gift & Binmore Kenner Fellowship of the Royal Society (1990), The Fullsome Award (1996), and the NC State University Alumni Associations Outstanding Research Award (2005). In addition to his academic work, Prof. Cavanagh co-founded the biotech company Agile Sciences in 2007 and serves as its Chief Scientific Officer.

All her life, Mary Higby Schweitzer has been fascinated with dinosaurs. She announced a desire to grow up to be a paleontologist when she was only five. Of course, childhood dreams rarely turn into reality. A native of Helena, Montana, Schweitzer studied speech therapy at Utah State University, and after earning her B.S., she moved back to Montana, got married, and had three children. She later went back to school to earn a teaching certificate so she could become a high school science teacher, finishing the Montana State University program in December 1988. Then her career took a turn. With several months to kill before the new school year started, she took a paleontology course for fun—and found her childhood passion reignited. Schweitzer later returned to school, earning her Ph.D. in biology from Montana State University in 1995. Along the way, and in the several years since, she has established herself as a creative and resourceful scientist. Her research on the world's first sample of soft dinosaur tissue has demanded the development of new investigative methods and criteria, crossing a variety of disciplines and requiring collaboration with teams of gifted researchers in other areas. As a result, she, and her work, are unique in the scientific community. Schweitzer is an associate professor in the Department of Marine, Earth and Atmospheric Sciences at North Carolina State University in Raleigh, NC. She holds a joint appointment at the N.C. Museum of Natural Sciences.

Agenda

Friday, April 3

6:00 – 8:20 a.m. — Late Registration (2nd-floor lobby); Breakfast (near hotel check-in)

8:30 – 9:00 a.m. — Welcome (Jefferson-Washington Room, 2nd floor)

9:00 – 10:00 a.m. — Oral presentations:
- Session #1, Cell, Molecular, Developmental Biology, BCH; Jefferson-Washington Room
- Session #2, Education, Psychology, Sociology, Anthropology; Caucus Room
- Session #3, Evolution, Ecology, Environmental, Animal Behavior; Sessions Room

10:00 – 10:30 a.m. — BREAK for interactive discussions

10:30 – 11:30 a.m. — Oral presentations:
- Session #4, Cell, Molecular, Developmental Biology, BCH; Jefferson-Washington Room
- Session #5, Education, Psychology, Sociology, Anthropology; Caucus Room
- Session #6, Literature, History; Sessions Room

11:30 – Noon — Free time

12:00 – 1:45 p.m. — Standing luncheon with Poster Presenters (Roosevelt-Lincoln Room, 2nd floor)

12:10 – 1:00 p.m. — Even-number poster presentations during luncheon
Cell, Molecular, Developmental Biology, BCH; Education, Psychology, Sociology, Anthropology

1:00 – 1:45 p.m. — Odd-number poster presentations during luncheon
Evolution, Ecology, Environmental, Animal Behavior; Engineering; Math, Physics, and Chemistry; Oceans, Meteorology, Geology; Visual Arts

1:45 – 2:00 p.m. — BREAK

2:00 – 3:00 p.m. — Oral presentations
- Session #7, Cell, Molecular, Developmental Biology, BCH; Jefferson-Washington Room
- Session #8, Education, Psychology, Sociology, Anthropology; Caucus Room
- Session #9, Literature, History; Sessions Room

3:00 – 4:00 p.m. — Oral presentations
- Session #10, Cell, Molecular, Developmental Biology, BCH; Jefferson-Washington Room

4:00 – 5:00 p.m. — Faculty meeting session; Sessions Room
ACC Business and Sharing Campus Assessment Plans on UG Research

4:00 – 4:45 p.m. — Special presentation for Students; Jefferson-Washington Room
Preparing for Graduate or Professional School and National Fellowships

5:30 p.m. — Buses leave for NC Museum of Art from east side of Brownstone Hotel

6:00 – 7:00 p.m. — Guided tours of NC Museum of Art

7:30 – 9:00 p.m. — Sit-down dinner (lower-level restaurant) with speaker Dr. Mary H. Schweitzer, "Soft Tissues in *T. rex* Bones"

9:00 p.m. — Buses return to Brownstone Hotel

Saturday, April 4

6:00 – 8:45 a.m. — Breakfast and sign-up for airport shuttle; check luggage in special room

8:45 – 9:05 a.m. — Announcements and comments from Dr. David Brown (Jefferson-Washington Room)

9:15 – 10:15 a.m. — Oral presentations:
Session #11, Education, Psychology, Sociology, Anthropology; Philosophy, Religion; Jefferson-Washington Room
Session #12, Math, Physics, and Chemistry; Caucus Room
Session #13, Engineering; Sessions Room

10:15 – 10:45 a.m. — BREAK for interactive discussions

10:50 – 11:50 — Oral presentations:
Session #14, Math, Physics, and Chemistry; Oceans, Meteorology, Geology; Jefferson-Washington Room
Session #15, Engineering; Visual Arts; Caucus Room
Session #16, Visual Arts; Sessions Room

Noon – 1:15 p.m. — Luncheon and Speaker; Roosevelt-Lincoln Room
John Cavanagh, William Neal Reynolds Distinguished Professor of Biochemistry at NC State University, "Human Health Programs in the Cavanagh Lab"

1:30 – 3:00 p.m. Shuttle service to RDU Airport (no airport service after this)

Conference Schedule

Oral Presentations

Friday, 9:00 – 10:00 a.m.

Session 1: Jefferson-Washington Room

Cell, Molecular, Developmental Biology, BCH

Characterization of Physical Interactions within a Multimeric Transcriptional Corepressor Complex in Arabidopsis
Nathan Bihlmeyer, NC State University

Propylthiouracil (PTU)-induced Hypothyroidism Alters Tissue Vitamin C (VC) Concentration and L-gulonolactone Oxidase (GLOX) Activity in Chicks
Crystal L. Davenport, Clemson

Biosensors for the Detection of Glucose in Human Interstitial Fluid
Courtney H. Fox, NC State University

Session 2: Caucus Room

Education, Psychology, Sociology, Anthropology

Changes in Religious Identity in Syria from 1947-2007 or Islamic Feminists
Maryam Al-Zoubi, UNC-Chapel Hill

Physical Activity and Function in Older Cancer Survivors
Holly Antony, Wake Forest

Assessment of Off-Campus Drinking in the Clemson Community
Allison L. Atkins, Clemson

Session 3: Sessions Room

Evolution, Ecology, Environmental, Animal Behavior

Scale and Social Movements: Environment and Sustainable Developments in the Canadian Arctic
Brian Jirout, Florida State

Carbon Stinks
Matthew Schulzinger, Maryland

Root Length Density and Root Number of Corn Plants: How Well They Were Correlated and Affected by Compaction and Cover Crops
Xiaojie Zhang, Maryland

Friday, 10:30 – 11:30 a.m.

Session 4: Jefferson-Washington Room

Cell, Molecular, Developmental Biology, BCH

In Vitro Biomechanical Comparison of Internal Spinal Fixation Techniques on the Canine Lumbosacral Vertebrae
Justin J. Hicks, NC State University

A Co-culture System for Intestinal Stem Cells
Lieselotte Kreuk, UNC-Chapel Hill

TNF/iNOS-Producing Dendritic Cells—The Necessary Evil of Lethal Influenza Virus Infections
Carson Moseley, Wake Forest

Session 5: Caucus Room

Education, Psychology, Sociology, Anthropology

The Multiple Layers of HIV/AIDS Devastation in West Africa: Exploring the Cultural, Economic, and Educational Impact
Scott Jelinek, Boston College

Hillbilly Heroine: OxyContin in Appalachia
Michelle Klassen, Virginia Tech

Choosing the Vice President
Michael E. Lewan, Miami

Session 6: Sessions Room

Literature, History

Transnational Civil Society and Governance in Weak and Failed African States: Empirical Incongruence of U.S. Policy
Jon Crain, Virginia Tech

The Interaction between Samuel Richardson and Eliza Haywood: Conflict and Rivalry
Adriana M. Kiszynski, Miami

Do States Fight for National Honor?
Nicholas Meros, Virginia

Poster Presentations

Friday, 12:10 – 1:00 p.m.

#2: Identification of Nicotinic Acetylcholine Receptors in the Zebra Finch: What Role Do the Receptors Play in Neurodegenerative Disorders?
Priscilla Givens, Florida State

#4: The Effect of Arsenic Analogues on Thymidylate Synthase Expression in Human Colon Carcinoma
Michael A. Gonzalez, Miami

#6: Effects of ATP and Glutamate on Sciatic Nerve Glia
Mangala Iyengar, NC State University

#8: Genetic Characterization of Yeast CBF5 Mutants: Implications with Regard to Dyskeratosis Congenita
Rachel O. Niederer, Maryland

#10: Collateral Tortuosity Is Acquired during Development, Increases with Aging, Varies with Genetic Background, and Intensifies after Middle Cerebral Artery Occlusion (MCAO)
Pranay Prabhakar, UNC-Chapel Hill

#12: Knockdown of Hormone Receptor Expression in Cultured Honey Bee Neurons
Teresa Tang, Wake Forest

#14: Physical Activity and Its Effect on Mental Fitness
Shaina Castle, Maryland

#16: The Effects of Sibutramine in the Nucleus Accumbens, Hypothalamus, or Prefrontal Cortex on Feeding Behavior in the Rat
Megan Connolly, Wake Forest

#18: Tracking Student Health Behavior Changes: The Zest Quest Experience
Christopher L. Hopkins, Clemson

#20: Dynamic Causes and Effects of Rubber Expansion in Northern Laos
Miles R. Kenney-Lazar, Miami

#22: Effects of Depression on Performance and Self-Assessed Performance under Sleep Deprivation Conditions
Robert S. Markle, Clemson

#24: Cognitions Affecting Obsessive-Compulsive Disorder
Christian M. Smith, Florida State

Friday, 1:00 – 1:45 p.m.

#1: Mixed Oxide Catalysts for Biodiesel Synthesis
Matthew Aronson, Virginia

#3: Diffusion Tensor Imaging (DTI) of Neurodegeneration in Genetic and Environmental Models of Amyotrophic Lateral Sclerosis
Timothy Gould, Florida State

#5: Investigating Steric Protection of DNA in the Presence of Nucleases
Taylor A. Tomassi, Georgia Tech

#7: A Comparison of the Cost of Parasite Resistance in Crossbred Katahdin Lambs Using Strategic Versus Selective Deworming Regimes
Garrett Smith, Virginia Tech

#9: Larval Growth- and Size-Selective Mortality in a Common Reef Fish in the Straits of Florida
Jennifer N. Boulay, Miami

#11: Nitrite Reductase Activity of Cytochrome c

Natalia Azarova, Wake Forest

#13: Accurately Characterizing the Pi-Pi Interaction Energy of the Indole-Benzene Complex
Yue Geng, Georgia Tech

#15: Detecting Birefringence of Hemozoin to Diagnose Malaria
Sheel Shah, UNC-Chapel Hill

#17: Black Hole Growth Excites Spin
Thomas Christopher Pope, NC State University

#19: How Virtual Worlds (Second Life) Are Affecting Traditional Concepts and Protection of Intellectual Property Rights, Such As Trademarks, Trade Names, and Copyrights
Aaron G. Kroll, Virginia Tech

Oral Presentations

Friday, 2:00 – 3:00 p.m.

Session 7: Jefferson-Washington Room

Cell, Molecular, Developmental Biology, BCH

Isolation and Purification of an Anti-Oncogenic Polypeptide from the Bonnethead Shark
Christopher J. Pollock, Clemson

The Effects of Cyclic Hydrostatic Pressure on Chondrogenesis and Viability of Human Adipose and Bone Marrow Derived Adult Stem Cells
Jennifer L. Puetzer, NC State University

New Factors Involved in Histone mRNA Metabolism
Adele Ricciardi, UNC-Chapel Hill

Session 8: Caucus Room

Education, Psychology, Sociology, Anthropology

The Effect of Global Trade in Conventional Weapons on Human Rights Violations
Leon Ratz, Boston College

Do U.S. Farm Payments Affect the Demand for Immigrant Agricultural Workers and Total Farm Labor? The Case of Conservation Subsidies and Decoupled Payments
Gabrielle S. Sirow, Georgia Tech

Moderate but Irrelevant? The Islamic Constitutional Movement in Kuwaiti Politics
Dorothy A. Smith, Boston College

Session 9: Sessions Room

Literature, History

Communal Double-Standards: Muslims, Anti-Terrorism, and the Hindu Right in India
Svantje Swider, Virginia

Poverty and Politics: Polemics and Programs in Mexico and the United States from the 1960's through the 1980's
Melissa Velarde, Wake Forest

Deconstructing the Memorial Museum: A Critical Analysis of Genocide Memorialization in Rwanda
Melissa Warnke, Virginia

Friday, 3:00 – 4:00 p.m.

