

**107TH ANNUAL MEETING
OF THE
NORTH CAROLINA
ACADEMY OF SCIENCE**

MARCH 26-27, 2010

**GUILFORD COLLEGE
GREENSBORO, NC**



North Carolina
Academy of Science
Since 1902

Welcome to the 107th Annual Meeting of the North Carolina Academy of Science hosted by Guilford College. With almost 100 presentations across a broad range of scientific disciplines, this meeting promises to have something of interest for everyone.

The meeting opens with a poster session in the Carnegie Room of Hege Library on Friday night. After the poster session, we are very pleased to present a concert by Grammy Award and Native American Music Award winning artist Bill Miller, co-sponsored by the Guilford College Multicultural Education Center, American Indian Student Circle, and Campus Activity Board.

After the concert, the Sigma Phi Chapter of Beta Beta Beta at Guilford College is sponsoring a social hour for undergraduate students at the Hyatt Place Hotel. All undergraduate students attending the NCAS meeting are welcome to attend for some camaraderie.

Saturday begins with a continental breakfast in the Frank Family Science Center (FFSC). Oral presentations, in five concurrent sessions, will take place in FFSC. Throughout the day, vendors, exhibits, and refreshments will be available in the Patterson Lobby of FFSC.

Rob Knight of the Department of Chemistry and Biochemistry at the University of Colorado will give the keynote presentation before lunch in Dana Auditorium. Just last week, Prof. Knight's work on bacterial "fingerprints" was highlighted on NPR's Science Friday.

Lunch boxes will be available after the keynote presentation in the lobby of Dana Auditorium. Weather permitting, please take advantage of the beautiful Guilford campus and find a pleasant place to enjoy your lunch. In the event of inclement weather, we have spaces in Dana Auditorium and in FFSC to eat.

After lunch, attendees have the choice of two presentations. Dr. Caroline Wilkinson of the Center for Anatomy and Human Identification at the University of Dundee in the Bryan Jr. Auditorium of FFSC, and Bill Miller will lead the Reconciliation and Diversity Symposium in Dana Auditorium.

We continue the day with more oral presentations in FFSC followed by the NCAS and CANCAS business meetings. Saturday concludes where we started in the Carnegie Room of Hege Library with the banquet and award ceremony.

If you have any questions or needs during the meeting, please look for Guilford College faculty, staff, and students with "Ask Me" ribbons on their badges. They will help in any way they can.

Welcome to Guilford!

NCAS 2010 Local Planning Committee

Bryan Brendley,
Assistant Professor of Biology

Anne Glenn,
Professor of Chemistry

Melanie Lee-Brown,
Associate Professor of Biology

Michele Malotky,
Assistant Professor of Biology

Angie Moore,
Associate Professor of Geology

Rob Whitnell,
Professor of Chemistry

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Tim Stewart



Annie Irving



Tim Thompson

UNC, RTP, ECU & UNC-Charlotte Chapters



Tim Atkinson



The NCAS Local Planning Committee would like to especially thank the Multicultural Education Center, the American Indian Student Circle and the Campus Activity Board (CAB) for their contributions to the Bill Miller Concert and Symposium!



PARKING LEGEND:	BURGUNDY - Milner & Student Apartment parking only
RED - Resident parking only	GREEN - Faculty/Staff/Visitor parking only
BROWN - Special Interest Housing parking only	- *Emergency phones
DARK BLUE - *Commuter parking only	

*after 5:30 p.m., CCE students may park in faculty/staff spaces.



Frank Family Science Center: Building F
Hege Library and Carnegie Room: Building C
Dana Auditorium: Building Q

Speaker Information



Keynote speaker **Dr. Rob Knight**

Assistant Professor, Department of Chemistry and Biochemistry, University of Colorado, Boulder. Ph.D. Ecology and Evolutionary Biology, Princeton University, 2001

Awards: Howard Hughes Medical Institute Early Career Scientist. Dr. Knight is integrating concepts from evolutionary biology and ecology with high-throughput sequencing to study molecular diversity. He is especially interested in understanding how the human microbiome develops and how variation in the microbiome affects health and disease.



Forensic Science Symposium **Dr. Caroline Wilkinson**

Center for Anatomy and Human Identification, University of Dundee, Scotland. Senior lecturer in Forensic Anthropology.