Session 10: Jefferson-Washington Room

Cell, Molecular, Developmental Biology, BCH

Titin Exon Usage in Normal and Diseased States
Shannon Scott, Florida State

Characterization of the Lac+ Phenotype in Salmonella Tennessee Isolates Associated with the Peanut Butter Outbreak of 2007
Sarah Tostanoski, Maryland

The Role of Vitamin B12 in Alzheimer's Disease Pathology
Patrice Williams, Florida State

Oral Presentations

Saturday, 9:15 – 10:15 a.m.

Session 11: Jefferson-Washington Room

Education, Psychology, Sociology, Anthropology; Philosophy, Religion

Racial and Ethnic Discrimination Experienced by Latinos in the American Justice System
Gloria Mercedes Villanueva, Boston College

Mediation of Bulimic Behaviors in Individuals with Borderline Personality Disorder
Anne Ward, Florida State

Potent Women and Alternative Images of Femininity: Courtesans and Hijras as Keepers of Culture and Religious Ritual in India
Kristin N. Francoeur, Miami

Session 12: Caucus Room

Math, Physics, and Chemistry

Fluorescent Polymer/Gold Nanoparticle Films for Chemical Sensing
Zachary A. Combs, Clemson

Is the Adiabatic Approximation Sufficient to Account for the Post-Born-Oppenheimer Effects on Molecular Electric Dipole Moments?
Sandra Hobson, Virginia Tech

Can Blood Lead Levels in Children Be Reduced?
Steven Somers, Ashley Myers & Erika Burger, NC State University

Session 13: Sessions Room

Engineering

Inhibition of ERK 1/2 Stimulates Osteogenesis in Pluripotent Cells Derived from Periodontal Ligament when Treated with TGF-B3
Nestor Arnaldo Arita, Miami

Response Surface Equations for Expendable Launch Vehicle Payload Capability
Elizabeth S. Fleming, Georgia Tech

Control Shaping for Cranes
Paul M. Jurek, Georgia Tech

Saturday, 10:50 – 11:50 a.m.

Session 14: Jefferson-Washington Room

Math, Physics, and Chemistry; Oceans, Meteorology, Geology

Generation of a Streptavidin Dimer for Complexation with and Crystallization of Biotinylated Membrane Proteins
Steve A. Hsieh, Georgia Tech

Fabrication and Characterization of Polycarporlactone Nanofibers Doped with Tri-calcium Phosphate
Deborah Christine White, NC State University

An Analysis of Tropical Cyclone Intensity Estimates of the Advanced Microwave Sounding Unit (AMSU), 2005-2008
Corey A. Walton, Miami

Session 15: Caucus Room

Engineering; Visual Arts

Universal Design of a Workstation
Sara Lu and Priyanka Malla, Virginia Tech

StorySigns: Structural Editing of Textual Narratives
John Murray, Maryland

Family, Memory, and Political Violence in Argentina: The Lizaso Family through Its Members
Carina Cortese, UNC-Chapel Hill

Session 16: Sessions Room

Visual Arts

Contemporary Religious Architecture in Italy
Robert Cox, Wake Forest

Stories of Househelps in Ghana, West Africa
Kristin Eberman, Wake Forest

Dido and Aeneas—A Historically Informed Performance
Brett Karlin, Florida State

Abstracts

BOSTON COLLEGE

Scott Jelinek, Boston College

The Multiple Layers of HIV/AIDS Devastation in West Africa: Exploring the Cultural, Economic, and Educational Impact

The physical problems associated with HIV/AIDS can be so striking that the cultural, economic, and educational implications are often overlooked. HIV/AIDS has become ingrained in Kenyan society and culture. Testing Centers are readily available and free, yet few Kenyans have a solid understanding of the virus and even fewer are tested. Physical, cultural, economic, and educational effects combine to form a vicious cycle that cultivates the rampant spread of HIV/AIDS and amplifies the effect. This project, which was based on prior research in Mozambique and designed to educate clients on HIV/AIDS, was formulated based on the field-tested assumption that the knowledge and empowerment gained from education has the power to break this vicious and devastating cycle.
Mentor: Eve Spangler

Leon Ratz, Boston College

The Effect of Global Trade in Conventional Weapons on Human Rights Violations

The crisis in Darfur, Sudan, has claimed the lives of well over 200,000 people and has displaced nearly 2,400,000 others. Despite a UN arms embargo on all parties to the conflict signed in March 2005, conventional weapons have continued to flow into Sudan, exacerbating serious violations of human rights and international humanitarian law. Uncontrolled transfers of conventional weapons have sustained atrocities and human rights violations in conflict zones around the world. In the summer of 2008, I worked with a team of researchers at Amnesty International to investigate and publish accounts of such arms transfers and their subsequent effects on human rights. I also assisted in efforts to promote an Arms Trade Treaty, a legally-binding instrument regulating arms/export regimes, at the UN General Assembly.
Mentor: Donald Hafner

Dorothy A. Smith, Boston College

Moderate but Irrelevant? The Islamic Constitutional Movement in Kuwaiti Politics

To understand Kuwait's political climate it is necessary to examine the largest bloc produced by the 2008 parliamentary election: Islamists. Kuwait's Islamists represent a moderate presence in national politics. An investigation of one historic Islamist group in Kuwait, the Muslim Brotherhood (MB)-linked Islamic Constitutional Movement (ICM), sheds light on Islamist politics as a whole in this Gulf nation. This study examines the development of regime-MB relations in Kuwait; inspects party rhetoric including campaign slogans, party platforms, and party website material; and lastly researches the issues raised by winning candidates and the use of the unique political powers available to members of parliament. The study asks whether the ICM's rhetoric and its commitment to political moderation be trusted and relevant in Kuwaiti politics.
Mentor: Kathy Bailey

Gloria Mercedes Villanueva, Boston College

Racial and Ethnic Discrimination Experienced by Latinos in the American Justice System

This study focuses on the racial and ethnic discrimination experienced by Latinos in the American Justice System, particularly by young Hispanic males. Latino youth enter the criminal justice system at a higher rate than their white counterparts do. Latino youth in Los Angeles are more likely to be arrested and imprisoned than white non-Hispanic youth for similar offenses. This suggests unfair and possibly racist treatment towards this population. My research compares judges' perceptions of Hispanics and Whites as an important but often overlooked part of the decision-making processes. It examines how the personal biases of individuals, police officers, and judges influence and differentially affect the Hispanic experience in the American judicial system.

Mentor: Eve Spangler

CLEMSON

Allison L. Atkins, Clemson

Assessment of Off-Campus Drinking in the Clemson Community

This study asked what are the specific needs and issues for off-campus students in regards to alcohol and safety? Through the research collected and ensuing action plans we hope to create a collaborative plan for reducing harm related to high risk drinking and increase safety factors and resources for college students. The design used three data collection methods: (1) Off-campus resident student focus groups to learn about the unique issues surrounding off-campus drinking, (2) off-campus resident student surveys (same purpose as #1), and (3) key informant interviews with community members and officials to determine the impact of alcohol use on the community and how it shapes perceptions of students. This knowledge supported the development of more effective prevention and intervention programs, policies, and strategies to control and reduce alcohol use. The data presented three major problem areas. An action committee was formed out of the Clemson Community Coalition to address the following issues: Action Group #1, Transportation Reduce the percentage of students reporting drinking and driving Increase late night transportation options for off-campus students Action Group #2, Law Enforcement Increase (positively) the students' perception of police Increase the number of students reporting a better understanding of enforcement of drinking laws as the relate to off-campus locales Action Group #3, Apartment Complexes Increasing consistency of implementation of policies/practices within apartment complexes that relate to high risk drinking and related consequences Increase manager attendance/ participation on the Clemson Community Coalition.

Mentors: Kathy Cauthen and George Clay

Zachary A. Combs, Clemson

Fluorescent Polymer/Gold Nanoparticle Films for Chemical Sensing

The objective of this research was to demonstrate that gold nanoparticles (AuNP) can quench the fluorescence of a fluorescently labeled polymer for use as an environmental sensor. The polymer film used was poly(glycidyl methacrylate) (PGMA) and the fluorescent label was Rhodamine B (RhB). The interaction of AuNP with fluorophores has been an area of recent interest due to the quenching ability of the AuNP. The principle behind this quenching efficiency is Forster resonance energy transfer (FRET) where the PGMA/RhB is the donor and the AuNP is the acceptor. It has been shown that the quenching ability of the metal is largely dependent upon the distance between the metal and the fluorophore. When this distance is small, the dye molecule can be efficiently quenched,

chemical sensing. The optimal thickness of the PGMA layer was found to be approximately 11nm from previous experiments. The film was exposed to vapors of different solvents including chloroform, ethanol, methyl ethyl ketone, and water to determine changes in the sample fluorescence by total internal reflectance fluorescence due to the swelling of the PGMA/RhB layer of the sample and the solvatochromic properties of the RhB fluorophores. The sensor designed in this experiment proved to be useful in detecting the presence of various solvent vapors by giving different and repeatable fluorescent signals for each solvent. This shows that this film has potential to be used as a highly sensitive sensor for chemical detection.

Mentor: Igor Luzinov

Crystal L. Davenport, Clemson

Propylthiouracil (PTU)-induced Hypothyroidism Alters Tissue Vitamin C (VC) Concentration and L-gulonolactone Oxidase (GLOX) Activity in Chicks

Thyroid hormones influence metabolism and reactive oxygen species produced in cells are disposed by a range of antioxidants (AO). Vitamin C, a major AO, is synthesized by chickens. Hypothyroidism is associated with decreased metabolism and thus may influence VC status. This study examined the effect of hypothyroidism on renal VC synthesis and tissue VC concentration in 3 week old chicks. Hypothyroidism was induced by feeding 0.1% PTU in the control diet. Plasma VC, triiodothyronine (T3) and thyroxine (T4) were measured. Liver, spleen, heart, bursa of Fabricius, adrenals, thyroids, and kidneys were assayed for VC and renal synthesis of VC. Decreased T4 and T3 levels indicated a hypothyroid (HT) state was induced. Livability was 100% but feed intake, growth, and relative weight of lymphoid tissues, bursa and spleen, were decreased and hepatic hypertrophy evident in HT chicks. Hepatic, splenic, bursal and cardiac VC levels were reduced in HT chicks when compared to controls. Despite this, HT birds showed greater renal GLOX activity, the last enzyme in VC synthesis. Higher VC production, coupled with low VC in tissues may be a result of dealing with the stressful repercussions of the induced HT state that may have altered entry or metabolism of VC into cells, and/or increased irreversible degradation of VC, or increased availability of renal glutathione. Changes in lymphoid tissues suggest the possibility of impaired immune responses and greater susceptibility to disease in HT chicks. The results indicated that PTU-induced hypothyroidism enhanced renal GLOX activity and reduced concentration of VC in all tissues assayed.

Mentor: Denzil V. Maurice

Christopher L. Hopkins, Clemson

Tracking Student Health Behavior Changes: The Zest Quest Experience

According to the Centers for Disease Control and Prevention sedentary lifestyles, unhealthy eating habits and other preventable health behaviors have led to the current obesity epidemic in the United States. Many of these poor health behaviors begin during childhood. Research has consistently shown that weight status in the early years predicts weight status into adulthood. Thus there is a demand for behavior change interventions geared toward children. The purpose of this study is to examine elementary students' self-report behavior change via tracking logs used as a component of a school based health promotion program, called Zest Quest. Zest Quest is based on the Social Cognitive Theory and the Social Ecological Model. The program intervenes at many levels within schools; however, central to the program is an interactive curriculum targeting seven health behaviors led by a Wellness Coach. As a part of the program, students completed daily trackers self-reporting on the seven health behaviors. Trackers from two schools were used

recommended behaviors. Averages were then used to create a behavioral trend line for the school year. The greatest changes were increases in fruit and vegetable consumption, which increased by 27 and 29 percent, respectively, and decreases in sedentary screen viewing time and intake of sugary drinks, which decreased by 37 and 28 percent, respectively. Additional analyses are being conducted to determine how the changes differ by various demographic and school level variables. This study was conducted in partnership with Zest Quest Associates, Inc.
Mentor: Sarah Griffin

Robert S. Markle, Clemson

Effects of Depression on Performance and Self-Assessed Performance under Sleep Deprivation Conditions

Introduction: Sleep deprivation and depression affect many people and often result in serious detrimental effects on performance, health, and well-being. The purpose of the current study was to determine the effects of short-term sleep deprivation on performance and self-assessed performance in depressed and non-depressed people. Methods: Participants included 26 depressed and 67 non-depressed college students. The participants completed a variety of tasks four times during 30 hours of acute sleep deprivation. The tasks included the Law School Admission Test (LSAT), which measured logical reasoning ability, and a meta-cognition survey that asked participants to rate the accuracy of their answers on the LSAT. Results: Two 2x4 ANOVAs were completed to compare performance in the depressed participants to the non-depressed participants across the four testing sessions. Actual performance on the LSAT decreased significantly across the night of sleep deprivation ($p<.001$) with depressed participants performing significantly worse on the LSAT ($p=.033$) than non-depressed participants. Self-assessed performance on the LSAT also decreased significantly across the night of sleep deprivation ($p<.001$). There was a trend for worse self-assessed performance in the depressed participants than the non-depressed participants ($p=.074$). There was no significant interaction for either actual performance or self-assessed performance. Conclusions: The current results suggest that depressed persons performed significantly worse under sleep deprivation conditions than non-depressed persons on a logical reasoning task. Furthermore, both depressed and non-depressed participants indicated that their performance decreased across the night of sleep deprivation. The current findings indicate that sleep deprivation may differentially impact performance based on current mood states. Support This research was funded in part by the Center for Advance Study of Language at the University of Maryland and by the Creative Inquiry Program at Clemson University.
Mentor: June J. Pilcher

Christopher J. Pollock, Clemson

Isolation and Purification of an Anti-Oncogenic Polypeptide from the Bonnethead Shark

An anti-tumor protein was isolated from serum free culture medium of epigonal cells of the bonnethead shark (Sphyrna tiburo). This protein possesses inhibitory activity toward 18 cancer cell lines of diverse origin, including fibrosarcoma, malignant melanoma, and breast adenocarcinoma and has great potential for use in anti-cancer treatments. The native protein is of high molecular weight (> 200 KDa) and is strongly resistant to standard chromatographic and electrophoretic separation techniques (e.g., ion exchange, gel filtration, and chromato-focusing). The protein appears to form stable aggregates even at high ionic strength and in 3 M urea; however, upon reduction with tris-carboxyethyl phosphine / 8 M urea and alkylation of the liberated thiols with iodoacetamide, the subsequently exhaustively dialyzed protein could be easily manipulated. This denatured, reduced, and alkylated protein was digested with trypsin and subsequently

was subjected to reverse phase HPLC using a water/trifluroacetic acid-acetonitrile gradient with detection at 210 nm. The resultant chromatogram contained over 40 peaks with approximately 20 resolved ""major" peaks. These peaks were collected in separate fractions and analyzed for bioactivity using a WEHI melanoma cell line inhibition assay. At present a single peak has been isolated with high specific activity. This relatively polar, low molecular weight polypeptide will be subsequently sequenced and synthesized in preparation for animal trials.
Mentors: Ashby B. Bodine and William Pennington

FLORIDA STATE

Priscilla Givens, Florida State

Identification of Nicotinic Acetylcholine Receptors in the Zebra Finch: What Role Do the Receptors Play in Neurodegenerative Disorders?

Nicotinic acetylcholine receptors (nAChRs) are found throughout the central and the peripheral nervous system, and its dysfunction is believed to be the source of neurodegenerative disorders. It is proposed that the impaired disorders can be roughly divided in two categories, namely those in which the function of the receptor is altered, and those where there is a loss of function of the receptor. This latter category includes neurodegenerative diseases such as Parkinson's disease, Alzheimer's disease and schizophrenia. Nicotine is credited with decreasing the accumulation of beta-amyloid in the brain, which reduces the formation of plaque associated with Alzheimer's Disease. Up-regulation of nicotine receptors, which are lacking in a brain of an Alzheimer's patient has been attributed as a beneficial effect of nicotine and thus nicotine can act as a neuroprotector. However, since nicotine induces drug dependence symptoms and hazardous side effects (incidence of cancer increases) patients cannot be asked to begin smoking. In addition it is unclear which nicotinic acetylcholine receptors are involved in the process of neurodegenerative disorders. There are a variety of nACh receptors and the aim of this research is to identify the different types of receptors in the adult male zebra finch brain tissue.
Mentor: Susanne Cappendijk

Timothy Gould, Florida State

Diffusion Tensor Imaging (DTI) of Neurodegeneration in Genetic and Environmental Models of Amyotrophic Lateral Sclerosis

Amyotrophic Lateral Sclerosis (ALS) is an invariably fatal disease marked by degeneration of motor neurons with primary white matter involvements. At 21.1-T, this study implements diffusion tensor imaging (DTI) to compare the central nervous system (CNS)—brains and spinal cords—of genetically and environmentally induced ALS mice models. Two phenotypes were studied and compared with age-matched controls. Characterized by the dysfunctional protein kinase, mutant superoxide dismutase (mSOD), the genetic isoform was modeled by mSODG93 mice. Environmental phenotypes, ALS-parkinsonian dementia complex (ALS-PDC) models, were obtained through the consumption of a purified sterol neurotoxin extracted from Cycas micronesica seeds (a plant local to Guam). Epidemiological studies were performed by administering the environmental neurotoxin in utero and/or ex utero. DTI data were acquired through the use of a multi-slice 2D spin echo sequence at a resolution of 50x50x250 ?m for brains and 40x40x400 ?m for spinal cords. DTI data were processed with MedINRIA and DtiStudio. Fractional anisotropy (FA) and apparent diffusion coefficient (ADC) maps were generated and analyzed. Additionally, whole volume fiber tractography data were used to

visualize connectivity changes between groups. DTI parameters reveal correlations specific to subject phenotypes. DTI and fiber tractography confirm variable CNS morphology and fiber integrity, supporting the hypothesis that different extents of neurodegeneration occur in ALS pathology.

Mentor: Samuel Grant

Brian Jirout, Florida State

Scale and Social Movements: Environment and Sustainable Developments in the Canadian Arctic

This study examines the use of geographic scale in social conflict. Simply defined, scale is the spatial extent of a process. Historically it has been used to identify the level at which a process occurs. However, given that scales themselves are produced, more recent thinking emphasizes the processes that produce scale and how they can be strategically constructed and manipulated by actors in social conflict. The work described here will examine the case of northern Canada where the Kitikmeot Inuit have used scale to advance their movement for control of natural resources including diamonds and energy sources. Leaders of the Inuit community assert that by gaining control of the natural resources, the Kitikmeot region can sustainably develop to support its population. This development is occurring particularly near the Bathurst Inlet where the Kitikmeot have contracted Nuna Logistics to build a large transport network consisting of roads and a port. Notable in this argument is the framing of the region as Kitikmeot, a region that is characterized by development problems and opportunities, rather than the broader province of Nunavut, wherein development issues are invariably interwoven with issues of native sovereignty and outsider influence. In contrast, we found that the Canadian Arctic Resource Committee employs scale to argue the potential negative impact of development on the local environment. Thus, both sides in this conflict utilize scale as a discursive strategy for arguing the issue of sustainable development in the Canadian north.

Mentor: Philip Steinberg

Brett Karlin, Florida State

Dido and Aeneas – A Historically Informed Performance

Dido and Aeneas is one of the most performed and recorded operas in the English operatic repertoire. Excerpts from the work can be found in most music history text books, and Dido's lament, "Thy Hand, Belinda" is one of the most recognizable arias in classical vocal literature. Despite the opera's fame, no autographed manuscript exists. Brett spent a week in the United Kingdom to examine the discrepancies between the oldest-known score and the original 1689 libretto. Subsequent studies took place with noted 17th Century musicologist Sir Curtis Price and the internationally renowned Early Music conductor Laurence Cummings. After extensively researching the work itself, as well as 17th Century instruments and performance practices, a practical application of the gathered information began: rehearsals. The challenge throughout the rehearsal period became training a 21st Century ensemble of singers and instrumentalists to conform to specific performance practices of the 17th Century. Singers who normally perform the music of Romantic Era composers, such as Puccini and Verdi, changed their approach from the widely-accepted 19th Century style of operatic performance to vocal techniques representative of the 17th Century. At the same time, instrumentalists utilized similar stylistic and idiomatic techniques in accordance with early-Baroque instrumental treatises. The Florida State University premiere of Dido and Aeneas took place on October 19, 2008. After an exciting, yet challenging, seven-week long rehearsal process, an ensemble comprised of twenty FSU undergraduate, masters, and doctoral students (involved in disciplines ranging from vocal performance to music theory to arts administration) mounted and recorded the tragic semi-opera by Henry Purcell.

Mentor: Charles Brewer

Shannon Scott, Florida State

Titin Exon Usage in Normal and Diseased States

Titin is a major structural and regulatory protein expressed in striated muscle, smooth muscle, and nonmuscle cells. Differential splicing of the 363 titin gene exons yields multiple novel isoforms. One differentially spliced region of titin encodes the PEVK region, which determines the degree of titin protein elasticity. The Keller lab has found that differential splicing of two specific PEVK regions, encoded by exons 148-155 and exons 217-223 yields at least two different titin isoforms, which could have different elasticities in smooth and nonmuscle cells. We have used RT-PCR analysis of smooth muscle total RNA to investigate and interpret the differential splicing patterns of exons encoding the titin PEVK region related to human pelvic prolapse disease. In a single blind study, total RNA was obtained from six patients in whom an unknown number have developed pelvic prolapse disease and the others are normal controls. The study of pelvic prolapse RNA is important since the disease has no history of being a genetic disease, ruling out a change in genomic DNA. Instead, the disease may be caused by differences in the RNA and the proteins being expressed. The RT-PCR products have shown multiple splicing variations and different levels of isoform expression. Analysis of exon region 148-155 also has displayed a recently documented sequence made of 86 base pairs between exons 148 and 149 in all six RNA samples. By determining the sequence of the titin PEVK region of patients with and without pelvic prolapse, the trends and patterns that may be associated with a defect in smooth muscle have begun to be interpreted.
Mentor: Tom Keller

Christian M. Smith, Florida State

Cognitions Affecting Obsessive-Compulsive Disorder

Recent studies investigating cognitive-behavioral approaches to obsessive compulsive disorder (OCD) have shown significant relationships between certain beliefs and OCD symptoms. Inflated perceptions of responsibility for harm and the tendency to fuse thoughts with actions are beliefs that have been the focus of much research attention. However, more recently, fear of negative emotions has been implicated. The present study sought to compare these different explanations in predicting OCD symptoms. The Obsessive Beliefs Questionnaire (OBQ), a standard assessment of OCD-related beliefs, was administered to participants along with the Perception of Threat from Emotion Questionnaire (PETQ), which assesses fear of negative emotion. Measures of anxiety, depression, and OCD symptoms were also administered. Analyses indicated that, after controlling for general distress, both the OBQ and PTEQ were found to predict unique variance in OCD symptoms. These findings suggest beliefs about negative emotion should be incorporated into cognitive-behavioral models of OCD.
Mentor: Jesse Cougle

Anne Ward, Florida State

Mediation of Bulimic Behaviors in Individuals with Borderline Personality Disorder

Bulimia Nervosa (BN) occurs at high rates in individuals with Borderline Personality Disorder (BPD) (33%), compared to the general population (1%). Studies also show that BN occurs more frequently in individuals with BPD than other Axis II disorders. The high comorbidity of BPD and BN raises questions about their correlation. The current study analyzes the mediators driving bulimic behavior in individuals with BPD using structural equations modeling (SEM). More specifically, it examines how rejection sensitivity and emotion dysregulation interact with BPD symptoms and result in binge eating. Data was gathered using

rejection and experience more intense negative emotions, both cognitively and physiologically. They are ill-equipped to regulate these negative emotions, demonstrated by low levels of distress tolerance and increased levels of experiential avoidance, urgency, anxiety sensitivity, and thought suppression. In an effort to decrease negative feelings, an individual may utilize the maladaptive coping strategy of binge-eating. After binging, the person may experience temporary relief (which is negatively reinforcing), followed by rumination focused on the consequences of the behavior (weight gain). Because of a fear of being fat (which could lead to further rejection), the individual feels compelled to offset the binge by engaging in compensatory behaviors (purging or restricting) to prevent weight gain. Following the compensatory behavior affect again improves, thus further negatively reinforcing the bulimic cycle.

Mentor: Thomas Joiner

Patrice Williams, Florida State

The Role of Vitamin B12 in Alzheimer's Disease Pathology

Alzheimer's disease (AD) is a devastating neurodegenerative disorder that impacts individuals, families, the healthcare system, and society. About five million Americans are afflicted with AD; this number is predicted to reach 42 million world-wide by the year 2020. A hallmark, and a putative cause, of Alzheimer's disease is the accumulation of the amyloid-beta peptide that eventually leads to formation of insoluble plaques within AD patient's brains. In spite of intense efforts to understand the mechanism of AD, many questions remain. Vitamin B12, whose deficiency causes cognitive impairment and dementia, has been postulated to play an important role in the pathology of Alzheimer's disease. My research tests a hypothesis that the binding between vitamin B12 and amyloid-beta peptide impacts the amyloid peptide self-association, thus affecting the pathology and progression of Alzheimer's disease. My preliminary data clearly demonstrate an amyloid-beta/B12 interaction (with a binding constant in the low micromolar range), supporting this hypothesis. Over the next year, we plan to study the multi-faceted biophysical characteristics of this interaction using Surface Plasmon Resonance, Fluorescence, and Isothermal Titration Calorimetry. The results of this study will provide a detailed characterization of stoichiometry, binding constants, entropy, enthalpy, and free energy of this interaction. In addition, these results will help to determine whether the interaction between vitamin B12 and amyloid-beta peptide impacts the amyloid-beta self-association leading to plaque formation. This study will provide insights into the role of vitamin B12 in the progression of AD and contribute to the ultimate goal of finding treatment and a cure for Alzheimer's disease.