Dr. Wilkinson developed a computerized facial reconstruction system employing virtual sculpture, which has been used within the UK for forensic identification and internationally for archaeological investigation.



Diversity Symposium and Friday Night Concert **Bill Miller**

A Mohican Indian from northern Wisconsin, Bill Miller has long been one of the most admired figures in the Native American music arena and beyond. As an award-winning recording artist, performer, songwriter, activist, painter and world-class accomplished flute player, he's been a voice for the voiceless, a link between two great and clashing civilizations. Bill Miller has won five Nammys at the Native American Music Awards including Artist of the Year, Album of the Year, Songwriter of the Year, and Song of the Year in 2000. Over the past four years, Miller has produced two incredible albums, received two Grammy Awards and led Wisconsin's La Crosse Symphony Orchestra.

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Yarbrough Undergraduate Research Grants

Tonya Johnson	Guilford College	Inactivation of the FMN riboswitch in <i>Pseudomonas aeruginosa</i>
Rachel Kivela	Warren Wilson College	Heavy metal analysis of tree core samples
Kopano Mmalang	Warren Wilson College	Trace mineral composition of <i>Imbrasia belina</i> (mophane worm), a common food in Botswana
Erin Shanblatt	Warren Wilson College	Lead and arsenic concentrations in Lake Fontana, Lake Julian, and Swannonoa River sediment
Isaac Smith	Lenoir-Rhyne College	The effect of kiko goats (<i>Capra hircus</i>) on the aboveground production of kudzu in the Piedmont of North Carolina
Isaiah Thalmayer	Warren Wilson College	Phylogeny of <i>Uvularia</i> (Colchicaceae) derived from morphology
Lindsay Yount	Lenoir-Rhyne College	The separation of allelopathy and resource competition by the invasive species <i>Pueraria lobata</i>

Robert R Bryden Graduate Research Grants

2008	Jennifer Petzold
2009	Alex R. Gunderson Leigh Ann Harden

NC Student Academy of Science Award Winning Posters

Coleman Bailey, Jr.
Edwin Chavez
Aakash Gandhi
Marissa Petri
Jake Nester
Michael Sturdivant

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Robert Wolk

Summary Schedule

Friday March 26th

- 1:00–2:00 Finance Committee Meeting (King 126)
- 2:00–5:00 Board Meeting (King 126)
- 5:00–6:00 Registration and poster setup (Hege Library Lobby/Carnegie Room)
- 5:30–6:00 Poster judges meeting (Hege Conference Room)
- 6:00–6:15 Welcome remarks from Kent Chabotar, President, Guilford College (Carnegie Room)
- 6:00–7:30 Poster Session and Reception with heavy hors d'oeuvres (Carnegie Room and Hege Library Lobby)
- 8:00–10:00 Bill Miller Concert (Dana Auditorium) Admission for Guilford Community- two cans of food
- 10:30–11:30 Undergraduate Social organized by the Sigma Phi Chapter of Beta Beta Beta (Hyatt Place Hotel)

Saturday March 27th

- 7:30–8:30 Registration and Exhibit Setup (Patterson Lobby/Science Commons-Frank Family Science Center)
- 8:30–5:00 Exhibits of Meeting Sponsors (Patterson Lobby/Science Commons-FFSC)
- 8:00–8:30 Judges and Session Chair Meetings (FFSC 330)
Judges Breakout Room (FFSC 314)
- 8:30-11:00 NC Student Academy of Science award winning posters (FFSC Science Library); posters attended 10:00-11:00
- 8:30–11:15 Sessions for oral presentations (FFSC-Bryan Jr Auditorium, 109, 110, 220, 320)
- 11:30–12:45 Keynote Speaker: Rob Knight, University of Colorado, Boulder-
"The Human Microbiome" (Dana Auditorium)
Welcome Remarks by Dr. Adrienne Israel, Vice President and Academic Dean of Guilford College
Introduction by Melanie Lee-Brown, Associate Professor and Chair of Biology
- 1:00–2:00 Lunch Boxes (Dana Auditorium Lobby)
Judges' Meeting Over Lunch (FFSC 320)
Vendor Exhibits (FFSC- Science Library & Patterson Lobby),
Recruiters Available