Mentor: Ewa Bienkiewicz

GEORGIA TECH

Elizabeth S. Fleming, Georgia Tech

Response Surface Equations for Expendable Launch Vehicle Payload Capability

A common requirement in systems analysis and conceptual design for new spacecraft is the capability to perform rapid, parametric assessments of launch vehicle options. Often, such launch vehicle analysis is accomplished through manual references to launch-vehicle-specific Payload Planner’s Guides. This method can be time consuming and is not conducive to parametric exploration and trade studies. In this paper, we develop response surface equations (RSEs) for expendable launch vehicle (ELV) payload capabilities to enable more efficient launch option analyses for a variety of applications. For each RSE fit we undertake a three step process. First, we collect and digitize

the data for payload capability of several ELVs considered in this study from their current Payload Planner's Guides. Second, we input the complete data set of each ELV into JMP, a statistical analysis software tool, in order to determine the partial regression coefficients of the RSE. Third, we analyze the goodness of fit of the regression analysis to determine how well our RSE fit the actual data through the statistics of the coefficient of determination (R2) and model fit error (MFE). The results from this paper should be useful to spacecraft systems engineers and mission planners in allowing integrated, extensive, and efficient launch options analyses and parametric trade studies (of cost and payload mass to orbit for example) early during development phases.
Mentor: Joseph H. Saleh

Yue Geng, Georgia Tech

Accurately Characterizing the Pi-Pi Interaction Energy of the Indole-Benzene Complex

Noncovalent interactions play a significant role in determining the structures of DNA, RNA, and proteins. Among the most prevalent are p- p interactions, which occur as favorable van der Waals forces between the aromatic subunits of biochemical molecules. Tryptophan and phenylalanine are commonly modeled with indole and benzene, respectively. Interaction energies involving indole, however, are difficult to characterize due to the size of the molecule, the presence of two aromatic rings, the effect of the nitrogen in the 5-member ring (heterogeneity), and the amount of unique configurations; when considering the indole-benzene system, there are several T-shaped configurations and complete 3-D PESs (displacements along the x, y, and z axes) when the indole and benzene are parallel. Computing all configuration PESs will determine how the interaction energies depend on the distance and orientation of the aromatic rings. Recently, the SCS-MP2 method has been shown to be quite efficient in describing the p- p interactions. We have utilized this method to compute all T-shaped and 3-D PESs. The trend of the T-shaped interactions have rationalized via an electrostatic potential mapping of indole. The 3-D PESs suggest the minimum occurs when the center of the benzene is over the nitrogen of indole (disagreeing with previous results by other groups). Furthermore, the CCSD(T) method (the "golden standard") has been used to obtain interaction energies at each local minima, confirming the T-shaped N-H/p interaction to be the global minimum.
Mentor: C. David Sherrill

Steve A. Hsieh, Georgia Tech

Generation of a Streptavidin Dimer for Complexation with and Crystallization of Biotinylated Membrane Proteins

There is a great need to facilitate the crystallization of membrane proteins, because once the crystals are grown, the molecular structure can be determined by X-ray crystallography. However, membrane proteins prove difficult to isolate and crystallize. Hydrophobic membrane proteins have limited hydrophilic interactions to stabilize the protein in its crystalline form, and the lipid membrane surrounding the protein must be replaced with a non-denaturing detergent. The overall goal of this project is to develop a new generalizable procedure to facilitate the crystallization of membrane proteins. For our approach, we take advantage of the high affinity biotin for streptavidin, a water soluble protein that crystallizes easily. We will crystallize the complex between streptavidin and a biotinylated membrane protein. To achieve this goal, we introduced four key mutations disrupting the streptavidin tetramer to generate a dimeric streptavidin construct with two biotin binding sites. Site directed mutagenesis, which encompassed primer design, PCR, DPN1 digest, transformation, cell culture, plasmid isolation, and sequencing, were used to introduce each mutation. The mutant streptavidin was then expressed and purified. Our next step is to form the streptavidin-biotinylated membrane protein

complex. We are testing our method on a biotinylated form of signal peptide peptidase. We will isolate the complex by size exclusion chromatography and then conduct crystallization trials. Compared with the importance of membrane proteins in Nature, our molecular understanding of membrane proteins is limited. If our approach works, it will be widely applicable to the structure determination of other membrane proteins

Mentor: Raquel Lieberman

Paul M. Jurek, Georgia Tech

Control Shaping for Cranes

Cranes are used in many different applications, and they can often be hard to control due to pendulum-like payload oscillations. Input shapers effectively limit these vibrations by intelligently modifying the command to cancel the operator created vibration. This comes at a price, as the command must be extended, resulting in the crane taking longer to stop and traveling farther than the non-manipulated signal. This research investigated the effectiveness of a new class of "stopping" input shapers designed to reduce the amount the input-shaped crane travels beyond the unshaped case. Just how effective are these new "stopping" input shapers? To this end, a case study of crane operators was conducted to compare the effectiveness of four controllers. Operators were asked to move the crane through two different obstacle courses, once each without input shaping, with a traditional input shaper, and with two different "stopping" shapers. For each trial, the completion time and precision of movement was recorded. All operators completed the trials more quickly and with better positioning precision when input shaping was enabled. The "stopping" shapers exhibited slightly better final positioning precision than traditional input shaping. Special thanks to Siemens Energy and Automation and Boeing Phantom Works for their support of this research

Mentor: William Singhose

Gabrielle S. Sirow, Georgia Tech

Do U.S. Farm Payments Affect the Demand for Immigrant Agricultural Workers and Total Farm Labor? The Case of Conservation Subsidies and Decoupled Payments

Concerns over the welfare impacts of US farm policy have persisted over time and have led to a well established literature documenting impacts of agricultural policies. Most of this literature has focused on the macroeconomic impacts of farm policy on productivity, the environment and markets for products and land. In this paper we explore the potential effects of changes in US farm policy on the labor market. Specifically, we show theoretically using a simple model that an increase in conservation subsidies can reduce the demand for legal farm labor and increase the demand for illegal farm labor, especially if minimum wage laws exist. We then test our hypothesis using real world data noting that an increase in conservation subsidy by 1% leads to a 3.8% increase in the share of Hispanic immigrant farm workers among all US farm workers. We also find two other surprising results: a robust negative relationship between the decoupled payments received by farmers in a state and the number of agricultural workers in that state and second, we find no relationship between the agricultural output in a state and the number of agricultural workers.

Mentor: Ruth Uwaifo Oyelere

Taylor A. Tomassi, Georgia Tech

Investigating Steric Protection of DNA in the Presence of Nucleases

In the body, DNA-linked colloidal assemblies are prone to cleavage by nucleases, yielding the uncontrolled release of particles and any associated therapeutics. Thus, ultimately for in vivo applications, the DNA-linkages must be protected from cleavage by serum nucleases. The goal of this research is to optimize the

length and chemistry of polymeric “tails” on one end of each target DNA strand to sterically hinder nucleases from finding and clipping the DNA duplex segments. The effects of sterically protecting DNA duplexes from nuclease activity by including a polymeric "tail" on oligonucleotide targets was investigated. The variables explored included the effect of tail chemistry as well as tail length on the kinetics and extent of nuclease activity. Two types of polymeric "tails" were compared: polyethylene glycol (PEG) chains and single stranded thymine-based strands (dT). Long and short PEG and thymine tails of equivalent lengths will also be compared. The target strands with longer tails attached were expected to be more effective in sterically hindering nuclease activity on the immobilized DNA duplexes. Flow cytometry is used to quantify the hybridization activity and measure the probe-target duplex density as well as determine time-dependence of nuclease activity by monitoring the number of duplexes remaining following incubation with DNase I. Significant clipping is observed for all targets tested and that the various tails did not significantly hinder nuclease activity. These results indicate that the respectively short tail lengths do not have appreciable effects on the hindrance of nuclease activity. Longer PEG tails must be examined.

Mentor: Valeria Milam

MARYLAND

Shaina Castle, Maryland

Physical Activity and Its Effect on Mental Fitness

The purpose of the Team Om study is to investigate the immediate effects of Yoga practice on selective attention and mental concentration. While there has been a vast increase in research pertaining to the relationship between yoga and cognitive function, there is limited focus on the attentional effects of yoga. Noting a lack of research in the field of yoga on attention, this study followed a quasi-experimental pre-test, post-test design to measure whether physical activity had an effect on selective attention and mental concentration in young adults, aged 18 to 25. Furthermore, this study compared yoga and aerobic exercise classes at the University of Maryland to see whether the meditative aspects of yoga improved attention past regular physical activity. A yoga experimental group and an aerobic dance control group took two surveys and the d2 Test of Attention at two observations immediately following their respective exercise classes. There were no statistically significant differences between the two groups. ANOVA analysis found a statistically significant improvement between post and pre-test scores on attention for both groups, with a greater improvement for the aerobic group. The findings show that exercise has an immediate effect on the attention of the targeted demographic. The study's findings do not suggest that the meditative component of yoga has a greater effect on the selective attention and mental concentration of young adults than basic aerobic exercise. The results of this study have practical implications for University students who wish to improve their attention.

Mentor: Christa Schmidt

John Murray, Maryland

StorySigns: Structural Editing of Textual Narratives

StorySigns is a program and user interface paradigm that explores techniques of organizing and accessing the structure of a story through graphical representation of its elements. The program addresses a number of problems of both story analysis and story authoring, particularly the ability to understand correspondence and dependency of a portion of a story on others. The program draws nodes which have a unique identifying symbol representing an element; one of a character, event, setting, beat (a portion of

action which progresses a scene) and/or a plot.
This provides a means of attaching notes and

relations among characters to the text itself, so that upon revision any changes can be made through the higher level organizations. The design process included creating a mock up of different versions in PowerPoint and developing a working prototype in flash. Then a usability study will be conducted and will measure through surveys and interviews with subjects satisfaction and usefulness of structure traversal and annotation in creative writing, revising and learning to write. The program will be distributed to the users and will provide a means to record ongoing use of the program over a period of two weeks. Future uses of the technique include generalizing it for annotation and traversal of other documents, including Wikipedia entries, textbooks, help documentation or other cross-linked or version-sensitive text documents. While not the primary aim of the study, both 2d and 3d versions of the interface will be tested to find the best representations.
Mentor: Ben Shneiderman

Rachel O. Niederer, Maryland

Genetic Characterization of Yeast CBF5 Mutants: Implications with Regard to Dyskeratosis Congenita

The yeast gene CBF5 encodes the pseudouridine synthase catalytic subunit of box H/ACA small nucleolar ribonucleoprotein particles. This complex is responsible for global rRNA modifications proposed to fine tune ribosome function. Additionally, Cbf5p is homologous to the human protein DKC1, mutants of which cause X-linked Dyskeratosis Congenita (X-DC). Here we endeavored to characterize the effects of three mutants of yeast CBF5. The S36A mutant corresponds to the mutation T66A in X-DC patients; A356T corresponds to the A386T mutation in the DKC1 mutant mouse fibroblast line; and D95A is a mutation in the catalytic site that abolishes CBF5 pseudouridylation activity. Effects of the mutations on translational fidelity, temperature sensitivity, and drug resistance were monitored. The D95A mutant promoted strong growth defects as well as temperature sensitivity. This strain also showed strong phenotypes in response to three antibiotic translational inhibitors. Specifically, D95A is hypersensitive to sparsomycin (ribosomal P-site) and paromomycin (tRNA/mRNA decoding center), but is resistant to anisomycin (ribosomal A-site). Translational fidelity assays revealed an approximately three fold increase in rates of programmed -1 frameshifting in this mutant. Future work will focus on further defining the effects of global pseudouridylation defects by investigating IRES binding, maintenance of the killer virus, and A- and P-site binding affinity.
Mentor: Jonathan Dinman

Matthew Schulzinger, Maryland

Carbon Stinks

Carbon that is circulated in and out of the atmosphere by the natural growth and decay process of trees makes up a sizeable portion of the carbon cycle. This portion of the carbon cycle holds potential for sequestering carbon in order to alleviate climate change. Team Carbon Sinks seeks to find a way to sequester carbon effectively in dead trees via their burial and submersion. Currently, Team Carbon Sinks is conducting a field experiment in Queenstown, Maryland, monitoring the decomposition of over 125 wood samples. A lab experiment is scheduled to begin in the next month to evaluate the various factors that affect decomposition in buried and submerged wood. Should these methods prove effective at sequestering carbon, the methodology created by Team Carbon Sinks could be adapted throughout the entire east coast of the United States due to its ecological homogeneity. If this region were to be utilized as a carbon sink by burying or submerging dead wood, a large impact could be made to reduce the growing effects of global climate change.
Mentor: Nimg Zeng

Sarah Tostanoski, Maryland

Characterization of the Lac+ Phenotype in Salmonella Tennessee Isolates Associated with the Peanut Butter Outbreak of 2007

In 2006-2007, there was a widespread foodborne outbreak in the United States linked to peanut butter and caused by Salmonella Tennessee. These bacterial pathogens were diagnostically spurious because they had acquired the unusual ability for Salmonella to ferment lactose. Therefore, to protect the public health, it is imperative to determine the mechanism of acquisition of the lactose fermenting genes in Salmonella. Traditional bacteriological methods used in screening food samples cannot distinguish lactose fermenting Salmonella spp. from Escherichia coli. Conjugation mating experiments were performed to determine the ability of genetic transfer from lactose fermenting donors to a non-lactose fermenting recipient Salmonella. Growth of lac+ Salmonella was observed on selective solid minimal media. Transformation of isolated plasmids from lactose fermenting Salmonella to a non-lactose fermenting Salmonella recipient by electroporation was performed and selection of lac+ trains was on solid minimal medium supplemented with lactose. Plasmids were isolated from the resulting transformants and analyzed by the polymerase chain reaction using known primers that amplify the lac genes. PCR confirmed the presence of the lac genes lacY and lacZ in the transformants, establishing that the lactose utilization genes are located on a plasmid and are transferrable. The plasmids were extracted from the transformants and sequenced to determine if there are similar genetic elements in all lactose fermenting Salmonella. By characterizing the genetic determinant carrying the lac genes, the mechanism of acquisition of the lac genes can be determined. This information will provide the means to develop more inclusive detection methods for Salmonella from foods.

Mentor: Keith Lampel

Xiaojie Zhang, Maryland

Root Length Density and Root Number of Corn Plants: How Well They Were Correlated and Affected by Compaction and Cover Crops

During dry periods plant roots need to access water stored in the subsoil layers. Numbers of roots reaching the subsoil is relatively easy to measure from soil cores. However, water uptake is most related to root length density (RLD), which is very difficult to measure. This research aimed to 1) determine the correlation between root length density and root number, and between root length density and growth (dry matter production) of corn crops and 2) to evaluate how soil compaction and cover crops treatments affect root length density and corn dry weight. Deep soil cores were broken at 5 cm intervals and live roots counted on both breakage faces. Roots were then separated from soil and organic debris by washing. After staining, roots were floated on water in a glass tray and scanned to create a digital image which was computer-analyzed to determine RLD. After scanning, root were dried and weighed. This method was calibrated by floating and imaging known lengths of sewing thread in the same manner as for the roots. The calibration results showed method was very accurate for low root length samples, but tended to underestimate in high root length samples. The hypotheses to be tested are 1) Root length density will be significantly correlated with root number, and root dry weight within a plant species; (2) Root length density will be lower in compacted soils than in uncompacted soils, but higher in plots after forage radish cover crops than other cover crop treatments.

Mentors: Guihua Chen and Ray Weil

MIAMI

Nestor Arnaldo Arita, Miami

Inhibition of ERK 1/2 Stimulates Osteogenesis in Pluripotent Cells Derived from Periodontal Ligament when Treated with TGF-B3

There is a large demand for bone regeneration research due to the high frequency of osteoporosis and critical size bone defect cases. Understanding the differentiation process of osteogenesis is vital for the use of multi/pluri potent cells in cellular therapy for the mentioned problems. In this experiment, cells cultured in fibrin gel suspensions, screened for embryonic stem cell markers derived from the periodontal ligament were induced to undergo osteogenesis by treating them with TGF-B3 while inhibiting ERK 1 and 2 with the inhibitor U0126. Cells treated for 14 days were compared to cells only treated with TGF-B3 and to a control group. Standard PCR analysis showed that the inhibited group expressed alkaline phosphatase (ALP) and collagen 1 (C1) significantly more than the control groups. However, the TGF-B3-only group also expressed elevated levels of ALP and C1.Therefore, according to these results the stimulation of osteogenesis is heavily influenced by the inhibition of ERK 1/2 but not exclusively. However, this experiment needs to be duplicated for confirmation and future experiments will compare these results to pellet culture. Also, there are plans to investigate whether osteogenesis is induced in 3D suspensions with mechanical stimuli instead of TGF-B3 during inhibition.

Mentor: Herman Cheung

Jennifer N. Boulay, Miami

Larval Growth- and Size-Selective Mortality in a Common Reef Fish in the Straits of Florida

Population structuring of marine fish can be influenced by the selective pressures on survival during the pelagic larval phase. Larval growth is naturally variable within and among cohorts of coral reef fish and can be under selective pressures due to high mortality during this phase. In this study, I tested the hypothesis that reef fish larvae with faster growth rates and larger sizes-at-age will preferentially survive as it has been suggested that "bigger is better" for survival and a faster growth rate will allow for less time spent as a small larva. Using a series of ichthyoplankton collections from the Straits of Florida, I extracted larvae of a common coral reef fish, *Thalassoma bifasciatum*, measured their standard lengths, dissected out their otoliths (earstones), and examined the microstructure of these otoliths to determine daily growth rates and relative sizes-at-age. These traits were compared among three larval age groups (youngest: 12-21d; intermediate: 22-31d; survivors: 32-42d) to determine whether mean traits varied with age. In contrast to expectations, survivors had slower early growth and were smaller-at-age than younger fish. These findings suggest that mortality may be selective for faster growing, larger individuals. However, because all larvae were collected along the same transect across the Florida Current, the differences in early growth environments may also underlie these observed patterns.

Mentor: Su Sponaugle

Kristin N. Francoeur, Miami

Potent Women and Alternative Images of Femininity: Courtesans and Hijras as Keepers of Culture and Religious Ritual in India

In this paper I explore the roles of the tawa'if and the hijras as keepers of religious ritual and cultural tradition in India. The tawa'if, or high-class courtesans, have been involved for centuries in performances of religious music and poetry, and many of them even have contributed to the genre by composing poetry themselves. Likewise, the hijra (usually referred to as 'third gender' individuals who have some of the

Michael A. Gonzalez, Miami

The Effect of Arsenic Analogues on Thymidylate Synthase Expression in Human Colon Carcinoma

The over expression of thymidylate synthase (TS) has been associated with treatment resistance in human cancer cells, most specifically when using the chemotherapy agent 5-fluoruracil (5-FU). Down-regulating TS expression could help reverse the resistance of human cancer cells to 5-FU treatment. We hypothesize that arsenic analogues have different effects on the amount of TS RNA present in the cell. Here we investigated the ability of arsenic compounds, arsenic tri-oxide (ATO) and ZIO 101 (ZIO), to modulate the expression of the TS RNA in a human colon carcinoma cell line (HT29). We cultured HT29 with increasing concentrations of ATO and ZIO for 24, 48, and 72 hours. Our control was only culture medium. Our treatments ranged from 0.2µM to 1.0µM in 0.2µM intervals. Once the incubation period was over, cell survival was quantified by XTT assay. In order to examine the expression of TS, reverse transcription and real-time polymerase chain reactions (RT-PCR) were used. Levels of TS were compared to ß-actin, a gene that is not down-regulated by arsenic treatments. The results demonstrated that both ATO and ZIO cause reduced cell viability, but ATO decreases TS expression in a time and dosage dependent manner. Therefore, we concluded that ATO and ZIO both contribute to reduced cell viability, but only ATO is effective in reducing the amount of TS expressed in cells as time and concentration increase. Future research will involve combining ATO and 5-FU as chemotherapeutic agents.
Mentor: Subbarayan Pochi

Miles R. Kenney-Lazar, Miami

Dynamic Causes and Effects of Rubber Expansion in Northern Laos

While studying abroad at the Chinese University of Hong Kong I worked on an independent research project concerning the spread of the rubber growing industry from southern China to northern Laos. This literature review and the professor I was working with inspired me to understand the issue at a deeper level by traveling to Laos and conducting my own fieldwork. I had a variety of questions such as, how exactly is the industry spreading throughout the region? What are the different forms of rubber growing and how differential levels of access to agricultural inputs affect which form of rubber growing a farmer employs? What are the socioeconomic effects each form of rubber growing is having upon the households? My main method was the use of semi-structured interviews with households, villages, and rubber

agencies. I came to a number of different conclusions such as that the economic benefits of rubber growing are not universal, and the spread of different forms of rubber growing has begun to exacerbate pre-existing income and wealth inequalities. Most importantly, the development of rubber throughout the region should be advanced at a moderate pace that manages the negative effects and allows for the positive effects upon rural livelihoods.
Mentor: Mazen Labban

Adriana M. Kiszynski, Miami

The Interaction between Samuel Richardson and Eliza Haywood: Conflict and Rivalry

The relationship between Samuel Richardson and Eliza Haywood was marked by both conflict and rivalry. In my thesis, I will use Eliza Haywood's Anti-Pamela to elucidate the tension and contradiction found in Richardson's Pamela. This thesis seeks to examine the interaction between the two authors by drawing on issues of performance and theatricality surrounding the novels. Through analysis of the parallels and critiques linking the two novels, I will show how Haywood's fiction responds to issues such as hypocrisy, the servant problem, distortion of first-person narrative, and sexuality in Pamela. To better understand the satire of Anti-Pamela, I will consult Henry Fielding's Shamela and Eliza Haywood's The History of Miss Betsy Thoughtless. In addition, a large part of the thesis will consist of outside research. I am studying the eighteenth century's political, social and economic affairs for the purpose of understanding how Richardson and Haywood's environment influenced their works.
Mentor: Tassie Gwilliam

Michael E. Lewan, Miami

Choosing the Vice President

This presentation analyzes the two major parties' selections for the office of the vice president between the years 1844 and 2008. Following a brief history of the office, the analysis covers the similarities and/or differences between the presidential candidates and their running mates. Essentially the project identifies whether candidates were chosen for electoral purposes (president and vice president are different), in other words to win more votes, or for constitutional purposes (president and vice president are similar), in other words to serve the president as designated by the Constitution. The research determines that while the reasons for vice presidential selection have fluctuated, for the majority of the country's history the vice president has been chosen for electoral reasons. The work concludes with an in-depth analysis of the 2008 election, analyzing the electoral effects, both positive and negative, of Joseph Biden and Sarah Palin, and includes contemporary textual and statistical analysis that will help show if either vice presidential candidate electorally helped their running mates in the general election. The project concludes with broad theoretical generalizations as well as predictions regarding future presidential elections.
Mentor: Joseph Uscinski

Corey A. Walton, Miami

An Analysis of Tropical Cyclone Intensity Estimates of the Advanced Microwave Sounding Unit (AMSU), 2005-2008

This study analyses a technique of tropical cyclone intensity estimation using the Advanced Microwave Sounding Unit (AMSU), providing the accuracy of the method for the 2005 to 2008 hurricane seasons, and comparing the AMSU method with the currently used Dvorak technique. Comprised of real time observations from the Automated Tropical Cyclone Forecasting system (ATCF), the data set includes AMSU estimates provided by two institutions, CIMSS and CIRA, and Dvorak estimates provided by two government departments, TAFB and SAB. Data was analyzed using statistical measures of mean bias

the dataset is subdivided by storm size, intensity level, multiple stratification of both size and intensity, latitude stratification, and finally a percent correct verification at the critical tropical depression/storm and storm/hurricane thresholds. Overall, the most significant finding is that both CIMSS and CIRA AMSU outperform the Dvorak technique for storms with a radius of maximum wind greater than 30 nm, and that the CIMSS AMSU outperforms the Dvorak technique for tropical depressions and tropical storms. These results are important in knowing which technique, Dvorak or AMSU, is most reliable in specific storm characteristics to help improve operational intensity estimates for tropical cyclones, which in turn can improve forecasts.
Mentor: Sharanya J. Majumdar

NC STATE UNIVERSITY

Nathan Bihlmeyer, NC State University

Characterization of Physical Interactions within a Multimeric Transcriptional Corepressor Complex in Arabidopsis

In Arabidopsis thaliana, proper AGAMOUS (AG) gene expression is required for cell differentiation of floral meristem into the four different flower organs. Previous studies have implicated several proteins as being in a complex to regulate AG; however, only SEUSS (SEU) and LEUNIG (LUG), transcriptional corepressors, have been shown to physically interact to repress AG expression. In addition, SEUSS-LIKE (SLK) proteins have been found that show functional redundancy with SEU, but it has not been established if they physically interact with LUG or SEU. We hypothesize the proteins SEU, SLK1, SLK2, LUG, and the DNA binding transcriptional regulator AINTEGUMENTA (ANT) are part of a multimeric complex that represses the gene AG. This complex may also regulate the development of other important structures like the ovules/seeds. I am performing protein-protein in vitro interaction assays to determine which of these five proteins physically interact; including whether or not each protein interacts with itself. Once it is known which proteins interact with which other proteins, a new theoretical model of the multimeric complex that represses the gene AG can be formed.
Mentor: Robert G. Franks