Saturday March 27th

- 2:00–3:00 Forensic Biology Symposium: Caroline Wilkinson, University of Dundee- "Human face variation - how the face reflects biological identity" (FFSC Bryan Jr. Auditorium)
Introduction by Savannah Irving ('07) International Programmes Manager, University of Dundee
- 2:00-3:00 Reconciliation and Diversity Symposium: Bill Miller- "The Red Road to Victory" (Dana Auditorium)
Introduction by Holly Wilson, Director of Multicultural Education
- 3:00-4:00 Vendor Exhibits (FFSC- Science Library & Patterson Lobby), Recruiters Available, Campus History Tour
- 3:30-4:30 Sessions for oral presentations (FFSC-Bryan Jr Auditorium, 220, 320)
- 4:45-5:45 Business Meetings
NCAS (FFSC- Bryan Jr. Auditorium)
CANCAS (FFSC 320)
- 5:45-6:15 CANCAS Officers Award Meeting (FFSC 314)
- 6:15-8:30 Banquet with Award Ceremony and Closing (Carnegie Room-Hege Library)
- 8:30-9:00 NCAS Board of Directors meeting (King 126)

Music for the poster session and banquet provided by Guilford College Music students Laura Boswell, Caroline Corbett, Robin Hrdlicka, and Andrew Bracken.

The Guilford College Art Gallery will be open Friday from 5-7:30 pm and Saturday from 6-7 pm. More information about the gallery can be found at <http://www.guilford.edu/artgallery>.

Presentation Schedule by Time, Room, and Discipline

Friday, March 26

Time	Room	Discipline
6-7:30 pm	Carnegie Room Hege Library	Poster Session: All Disciplines

Saturday, March 27

Time	Room	Discipline
8:30-9:45 am	Bryan Jr. Auditorium	Environmental Science
	FFSC 220	Zoology
	FFSC 320	Ecology
	FFSC 109	Cell and Developmental Biology
	FFSC 110	Molecular Biology
10-11 am	Bryan Jr. Auditorium	Ecology
		Botany
	FFSC 220	Behavioral Sciences
		Physics
	FFSC 320	Microbiology
	FFSC 109	Chemistry
		Biotechnology
3:30-4:30 pm	FFSC 110	Physiology
		Health Sciences
	Bryan Jr. Auditorium	Environmental Science
		Ecology
	FFSC 220	Botany
FFSC 320		Biotechnology
		Behavioral Sciences
		Chemistry
		Science Education

Friday, March 26, 2010: Poster presentations

Carnegie Room, Hege Library, 6-7:30 pm

Brassard	Catalyzing the reaction: High school seniors → college chemists
Byrd	Willingness of African American Males to Participate in Biomedical Research Studies that Address Health Disparities
Chaney-Berkeley	Expression of the tyrosine kinase receptor EpHB6 during adipocyte differentiation.
Chmielewski	Characterization of a male chromosome loss mutant in <i>Drosophila melanogaster</i>
Cuellar	Long-term retention of ¹⁵ N in an arctic beaded stream.
Cutchin	In Search of Heterocarpy in <i>Packera tomentosa</i>
Dimov	Effects of Penta-Brominated Diphenyl Ether on Motor Function in <i>Drosophila Melanogaster</i>
Dixon	Effect of Queen Presence or Absence on Honey Bee Worker Mortality
Dorsey	Does availability of on-site SAT differ for high schools with high & low levels of minority presence in different types of communities?
Faircloth	Characterization of three newly identified bacterial isolates acquired from the tubeworm <i>Nereis succinea</i>
Faulkner	Inhibition of Microsomal Triglyceride Transfer Protein by RNA Interference in <i>Drosophila</i> S2 Cells
Fisher	Pyk2: a pH-sensitive protein in outer medullary collecting duct (mOMCD1) cells
Gilchrist	Characterization of a Novel Transgenic Mouse Model that Over-expresses the Parkinson's Related LRRK2 & the Microtubule Related Tau
Greene, M.	Analysis of lead absorption in <i>A. thaliana</i> by atomic absorption spectroscopy
Greene, J.	Cellular Characterization of the Last of the Dictyostelium Myosin II Heavy Chain Kinases – MHCK-D
Gregg	Survival of Community-Associated Methicillin-resistant <i>Staphylococcus aureus</i> in Three Different Swimming Pool Environments (Chlorinated, Saltwater, and Biguanide non-chlorinated)
Harris	Is availability of on-site SAT related to presence of economically disadvantaged students in high schools serving different community types?
Hoekstra	A Comparison of Two Sample Methods in the Detection of <i>Borrelia burgdorferi</i> in <i>Peromyscus leucopus</i>
Inman	Mass Production of the Beneficial Nematode, <i>Heterorhabditis bacteriophora</i> , in Submerged Culture
Inman	Screening <i>Photobacterium luminescens</i> for Bacteriocidal Properties Using a Modified Version of the Kirby-Bauer Method