Courtney H. Fox, NC State University

Biosensors for the Detection of Glucose in Human Interstitial Fluid

Biosensors are devices comprising of a selective interface in close proximity or integrated with a transducer, which relays an interaction between the surface and analyte. Additionally, electrochemical biosensors are capable of operating in turbid media, much like the interstitial fluid of the human body. Enzyme-based biosensors are highly effective tools for detecting the presence of a biological molecule in vivo that can be utilized in medical devices and diagnostics. This research project focused on the development of a robust glucose biosensor system that can detect glucose in subcutaneous human interstitial fluid. Large biological molecules, like enzymes or antibodies, can be immobilized to the surface of microelectrodes by forming a stable acyl amino ester on the electrode surface. The co-addition of N'-(3-dimethyaminopropyl)-N'-ethylcarbodiimide (EDC) and N-hydroxysuccinimide (NHS) forms a stable amino ester. Large biological molecules can be easily intercalated into this network, and will be immobilized in the immediate proximity of the electrode. Glucose oxidase (GOx) was densely substituted into this network by replacing the active NHS esters with the primary amines of the enzyme. When tested and calibrated in a solution designed to mimic the composition of human interstitial fluid, the glucose biosensors

particularly at glucose concentrations within the hyperglycemic regime.
Mentor: Tony Cass

Justin J. Hicks, NC State University

In Vitro Biomechanical Comparison of Internal Spinal Fixation Techniques on the Canine Lumbosacral Vertebrae

Spinal fixation is commonly used in small animal surgery for traumatic injuries to the canine lumbar vertebrae. In patients with unstable spinal injuries surgical intervention is often promptly needed to prevent further neurologic damage by reestablishing anatomical alignment, addressing spinal cord compression, providing rigid stabilization of affected vertebrae and relieving or moderating pain. Several surgical techniques have been described, among those, internal and external fixation. An optimal configuration or system of fixation has yet to be determined. The two fixation techniques that are mostly used and clinically accepted utilizes: 1) positive profile threaded pins and polymethylmethacrylate (PMMA) to form an internal fixator bridging the unstable lumbosacral spine segments or 2) bilateral transarticular screws. A recently developed SOP™ Locking Plate System offers many advantages and unique abilities when compared to the conventional approach in spinal fixation. The SOP system is intended to allow locking screw technology using standard orthopedic screws but since the plate can be contoured to any shape, the locking screws can be positioned in a variety of orientations. The SOP™ system was designed to be significantly stiffer and provide more stable fixation of fractured fragments with compromised bone quality than comparable compression or locking plates. The system has a smaller footprint than standard orthopedic plates and pins/PMMA internal fixation. The purpose of this canine cadaver study is to evaluate the biomechanical characteristics of the canine lumbosacral spine in flexion and extension via four-point bending test using three different types of internal fixation techniques. 1) Basic 6-pin system; positive profile threaded pins and polymethylmethacrylate; 2) bilateral transarticular screws and 3) SOP™ Locking Plate System.
Mentor: Peter Mente

Mangala Iyengar, NC State University

Effects of ATP and Glutamate on Sciatic Nerve Glia

Adenosine triphosphate (ATP) and glutamate are considered to be major neurotransmitters by which neurons and glia, the two main cell types, communicate with each other in the central and peripheral nervous systems. The current consensus is that glutamate acts on glial cells by stimulating the release of ATP, which then binds to the relevant receptors to create its effect. We, therefore, would expect that the neural responses to ATP and glutamate should be similar and that both should be blocked by antagonists of ATP receptors. Most glial cells do not generate the types of electrical responses that characterize neurons but they do respond to stimulation with changes in cytoplasmic calcium. We used optical imaging of calcium responses to study and quantify the responses of glia to ATP and glutamate in the developing rat sciatic nerve, a model peripheral nerve. ATP produced a consistent and robust response, but application of glutamate produced little or no response. In rat optic nerve, a model central nerve studied in our laboratory, ATP and glutamate also produced different responses. These results suggest the need to reevaluate the means by which these substances may mediate intercellular chemical communication between neurons and glia in intact nerves.
Mentor: Robert Grossfeld

Thomas Christopher Pope, NC State University

Black Hole Growth Excites Spin

Looking up at the night sky with an x-ray telescope reveals hundreds of thousands of x-ray sources invisible to your eyes. These objects are powered by accretion, the process by which the gravity of a compact star like a black hole will attract and capture material. The theory of hydrodynamic accretion was first described 70 years ago by Hoyle and Lyttleton (1939), and has become a fundamental building block for understanding compact x-ray sources. Modern research on gravitational accretion has focused on the use of numerical simulations to study the stability of accretion and the possibility of accretion of angular momentum, which does not exist in the steady- state theory of Hoyle and Lyttleton. After 20 years and dozens of published papers there is still no consensus on the stability of such. We have attempted to address this confusion by using high- fidelity numerical simulations run on the NSF's 'Ranger' supercomputer. By starting from an initially steady-state axisymmetric solution we are able to show – for the first time – that Hoyle-Lyttleton accretion is unstable to small perturbations. We use these simulations to quantify the growth rate and oscillation period of the unstable accretion shock as a function of Mach number and size of the accreting star. Provided the star is sufficiently small, the secular evolution is described by sudden jumps between states with counter rotating semi-Keplerian accretion disks feeding the star with a specific angular momentum comparable to a Keplerian orbit at the surface of the star.
Mentor: John M. Blondin

Jennifer L. Puetzer, NC State University

The Effects of Cyclic Hydrostatic Pressure on Chondrogenesis and Viability of Human Adipose and Bone Marrow Derived Adult Stem Cells

Treatments for cartilage defects due to trauma, genetic predisposition, or metabolic conditions are often invasive and only serve to temporarily reduce pain. Adult stem cells have been shown to differentiate into multiple musculoskeletal tissue lineages making them a favorable means of treatment. However, the retrieval of bone marrow to isolate mesenchymal stem cells is still quite invasive for patients already suffering from cartilage injury. For this reason, the use of human adipose-derived adult stem cells (hASCs) has gained increasing interest since they are less invasive to retrieve and also have multipotential differentiation capabilities. The purpose of this study was to determine if, in the absence of chondrogenic media, hASCs would initiate chondrogenic differentiation in response to cyclic hydrostatic pressure (CHP). We hypothesized that CHP alone would be enough to induce chondrogenesis of hASCs as evidenced by upregulation of mRNA expression of Sox9, aggrecan, collagen II, and/or cartilage oligomeric matrix protein (COMP). To further investigate viability of hASCs as compared to bone marrow derived human mesenchymal stem cells (hMSCs) in response to CHP, the experiment was repeated. The purpose of this component of the study was to determine if, in the absence of chondrogenic media, hASCs and/or hMSCs demonstrated a lack of viability at any time during, or after, 21 days of exposure to CHP in 3-D agarose constructs. This study found indications of CHP induced chondrogenesis in hASCs along with a lack of cell viability by day 21 in loaded and unloaded samples of hMSCs and hASCs.
Mentor: Elizabeth G. Loboa

Steven Somers, Ashley Myers & Erika Burger, NC State University

Can Blood Lead Levels in Children Be Reduced?

Lead exposure, whether acute or chronic, is a serious public concern due to the associated health hazards. Chronic lead poisoning, defined as a small amount of lead intake over a long

time period, is more common among children and can have severe adverse effects on their cognitive development. Even low levels of lead intake have been shown to cause damaging effects after prolonged exposure. Our objective is to investigate Elevated Blood Lead Level (EBLL) rates per 1000 children. We have compared the 2003 California EBLL data to another EBLL data set they submitted in 2006 and found the 2003 data to be incorrect. We have contacted other state officials to validate the integrity of all the data and have also contacted states that didn't submit data to the CDC in hopes of gaining access to their data. We are hoping to predict EBLL as a function of environmental factors and believe different regions of the country will have different significant factors. We have also produced a map that depicts the concentration of EBLL rates, highlighting the rustbelt as the main area of concern for our nation. Using exploratory statistical methods, we hope to better inform the USEPA of areas with high EBLL. Our final objective is to provide a more accurate data base than the one currently available for the CDC and attempt to determine the next major contributor to the current high EBLL in children.
Mentor: William F. Hunt, Jr.

Deborah Christine White, NC State University

Fabrication and Characterization of Polycarporlactone Nanofibers Doped with Tri-calcium Phosphate

Polycaprolactone nanofibers were created using the electrospinning process. The polymer was dissolved in chloroform and methanol and the resulting solution spun through a variety of conditions in order to determine optimum parameters for fiber size and uniformity. Once these conditions were established, a range of concentrations of tri-calcium phosphate particles were electrospun to examine loading, dispersion, and fiber size. Samples were examined using a scanning electron microscope and a transmission electron microscope. The average fiber size was near 700 nanometers. The particles showed a tendency to aggregate within the fibers causing inconsistencies in the fiber structure. Future work would include increasing the dispersion of the particles and using the resulting nanofiber mats as scaffolds for cell growth.
Mentor: Russell E. Gorga

UNC-CHAPEL HILL

Maryam Al-Zoubi, UNC-Chapel Hill

Changes in Religious Identity in Syria from 1947-2007 or Islamic Feminists

Last summer I travelled to Damascus, Syria to research the changes in Muslim identity in Syria between generations of women from 1947 to 2007. I interviewed 20 activist and devoutly religious women ages 26 to 60. Starting a decade ago, there has been a female-led revival of Islam in Syria, which has strong significance for understanding Arab Muslim women today. The female revivalist leadership encourages roles of independence and freedom that creates a different sense of feminism then western scholars are used to. At the same time, it opens new senses of identity and status for these women where their roles in society were, and often still are, otherwise limited. The women I met influenced my image of feminists. Muslim feminism is distinct from Western feminism. They do not support gender equality but rather believe in complementality. They stress the necessity to learn from Western science and education without giving up what is positive in Arab culture and Muslim religion. They argue that women surpass men in sensitivity, kindness, sympathy and deep thought, because women are the source of life and the origin of everything valuable in it. What others call weakness in women's character is, in fact true strength and solid basis for social justice. They encourage women to join the workforce but not give up

their devoutness. Despite its position in the center of the Middle East, Syria has largely been ignored by academics. Syria's erasure from most international communication is striking and creates a void in understanding of the nation and its people.
Mentor: Sarah Shields

Carina Cortese, UNC-Chapel Hill

Family, Memory, and Political Violence in Argentina: The Lizaso Family through Its Members

The clandestine execution of Carlos Lizaso by the Argentine government propelled the Lizaso family into an involved political struggle against the military dictatorship during La Guerra Sucia from 1976 to 1983 in which the Lizaso family— my mother's family— lost nine of its members to military murders. Argentina lost an entire generation to this struggle; their stories disappeared with them. My research documents and explores the impact of Argentina's Guerra Sucia on Montonero revolutionaries Jorge and Miguel Lizaso through a multi-faceted investigation that includes a series of interviews with their surviving relatives and the compilation of family photographs and videos. These transcripts and materials are being adapted to the stage as part of my Senior Honors Project in the UNC Dramatic Art Department. The piece will utilize several generational perspectives, examining the effect of La Guerra Sucia on the Lizaso family and its enduring presence in Argentine society in general. Sharing these striking stories with the greater-campus community will help make the memory of my family's political experience an active part in Argentina's recovery and our community's global awareness.
Mentor: Adam Versenyi

Lieselotte Kreuk, UNC-Chapel Hill

A Co-culture System for Intestinal Stem Cells

Every 3-4 days our entire intestinal lining needs to be renewed because of the damage induced by luminal contents. This extremely high rate of epithelial turnover is achieved as a result of intestinal stem cells that reside in the intestinal crypts. In 2005, due to a breakthrough in the laboratory of my mentor Dr. Susan Henning, it was possible to isolate a viable fraction enriched for putative intestinal stem cells (PISC) and begin to understand their biology and develop their therapeutic potential. After being removed from their niche, I found that the PISC had limited viability in vitro, and they certainly did not proliferate or differentiate— two fundamental characteristics of stem cells. The long-term goal of my work is to recreate the intestinal niche by co-culturing the PISC with a potential critical element and observe proliferation. It is well known that a major cell type in the ISC niche is the pericryptal myofibroblast, which lies immediately subjacent to the overlying epithelial cells, is capable of secreting a wide range of peptide factors, and is thought to be a source of Wnt signaling. I co-cultured different characterized fibroblast lines with intestinal epithelial cells (IEC) in hopes of providing the important epithelial-mesenchymal interaction, enabling the specification of ISC during development. Preliminary studies included finding cell tracking methods in order to accurately quantify IEC viability and proliferation in vitro. Additionally different cell dissociation methods and co-culture conditions, such as serum type and concentration in media, were assessed in my in vitro model.
Mentor: Susan J. Henning

Pranay Prabhakar, UNC-Chapel Hill

Collateral Tortuosity Is Acquired during Development, Increases with Aging, Varies with Genetic Background, and Intensifies after Middle Cerebral Artery Occlusion (MCAO)

Presence of collateral vessels that interconnect adjacent arterial trees is critical in minimizing stroke and infarctions in occlusive vascular disease. Unique features of collaterals include

their significant tortusoity (TY), which, however, decreases collateral conductance. When native collaterals acquire TY and whether it changes with aging or genetic background are unknown, nor has TY in ischemia been quantified. Therefore, we measured collateral diameter, number, length, (l), span (L, scalar distance between collateral "stem and reentry" points between adjacent trees) and TY index (TYI=l/L) in the cerebral pial circulation. Conductance was estimated using Poiseuille's equation. In C57BL/6 mice, TY was acquired between E15.5 and postnatal day 21, thereafter increasing through adulthood (3 mos old). TYI increased ~107% between 3 and 16 mos age, which along with a ~13% decrease in diameter, decreased conductance ~50%; preliminary study of 22 and 30 mos old C57BL/6 suggests a much larger reduction. These changes predict increased severity of stroke. Collaterals of BALB/c mice exhibited less TY at all ages. This is consistent with this strain's impaired collateral enlargement in ischemia (Physiol Genomics 2007). In C57BL/6, TYI peaked at 6 days (~2-fold increase). Conclusions: Collaterals acquire TY primarily after birth. TY, and thus resistance, continue to increase with maturation and old-age. BALB/c mice have a genetic defect in overall collateral growth that includes reduced TY. TY intensifies during enlargement of collateral diameter following artery obstruction. These findings demonstrate that genetics, aging, and remodeling in ischemic disease affect tortuosity of collaterals, with significant effect on their conductance function.
Mentor: James Faber

Adele Ricciardi, UNC-Chapel Hill

New Factors Involved in Histone mRNA Metabolism

The mRNAs that encode histone proteins in metazoans are the only eukaryotic mRNAs that do not end in a poly(A) tail. These mRNAs end instead in a conserved 26 nucleotide stem loop. The stem loop is critical for all stages of the histone mRNA life cycle: mRNA processing, translation and degradation. The 3' stem loop is bound by the stem-loop binding protein (SLBP), which participates in multiple aspects of histone pre-mRNA processing and histone mRNA translation. Previously, using a yeast two-hybrid screen with SLBP as bait, the Marzluff lab identified a novel protein, SLBP-interacting protein 1 (SLIP1), which binds to the translation activation domain of SLBP. SLIP1 stimulates translation of histone mRNA and interacts with translation factor eIF4G. Polyadenylated RNAs are circularized via eIF4G, which brings the 5' and 3' ends of the mRNA together through interactions with both cap-binding protein eIF4E, and poly A binding protein (PABP). This circularization of the mRNA is thought to increase translation efficiency by stabilizing the structure of the mRNA. It has been unclear whether histone mRNAs were similarly circularized, as no interactions between SLBP and proteins at the 5' end of the histone mRNA have been identified, SLIP1 interacts with both eIF4G and SLBP, and thus is a good candidate protein for creating an analogous circular mRNA structure for histone mRNAs ending in a stem-loop instead of the usual poly(A) tail. While it is clear that SLIP1 participates in histone mRNA translation, the entire cellular role and molecular mechanism of SLIP1 function is still unknown. Although SLBP is critical for histone mRNA processing, translation and degradation, cells with knockdown of SLBP protein by RNA interference remain viable. These cells lacking SLBP slowly progress through the cell cycle and arrest in S-phase. Yet, knockdown of SLIP1 in cells causes rapid cell death, suggesting that SLIP1 plays a significant function necessary for viability, aside from assisting in histone mRNA translation. A yeast two-hybrid screen using SLIP1 as bait was performed to identify possible SLIP1 interacting proteins in order to gain further knowledge about the function of SLIP1.
Mentor: William Marzluff

Sheel Shah, UNC-Chapel Hill

Detecting Birefringence of Hemozoin to Diagnose Malaria

Malaria infects 300 to 500 million people every year, resulting in over 1 million deaths annually. The vast majority of these cases occur in children, and malaria is currently the fourth leading killer of children in developing countries. A key challenge is not the lack of available treatment, but rather the ability to diagnose this disease inexpensively in areas where monetary resources and expertise are scarce, and other causes of febrile illness are common. To alleviate this disconnect, we have developed a novel new device that takes advantage of an optical property, known as birefringence, of the byproduct of the malaria parasite. We have found that this crystalline byproduct, called hemozoin, can rotate plane polarized light and therefore can be easily identified using polarized microscopy. The device uses a simple LED light source which is collimated and polarized using polarizer films. A CCD is placed after a second polarizer to capture the images. An automated translational stage built using stepper motors allows capture of over 100 images in less than a minute. The images are sent through an image analysis algorithm written using Java and MATLAB for analysis and diagnosis. High signal to noise ratio is observed in samples with parasitemia as low as 0.1%.

Mentor: Steven Meshnick

VIRGINIA

Matthew Aronson, Virginia

Mixed Oxide Catalysts for Biodiesel Synthesis

The recent push for alternative sources of energy has created the need for more efficient and cost effective means of producing bio-renewable fuels like biodiesel. The commonly used industrial method of producing biodiesel involves a homogeneous base catalyst that requires costly separation and purification steps and the generation of large quantities of waste water. A possible solution to these processing problems is to use a heterogeneous (solid) base catalyst in the trans-esterification reaction that converts plant-derived oils and an alcohol (usually methanol or ethanol) into methyl esters (biodiesel) and glycerol. Use of a solid catalyst prevents the need for costly separation steps and allows for easier recycle or reuse of the catalyst. In this work, a solid base composed of a mixed oxide of magnesia and titania was evaluated as a catalyst for the trans-esterification of tributyrin with methanol, which is a model reaction for biodiesel synthesis. Catalysts were synthesized using co- precipitation and sol-gel techniques. The reaction was performed in excess methanol at 333 K and atmospheric pressure. Analysis of the products revealed that the mixed oxide of magnesia and titania exhibited catalytic activity similar to pure magnesia whereas pure titania was inactive. The structure and composition of the catalytic materials were characterized by a variety of methods, including thermogravimetric analysis, surface area analysis and X-ray diffraction. The use of heterogeneous catalysis to produce refined chemicals and alternative fuels from renewable resources is a necessary and important step to reduce our reliance on fossil fuels.

Mentor: Robert Davis

Nicholas Meros, Virginia

Do States Fight for National Honor?

Contemporary international relations paradigms imply that states will not fight to defend their national honor. The three most prevalent models—Realism, Liberalism, and Instrumentalism—argue that states conduct foreign policy according to either calculations of power and their national interest, or their economic relationships, political ideology, and the international political structure. My presentation reviews their theories on and treatment of national honor and proposes four

original hypotheses about which types of military threats provoke states to defend their national honor. I then test these hypotheses against events in four historical case studies. I find that national honor matters because states consider and fight to defend it if—but only if—a challenger threatens their national honor so deeply that they feel obligated to disregard traditional concerns and defend it. I argue that such threats are most often issued from large to small states, as an insult, through private channels, and by compromising with the target. These findings undermine contemporary international relations paradigms, most notably their view of national honor. By doing so, they implore the political community to reassess and revise their theories with a new emphasis on national honor. My research, in addition, demonstrates that states must take extra care to avoid trespassing upon other states' national honor and details how to couch military threats and conduct foreign policy so as not to infringe upon national honor. These policy prescriptions will, I hope, help states avoid unintentionally triggering wars and limit wars fought over national honor.

Mentor: Todd S. Sechser

Svantje Swider, Virginia

Communal Double-Standards: Muslims, Anti-Terrorism, and the Hindu Right in India

Right-wing Hindu nationalism has become a major force in Indian politics since the 1970s, and constitutes the ideology of the Bharatiya Janata Party (BJP), which governed nationally from 1998-2004 and has also formed the government in several provinces throughout the country. Analyzing BJP politicians' responses to two recent incidences of Hindu-Muslim violence, one allegedly perpetrated by Muslims and the other allegedly perpetrated by Hindu activists, I demonstrate that the party labels as "terrorism" the former incident and supports the prosecution of the suspects under the country's strict anti-terrorism laws, but objects to similar harsh labeling and prosecution in the latter case. I conclude that the BJP is attempting to shift the discourse on terrorism in India for political gain, subtly redefining terrorism as an inherently Muslim phenomenon.

Mentor: John Echeverri-Gent

Melissa Warnke, Virginia

Deconstructing the Memorial Museum: A Critical Analysis of Genocide Memorialization in Rwanda

This summer, I spent six weeks in Rwanda studying internationally and locally constructed and funded genocide memorials. Upon arrival, I realized that the Kigali Memorial Center, the far most-traversed genocide memorial in Rwanda, is a near carbon copy of a Holocaust memorial in Nottinghamshire, UK; it is created by the same anti-genocide British NGO, filled with the same sculptures and organized in the same structure. In my presentation, born of that research, I will probe the question: why, among such different contexts and cultures, have virtually identical methods of memorialization been reproduced? I will use primary research on five memorials/memorial museums within post-genocide Rwanda as an illustrative case study, three of which are locally maintained and do not fit the traditional paradigm. I will suggest, ultimately, that the business of reproducing the construct in which traumatic memory is related creates a forum for reconciliation and remembrance that is, at worst, irrelevant to the community in which this trauma was experienced and, at best, reduces the depth of their experience. My presentation will also explain the process through which the memorial museum was negotiated in different parts of Rwanda, illuminating the political, social and economic factors at play in the creation of a national memory.

Mentor: Jeffrey Rossman

VIRGINIA TECH

Jon Crain, Virginia Tech

Transnational Civil Society and Governance in Weak and Failed African States: Empirical Incongruence of U.S. Policy

Civil society literature presupposes a substantive amount of state capacity, due its Eurocentric development, as well as the African context of colonial and state repression that catalyzed the revival of scholarly interest in civil society. It is important to examine the relationship between society and state due to the universal acceptance of, and lack of alternatives to, the Westphalian state system. However, in many cases civil society literature, which seeks to delineate the relationship between state and society (both local and global), has been invoked to examine the development capacity of non-state civic institutions, organizations, and efforts. By maintaining the traditional 'state-society' perspective, theorists have reduced their utility in scenarios where state capacity is extremely limited. This article will argue that the predominant 'state-society' perspective that frames civil society literature should not be utilized to examine civic action in areas where state capacity is minimal or non-existent. The fractured nature of sovereignty in the globalized era will be invoked to justify the claim that the state no longer is guaranteed a substantial role within the African development process. As such, civil society literature must disregard the supremacy of the 'state-society' perspective, in order to acknowledge the empirical flows of power that occur (when state capacity is lacking) between local and global civic elements, outside of the realm of state influence. The Democratic Republic of Congo (DRC) will be used as the main exemplar, however the author holds that the theory entailed within holds for all African regions where state capacity lacks.
Mentor: Ioannis Stivachtis

Sandra Hobson, Virginia Tech

Is the Adiabatic Approximation Sufficient to Account for the Post-Born-Oppenheimer Effects on Molecular Electric Dipole Moments?