Jones	Utilization of woody debris by <i>Peromyscus leucopus</i>
Keith	Identifying Target Binding Sites for Teflon, a Protein Required for Autosomal Homolog Conjunction in <i>Drosophila melanogaster</i> male meiosis.
Kingsbury	Synthesis of Biodiesel Using Morpholine
Lee	Do College Students' Majors Impact Their Perceived Levels of Stress?
Lin	Human Hunger for Information from Personal Electronic Communication Devices, Extending the Models of Rewarding Stimuli
Locklear, B.	Micropropagation of Indigenous Plants
Locklear, J.	The Use of the Fluorescent Organisms <i>Pseudomonas fluorescens</i> and <i>Pseudomonas aeruginosa</i> to Study the Physical Microbiology of Shear Forces Under Simulated Microgravity and Hypergravity
Lytle	New Training Guides for Facilitators of Science Notebook Workshops for Elementary and Middle School Teachers
McMullen	Creating a Regional Partnership to Address Honey Bee Collapse Disorder
Moussa	Moderate marijuana use: Behavioral and neural effects on decision making
Ore	Calcium and Chloride Bi-Substrate-Like Activation of Oxygen Evolution by Photosystem II
Perez	Domain Structure/Function Analysis of the <i>Drosophila</i> Homolog of the Human Tumor Suppressor Topors
Raspet	Kleptoparasitism in <i>Onthophagus taurus</i> : The role of density, dung, and males
Reed	Effect of Calcium on Chloride Activation of Oxygen Evolution by Photosystem II
Ritchey	Observations of an Ectocommensal Protozoan, <i>Lagenophrys sp</i> (<i>Ciliophora: Peritricha: Lagenophryidae</i>) on Seed Shrimp (<i>Crustacea: Ostracoda</i>) Found in Gardner-Webb University Pond (Boiling Springs, NC)
Rushing	How Field Conditions Influence Brood Ball Production By the Dung Beetle <i>Onthophagus taurus</i>
Seischab	The Binding of Secretory Leukocyte Proteinase Inhibitor to Actin Filaments: Implications for Cystic Fibrosis
Shanblatt	Lead and Arsenic Concentrations in Western North Carolina Aquatic Sediment
Van Every	The Sense of the Spider
Vinholo	Does water temperature affect efficiency in hand washing?
Willis	Radical Reactions in Ionic Liquid Solvents
Woody	Characterization of the Role of Myosin II During Insulin-Stimulated Glucose Uptake in 3T3-L1 Adipocytes

Saturday, March 27, 2010: Oral presentations

Botany, Biotechnology and Behavioral Sciences	FFSC 220	15:30 Kassem	Quantitative Trait Loci For Resistance to Sudden Death Syndrome (SDS) and Soybean Cyst Nematode (SCN) in Soybean [Glycine max (L.) Merr.]
		15:45 Coburn	Using a DNazyme to Probe RNA Secondary Structure
		16:00 Briones	Do Edges Act as Conduits or Filters for Foraging Bats?
		16:15 Collier	Ratings of Happiness and Liking for Auditory Stimuli Varying in Pitch: A Preliminary Study
Cell and Developmental Biology	FFSC 109	9:00 Lachance	Identifying Dachshund's role in Hedgehog Signaling and Urchin Development.
		9:15 Beattie	The effect of serum heat inactivation on the cellular response to the antineoplastic agent, Bleomycin.
		9:30 Tibehu	Folate deficient cells display increased sensitivity to oxidative stress
Chemistry and Biotechnology	FFSC 109	10:00 Kivela	Heavy Metals in Tree Cores from the Blue Ridge Plating Superfund Site
		10:15 Jones	Measuring lipid content in algae for the purpose of biodiesel
		10:30 Cooper	Monitoring the Pathogenic Activation of Calpain to Assess Potential Neuroprotectants
		10:45 Adnew	Molecular Evolution of Candidate Genes for Caste Divergence in Apis