A recent analysis of high-resolution sunspot spectra uncovered the existence of water on the sun. Interpreting these high-resolution molecular spectra requires accurate knowledge of the dipole moment. Current quantum chemistry models can predict the dipole moments of many molecules subject to approximations. Most quantum chemistry calculations are done within the Born-Oppenheimer (BO) approximation that assumes that nuclei are motionless and provides the foundation for all chemistry. However, the BO approximation can break down and thus the post-Born-Oppenheimer (post-BO) contributions to molecular properties, e.g., the dipole moment, must be considered to attain high accuracy. Our work investigated whether the so-called adiabatic approximation is sufficient to predict quantitatively the post-BO effect on the dipole moment of a simple polyatomic molecule. We estimated the post-BO contribution to the dipole moments by finite-field derivatives of the Diagonal Born-Oppenheimer Correction computed with correlated electronic wave functions. The new method is used to examine the effect of isotopic substitution on the dipole moments of the HD, LiH, LiD, and H216O molecules. Our findings suggest that for species that are well behaved in the BO sense, the post-BO contribution to molecular electric dipole moments can be described within the adiabatic approximation to a few percent accuracy. Work is underway to use our approach to improve the accuracy of computed spectra of water.
Mentor: Edward F. Valeev

Michelle Klassen, Virginia Tech

Hillbilly Heroine: OxyContin in Appalachia

My research answers the question of why as the abuse and diversion of OxyContin has become such a widespread problem in Appalachia. The purpose of the study is to determine what action

should be taken to reduce the abuse and diversion of OxyContin in Appalachia and to identify what about OxyContin appeals to drug sellers and users. By identifying this, actions can be taken to reduce the economic impact of the vast black market in those areas affected by the illegal activity. To research OxyContin in Appalachia, I used newspaper articles, FDA and DEA records, transcripts of Congressional hearings, and court case summaries. In my research, I found that the abuse and diversion of OxyContin has become a major problem in Appalachia since its introduction in 1995 because of its relative availability and public disregard for the fatal potential of abuse. Starting in 2001, reports of widespread abuse of the prescription drug began to surface. Several State and Federal Government agencies took action to control the abuse and diversion that had reached unprecedented levels, but the measures proved too little, too late. Today, the problems of diversion and abuse have only multiplied as a result and significant black markets have developed. A solution that holds doctors and pharmacists accountable for the distribution is needed, as well as one that helps eliminate the black market that has dominated the economies of these depressed towns.
Mentor: Peter Wallenstein

Aaron G. Kroll, Virginia Tech

How Virtual Worlds (Second Life) Are Affecting Traditional Concepts and Protection of Intellectual Property Rights, Such As Trademarks, Trade Names, and Copyrights

The emergence of virtual worlds, such as Second Life, gives rise to an increasing number of intellectual property questions because of the innovative nature of these electronic places. There are unique challenges to intellectual property rights as the line between the virtual world and the real world slowly blurs. By understanding and enforcing intellectual property rights consistently in virtual and in real life, we can uphold these rights and prevent future disputes. This work presents an investigation of how virtual worlds (specifically Second Life), are affecting traditional concepts and protection of intellectual property rights, such as trademarks, trade names and copyrights. In order to test the current limitations of intellectual property rights in a virtual world this research used a sampling, through direct observation by creating an avatar and exploring the virtual world of Second Life, and examining the terms of use and additional steps Linden Labs (creator of Second Life) is taking to protect intellectual property rights.
Mentor: Janine Hiller

Sara Lu and Priyanka Malla, Virginia Tech

Universal Design of a Workstation

The majority of workstations, tasks, and facilities at manufacturing facilities are designed for employees who have typical needs; disregarding over 18% of the population that have some level of special needs. The objective of this research project is to redesign the item setup workstation at a Walgreens' distribution center to ensure accessibility by employees with special needs. The item setup workstation ensures that items are measured and initialized into the Walgreens' database correctly. In collaboration with two special education teachers, the research team is using the Universal System Engineering Design (USED) Process, which is a hybrid of the Systems Engineering Process (Blanchard and Fabrycky, 2008), the System Design Process (Sanders and McCormick, 1993), and the Process of Universal Design (Burgstahler, 2008). As part of the USED Process, the team is assessing the employee satisfaction, work flow, and productivity of the workstation using surveys, procedural task analysis, and simulations both before and after the redesign. The expected results include a successful application of the USED Process, a redesigned workstation with increased productivity, and increased employment opportunities for people with special needs.
Mentor: Kimberly Ellis

Garrett Smith, Virginia Tech

A Comparison of the Cost of Parasite Resistance in Crossbred Katahdin Lambs Using Strategic Versus Selective Deworming Regimes

In a parasite-abundant environment, Katahdin lambs are more resistant to gastro-intestinal nematodes (GINs) than traditional breeds yet experience poor growth due to parasitism, especially after weaning. A single anthelmintic treatment at this critical time may improve growth and reduce costs compared to selectively dewormed lambs. To assess various parasite-control schemes, 140 Katahdin crossbred lambs were randomly assigned to three groups. All lambs in groups A (n=45) and B (n=49) were dewormed 21 days following weaning. Group A lambs were placed on a low worm-burden pasture, whereas B lambs were returned to high worm-burden pasture. In group C (n=46), 48% of the lambs were selectively dewormed based on FAMACHA© score and pastured with group B. Fecal samples were collected every 2 weeks for 6-weeks. Group A had lower fecal egg counts (FEC) (329.3 eggs/g,) by week 6 than group C (962.5 eggs/g; P=0.006). Group A lambs gained significantly more (13.5 lbs) and had much lower feed costs per pound of gain ($0.30/lb) than B (3.4 lbs and $1.24/lb, respectively) or C (1.4 lbs, $3.13/lb, respectively). The levels of parasite resistance present in Katahdin lambs are thus not adequate to avoid reductions in growth rate if lambs are constantly exposed to GIN.
Mentor: David Notter

WAKE FOREST

Holly Antony, Wake Forest

Physical Activity and Function in Older Cancer Survivors

Aging is considered the single greatest risk factor for developing cancer, and 60% of all cancers occur in adults over the age of 65. Survival rates are improving and a greater number of older adults are currently living with cancer. As people age, physical activity participation becomes increasingly important for the prevention of functional decline and chronic disease, but little is known about the role of physical activity in the older cancer survivor. The purpose of this study was to assess physical activity and physical function in older adults with cancer and to examine how the physical activity levels of older cancer patients are related to physical function. This study was conducted in the Geriatric Oncology Clinic at Wake Forest University Baptist Hospital. Physical function was assessed by grip strength, range of motion, and the Short Physical Performance Battery (SPPB). Physical activity was assessed by a verbally administered questionnaire related to days per week of participation in mild, moderate, and strenuous physical activity. Analyses examine how physical activity levels in older cancer survivors are related to indices of physical function by cancer type and stage. Additionally, physical activity and physical function will be categorized by number of comorbidities and metastatic or localized disease. Discussion of these findings will include the feasibility of establishing a clinical database and implications for cancer treatment and functional independence.
Mentor: Shannon Mihalko

Natalia Azarova, Wake Forest

Nitrite Reductase Activity of Cytochrome c

Cytochrome c is a heme-containing protein that functions as an electron carrier in the electron transport chain, helping to synthesize ATP. The Kim-Shapiro lab studies nitrite as an important signaling molecule that mediates a number of biological responses including hypoxic vasodilation and protein expression through its reduction to nitric oxide by hemoglobin. We have shown that cytochrome c can also function as a nitrite reductase. Using absorption and EPR spectroscopies, we show that cytochrome c generates NO in a time and nitrite concentration

dependent manner. The end product is iron nitrosylated cytochrome c, which is efficient at initiating apoptosis (programmed cell death). Apoptosis eliminates potentially cancerous cells and also, when not properly controlled, likely contributes to a variety of diseases. The reduction of nitrite by cytochrome c also results in increased levels of NO, which have been observed during the early stages of apoptosis, indicating NO's involvement as an apoptotic signaling molecule. We have shown that such nitrite reductase activity is dependent upon a pentacoordinate arrangement of the protein's heme and requires hypoxic and slightly acidic conditions. Pentacoordination is achieved by the protein's binding to anionic phospholipids, which are present in the mitochondria as cardiolipin in the membrane and interact with cytochrome c during apoptosis. We suggest that cytochrome c's reduction of nitrite to NO and the subsequent formation of iron nitrosylated cytochrome c helps initiate the process of apoptosis and may also be important in redox or hypoxic signaling as well as cytoprotection in ischemic reperfusion injury.
Mentor: Daniel Kim-Shapiro

Megan Connolly, Wake Forest

The Effects of Sibutramine in the Nucleus Accumbens, Hypothalamus, or Prefrontal Cortex on Feeding Behavior in the Rat

Sibutramine hydrochloride monohydrate is a weight-modifying agent currently used in the treatment of obesity. As a serotonin and norepinephrine reuptake inhibitor, it helps decrease food intake by increasing satiety. Although systemic treatment with sibutramine has been shown to reduce feeding in both humans and rats, the neural locus of effect is unclear. Past research has shown increases in serotonin accumulation in the hypothalamus and prefrontal cortex after sibutramine was administered systemically. Additionally, recent experiments in our laboratory have demonstrated that serotonin receptors in the nucleus accumbens modulate feeding behavior. These experiments tested whether sibutramine injected into the nucleus accumbens, the hypothalamus, or the prefrontal cortex would impact feeding on a high fat/sucrose palatable diet in non-deprived animals. Male Sprague-Dawley rats were implanted with bilateral guide cannulas aimed at the nucleus accumbens shell, the paraventricular nucleus of the hypothalamus, or the prefrontal cortex. Subsequently, rats were presented with a high fat/sucrose diet for daily 2-hr feeding sessions. Food intake and locomotion were monitored throughout each session. On experimental days, rats (N= 5-8/group) received infusions of sibutramine (0.0, 2.0, 4.0 and 10.0 µg/0.5 µl bilaterally) directly into a single brain region prior to placement into the food intake chambers. Experiments are concluded and analysis is ongoing; results from all groups will be analyzed and presented.
Mentor: Wayne Pratt

Robert Cox, Wake Forest

Contemporary Religious Architecture in Italy

In a country that already claims some of the greatest religious architecture in the world, Italians continue to build new churches. By visiting and observing four different churches built within the past ten years, this project examines the state of the Italian church at the turn of the 21st century, asking if and how this unique culture continues to strengthen its architectural heritage. My talk will focus on the effects of light in the selected churches, discussing how this element pertains to the design of sacred spaces.
Mentor: Harry Titus

Kristin Eberman, Wake Forest

Stories of Househelps in Ghana, West Africa

The focus of my project captures the lives and stories of "househelps" in Ghana, West Africa and presents their situations in a documentary film. I spent the month of June in Ghana filming and interviewing 10 househelps about their lives.

"Househelps" are domestic child laborers ranging from the ages of seven to adolescence and are typically from poor, rural areas. They come to larger towns and cities in order to do domestic work for other families since their biological families cannot afford to take care of them. Children can be forced into the life of a househelp by their parents or community, or choose to go into this type of work themselves for a lack of better options. My documentary film highlights the situations of three househelps in Ghana demonstrating various situations these young adults have experienced.
Mentor: Mary Dalton

Carson Moseley, Wake Forest

TNF/iNOS-Producing Dendritic Cells—The Necessary Evil of Lethal Influenza Virus Infections

Respiratory infection with highly pathogenic influenza A viruses is characterized by the exuberant production of cytokines and chemokines and the enhanced recruitment of innate inflammatory cells. Here, we show that challenging mice with virulent influenza A viruses, including currently circulating H5N1 strains, causes the increased, selective accumulation of a particular dendritic cell (DC) subset, the tipDC, in the pneumonic airways. These tipDCs are required for the further proliferation of influenza-specific CD8+ T cells in the infected lung, as blocking their recruitment in CCR2-/- mice decreases the numbers of CD8+ effectors and ultimately compromises virus clearance. However, diminution, rather than total elimination, of tipDC trafficking by treatment with the peroxisome proliferator activated receptor-? agonist pioglitazone moderates the potentially lethal consequences of excessive tipDC recruitment without abrogating CD8+ T cell expansion or compromising virus control. Targeting the tipDC in this way thus offers novel possibilities for therapeutic intervention in the face of a catastrophic pandemic.
Mentor: Raymond Kuhn

Teresa Tang, Wake Forest

Knockdown of Hormone Receptor Expression in Cultured Honey Bee Neurons

Developmental hormones regulate many aspects of neuronal morphology and physiology. Our laboratory has developed an in vitro system for study of the effects of hormones on honey bee neurons. In vivo, the steroid hormone 20-hydroxyecdysone causes process outgrowth and altered patterns of gene expression in a population of neurons called the Kenyon cells. We propose to use dsRNA to "knockdown" the expression of the nuclear receptor for 20-hydroxyecdysone in primary cultures of Kenyon cells. This experiment will test the hypothesis that this receptor mediates the previously described effects of ecdysteroids on insect neurons.
Mentor: Susan Fahrbach

Melissa Velarde, Wake Forest

Poverty and Politics: Polemics and Programs in Mexico and the United States from the 1960's through the 1980's

This paper explores how Oscar Lewis's culture of poverty theory influenced politicians and policymakers in Mexico and the United States from the 1960's through the 1980's. In the mid-twentieth century, American anthropologist Oscar Lewis developed the groundbreaking "culture of poverty" theory during his research in Mexico, although ironically the theory most significantly impacted governmental programs in the United States. Lewis's theory recognizes the complexity and universality of poverty and encourages anti-poverty programs to delve into the root causes of poverty. With his culture of poverty theory, Oscar Lewis attempts to explain why poverty perpetuates itself. According to Lewis, many poor people belong to a subculture of society characterized by feelings of marginality, helplessness, and alienation from mainstream society. Policymakers in Mexico and the United States diverged in their response to Lewis's theory and on how they viewed race

as an aspect of the theory. Lewis's work initially faced a hostile reception in Mexico in the 1960's. Nonetheless, in Mexico, Lewis's theory sparked an intellectual debate that opened up a public forum on the issue of poverty. Oscar Lewis's work more directly influenced policy in the United States because the culture of poverty theory served as part of the conceptual backbone for the Johnson administration's War on Poverty during the 1960's and 1970's. Policy makers in the United States such as Daniel P. Moynihan, who served as an advisor to President Johnson, borrowed heavily from Lewis's theory. The paper explores how Moynihan narrowed and misapplied the culture of poverty theory to American poverty.

Mentor: Emily Wakild

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Acknowledgments

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George Barthalmus, Host
ACC Meeting of the Minds 2008

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Notes