**Chemistry and
Science
Education**

FFSC 320

15:30 Zhang

A study of PB-PEO diblock copolymers in ionic liquid [EMI][TFSI]

15:45 Lindquist

Establishing an Ecological Research/Education Network (EREN) at Primarily Undergraduate Institutions

16:00 Niedziela

Bioinformatics for the uninitiated: the design of a non-majors course

16:15 Malotky

Introduction to Scientific Inquiry: A discipline-specific writing course for biology majors

Ecology

FFSC 320

8:30 Post

Solenopsis invicta (red imported fire ant): Colony Density in Clay-based Bays (Antioch and Goose Pond Bays, North Carolina)

8:45 Smith

The Effects of Resource Delivery Pattern on the Transient Dynamics of an Aquatic Ecosystem

9:00 Diggs

Examining Population Structure in Two Species of Australian Freshwater Turtle

9:15 Davies

The Efficiency of UV Light as a Treatment Method for Mold Infestations in HVAC Systems

9:30 Coppock

A Comparison of Fungal Abundance and Species Richness in Different Successions of Australian Rainforest

Category	Location	Time	Presenter	Topic
Ecology and Botany	Bryan Jr. Auditorium	10:00	Yount	The Relative Impact of Shade and Kudzu (<i>Pueraria lobata</i>) Extract on the Growth of Lettuce (<i>Lactuca sativa</i>) Seedlings
		10:15	Smith	Population Demographics of Woody Goldenrod (<i>Chrysoma pauciflosculosa</i>) in Lumber River State Park, North Carolina
		10:30	Guo	Growing Marine Plants on the Ocean Surface to Weaken Hurricanes, Absorb Carbon Dioxide and Produce Biofuel
		10:45	Todd	Effects of use of Debbie Meyer Green Bags and temperature on ripening and spoiling in banana fruits
		11:00	Thalmayer	A Phylogeny for <i>Uvularia</i> (Colchicaceae) Derived From Morphology
Environmental Science	Bryan Jr. Auditorium	8:30	Mahoney	Cytotoxicity of sodium dodecyl sulfate on onion cells (<i>Allium cepa</i>) relative to its presence in water supplies in Catawba County, North Carolina
		8:45	Stancil	Determining Carbon Accumulation in Trees on the Meredith College Campus
		9:00	Jackson	Pharmaceutical Contaminants: The effects of kanamycin on growth, feeding, and reproduction in a common freshwater invertebrate
		9:15	McLean	PCB accumulation in aquatic biota inhabiting an EPA superfund watershed
		9:30	Somerville	Patterns of metal concentrations in the shells of Blue Crabs (<i>Callinectes sapidus</i>) as a tracking mechanism for adult females

Field	Venue	Time	Presenter	Topic
Environmental Science and Ecology	Bryan Jr. Auditorium	15:30	Smith-Uhl	Characterization of Bivalve Populations along a Stream/Swamp Continuum
		15:45	Gentzel	Effects of Methane Producers and Consumers on the Diet of Chironmus Larvae in an Arctic Lake
		16:00	Pearl	Ecological Relationship of <i>Corbicula fluminea</i> and Physa species
		16:15	Marshall	Impacts of Managing Loblolly Pine Plantations for Biofuels Production on Rodent Abundance, Distribution, and Demographics
Microbiology	FFSC 320	10:00	Wilks	<i>Ensifer adhaerens</i> : a microbial cave predator
		10:15	Hall	Characterization of three newly identified bacterial isolates acquired from the tubeworm <i>Nereis succinea</i>
		10:30	Blankenship	Variations in <i>rrn</i> copy number in symbiotic and non-symbiotic Azotobacteria.
		10:45	Zullo	Enzyme, Chemical, Heat and pH Treatment of a Growth Inhibitor from <i>Bacillus cereus</i> GS1
Molecular Biology	FFSC 110	8:45	Helms	Gene Expression During Tissue Regeneration of the Earthworm <i>Lumbricus terrestris</i>
		9:00	Orebaugh	TREX1 Mutations in Autoimmune Disease Reveal Essential Dimer Interactions
		9:15	Lucas	Mitochondrial DNA reveals heteroplasmy and no evidence for reproductive isolation of two parasitoid fly populations
		9:30	Johnson	Inactivation of the FMN riboswitch in <i>Pseudomonas aeruginosa</i>

NCAS 2010**Presentation Schedule by Presenter****Guilford College****Physics and Behavioral Sciences****FFSC 220****10:00 Hutcheson**

The Band Gap of Liquid Water Based on the Dispersion of the Verdet Constant

10:15 CondonDevelopment of a behavioral assay to examine the spectral sensitivity of the quadramodal geomagnetic landing alignment of adult *Drosophila melanogaster***10:30 Ward**

Technology in the classroom

10:45 PetricIndividual Context of Ultrasonic Vocalizations Produced by Wild Brush Mice (*Peromyscus boylii*)**Physiology and Health Sciences****FFSC 110****10:00 Farris**

The Effect of Meditative Breathing on Pulse Transit Time: An Analysis in the Frequency Domain

10:15 Imes

Do Neutrophils Establish a Pre-Metastatic Niche?

10:30 MmalaneTrace Mineral Composition of *Acanthocampa belina* (Mophane worm), a Common Food in Botswana**10:45 Gordon**

Does Seaweed (Laminaria and Porphyra) Have Antibacterial Properties?

Zoology**FFSC 220****8:30 Rousseau**Repertoire size and territory quality in Northern Mockingbird (*Mimus polyglottos*)**8:45 Turner**

Phylogenetic positions of two species of peritrich ciliates (Protista, Ciliophora, Peritrichia) with atypical morphologies

9:00 Kunkel

Natural Products as Anthelmintics

9:15 BottemillerEffect of diet change on daily activity and colony weight of captive naked mole-rats, *Heterocephalus glaber***9:30 Gunderson**

Thermal ecology and physiology of the Puerto Rican crested Anolis lizard

Abstracts

Molecular Evolution of Candidate Genes for Caste Divergence in *Apis*

Dawit Adnew* (UNCG), Dr.Olav Rueppell (UNCG)

(Biotechnology, Oral presentation, FFSC 109, Sat: 10:45)

Most social insects, like honey-bees, live in colonies with a reproduction division of labor between a queen and her female workers. This division of labor entails morphological specialization. The queen is larger and contains significantly larger ovaries than the workers. However, this caste divergence varies among species. To investigate a possible molecular basis of this variation we selected five functional candidate genes and studied their molecular evolution. We compared existing *Apis mellifera* sequences with their homologs that were obtained from *Apis dorsata* by high throughput sequencing. We hypothesized that genes that are relevant for caste divergence show signs of positive selection. From the aligned sequences we determined synonymous and non-synonymous substitutions between the two species and calculated relative rates of evolution in the five candidate genes. One gene (GB14535) showed significant excess of non-synonymous substitution. This gene is similar to the “abnormal oocyte” gene in *Drosophila*, which is a regulator of transcription, interacts with heterochromatin, and influences germ band length as a maternal effect gene. We conclude that this gene may have played an important role in caste divergence in *Apis*.

The effect of serum heat inactivation on the cellular response to the antineoplastic agent, Bleomycin

Mike Beattie*, Eric Bourgeois Jack Pate, David Dommer, and Mickael Cariveau.

Mount Olive College, Mount Olive NC 28365.

(Cell and Developmental Biology, Oral presentation, FFSC 109, Sat: 9:15)

Serum heat inactivation (SHI) is considered an important process in the culture of mammalian cells, as it is used to inactivate serum complement protein. In the past, it has been presumed that SHI has negligible effects on cell growth and survival; however, experiments in our lab have led us to hypothesize that some cell lines are more sensitive than others to SHI. In order to address this issue in more detail, we have established a series of experiments to study the effects of SHI on the cellular response to the DNA damaging agent, Bleomycin. HeLa and A375 cells were grown in DMEM with both heat and non-heat inactivated fetal bovine serum (FBS). Cells were maintained in exponential growth, treated with Bleomycin, and evaluated for clonogenic survival. H2AX foci formation and DAPI staining were used to elucidate the effects of SHI on the induction of DNA double strand breaks and apoptosis in response to Bleomycin. Preliminary data indicate a significant difference in the effect of SHI on the clonogenic survival of HeLa and A375 cells to Bleomycin. Studies are ongoing to determine the extent of the effect of SHI on the DNA damage response in HeLa, A375, MCF-7 cells and several other cell lines.

Variations in *rrn* copy number in symbiotic and non-symbiotic Azotobacteria.

Stephanie L. Blankenship*, Guilford College

Melanie J. Lee-Brown, Guilford College

James W. Brown, North Carolina State University

(Microbiology, Oral presentation, FFSC 320, Sat: 10:30)

Among non-pathogenic bacteria, oligotrophs typically have few ribosomal RNA (*rrn*) operons whereas copiotrophs have many. This may be because numerous *rrn* operons allows higher growth rates and more dynamic growth rate changes as nutrient availability fluctuates. The

number of *rrn* operons in pathogenic bacteria and pathogenicity are inversely correlated. In pathogens, low *rrn* copy number may reflect general nutrient limitation imposed by host innate immunity and a consistent environment. The Azotobacteria are nitrogen-fixing soil bacteria, some of which are found in symbiotic association with plant root rhizospheres, and some are free-living. Azotobacteria examined so far have six to eight *rrn* operons. Because these organisms inhabit the same general environment and are non-pathogenic, we hypothesize that the variance in *rrn* copy number in these organisms, and perhaps more generally among Bacteria, differs between free-living and rhizosphere symbionts in the same way that *rrn* copy number differs between free-living, non-pathogenic bacteria and their pathogenic counterparts. The goal of this study is to determine *rrn* copy number in uncharacterized members of the Azotobacteria, and determine whether or not *rrn* copy number is associated with plant symbiosis..

Effect of diet change on daily activity and colony weight of captive naked mole-rats,
Heterocephalus glaber

Muriah Bottemiller^{1*}, Mandi Olsen² and Michelle Mabry¹, ¹Lenoir-Rhyne University and
²Omaha's Henry Doorly Zoo

(Zoology, Oral presentation, FFSC 220, Sat: 9:15)

The research was conducted during the summer of 2009 at Omaha's Henry Doorly Zoo with the aid of the Desert Dome and Nutrition department's staff. The purpose of the project was to observe the effect of four experimental diets on the daily activity and colony weight of naked mole-rats, *Heterocephalus glaber*. Little is known about the nutritional requirements of *H. glaber*, especially in a captive setting; improvements in an animal's nutrition can thus improve reproduction and longevity in captive populations. Activity of the colony was determined by counting how often individuals crossed a line marked in their enclosure. Four experimental diets were chosen in order to compare vegetable and fruit based diets, as well as relatively whole and finely chopped diets. Results suggest that the whole diets increased the overall activity of the colony, while the vegetable based diets had the greatest positive influence on the mean colony weight. These results will provide Omaha's Henry Doorly Zoo, and other institutions which keep captive colonies of *H. glaber*, information for the best nutrition and highest quality of life while we continue to gain more knowledge regarding this species.

Catalyzing the reaction: High school seniors --> college chemists

Kimberly Brassard* (Dr. Brian Postek)

University of North Carolina at Pembroke

(Science Education, Poster, Carnegie Room, Fri: 6-7:30 pm)

The purpose of this investigation was to determine if college chemistry professors feel their students are prepared for the work expected of them, and to determine if introductory students feel they have been adequately prepared by their high schools to complete college-level chemistry work. Data was gathered from professors of the UNCP Chemistry Department regarding their feelings on the level of preparation displayed by their students. From the interview, significant data indicated that the professors felt their students lacked a very general understanding of laboratory practices. A survey was administered to General Chemistry I students to determine if they were prepared for laboratory techniques and for writing lab reports. Results of the survey indicated that students did not feel they were very prepared for college-level chemistry laboratories. It appears that both professors and students do not feel the level of preparation is adequate. High school teachers were also interviewed, with results indicating that they felt they were not able to prepare students for college chemistry laboratories adequately. Responses included that there were lack of resources and that more time had to be devoted to preparation for the EOC.

Do Edges Act as Conduits or Filters for Foraging Bats?

K.M. Briones*, R. Petric, M.M. Marshall, M.C. Kalcounis-Ruppell, D.A. Miller, and J.A. Homyack. University of North Carolina at Greensboro (KMB, RP, MMM and MCKR); Weyerhaeuser Company, Columbus, MS (DAM); Weyerhaeuser Company, Vanceboro, NC (JAH).

(Behavioral Sciences, Oral presentation, FFSC 220, Sat: 16:00)

Research on managed forest landscapes in the southeastern U.S. has shown that many bat species have substantially higher activity along hard forest edges than in forest interiors, consistent with studies that show high bat species richness and abundance along hard forest edges. Hard edges may create a semi-permeable barrier to movements of bats into the forest, causing an accumulation of bat activity along edges (a filtering effect). Alternatively, forest edges may provide an important linear landscape feature (a conduit effect), or serve as both a filter and a conduit. To investigate this, we used a microphone array and thermal imagery during summer 2009, along hard forest edges, to examine how individual bats use edges and to test the hypotheses that edges act as filters (fly perpendicular to edge) and/or conduits (fly parallel to edge). We used a 4-channel microphone array to determine position of the incoming echolocation call, relative to the edge, based on time of arrival of the call at each microphone in the array. In addition, we used a thermal imaging camera with the microphone array to visualize individual bat flight at the edge. We sampled 10 different edge sites, each for 3 continuous nights, within a managed forest owned and managed by Weyerhaeuser Company in eastern North Carolina. Preliminary analysis suggests that the edge acts as a conduit for bats in this landscape.

Expression of the tyrosine kinase receptor EphB6 during adipocyte differentiation.

Angelica Chaney-Berkeley*, Renekia Elliott*, and Karen S. Katula.

The University of North Carolina at Greensboro

(Cell and Developmental Biology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Obesity is a health issue that is becoming more prevalent world wide, especially in the United States. This makes the need to study adipogenesis more essential. There is some evidence that the protein EphB6 is expressed in adipose tissue, however its function in these cells is unknown. EphB6 is a pseudo kinase that has been found to be involved in cell signaling during development and differentiation. In this study the level of EphB6 mRNA and protein were examined in undifferentiated adipocyte precursor cells (3T3 L1), during induction of differentiation, and in mature adipocytes. The protein and mRNA were prepared from the cells at different time points during differentiation. Western blot analysis of EphB6 showed that the level of the protein was higher in undifferentiated cells and nearly undetectable in the mature adipocytes. The relative level of EphB6 mRNA was analyzed by qRT-PCR. Results correspond to the protein data; EphB6 transcripts were detected in the undifferentiated cells and after induction but was undetected in the differentiated adipocytes. These results suggest that the EphB6 receptor is functioning in the undifferentiated and induced cells but not in the fully differentiated adipocytes.

Willingness of African American Males to Participate in Biomedical Research Studies that Address Health Disparities

¹Jennifer Byrd*, B.S., ¹Goldie S. Byrd, Ph.D., ²Christopher L. Edwards, Ph.D., ¹Vinaya Kelkar, Ph.D., ¹Ruth Phillips, M.D., ¹Dora Som PimPong, M.S., ¹Takiyah Starks, M.S., ¹Ashleigh Taylor, M.S., ¹Jennifer Bynum, M.S. ³Yi-Ju Li and ⁴Margaret Pericak-Vance, Ph.D.

1. Department of Biology, North Carolina A&T State University; 2. Department of Psychiatry Duke University Medical Center; 3. Center for Human Genetics, Duke University Medical Center and 4. Miami Institute for Human Genomics, The University of Miami.

(Health Sciences, Poster, Carnegie Room, Fri: 6-7:30 pm)

Despite many improvements in minority health in general, African American males continue to have the highest age-adjusted mortality rate of any race-sex group in the United States. Such disparities are accounted for by deaths from a number of preventable diseases such as diabetes, HIV, cancer, cardiovascular disease as well as by many historical and present social and cultural constructs that worsen health outcomes for them. Distrust of the medical community, education, socioeconomic status, social deprivation and underutilized primary health care services all contribute to dismal health outcomes among many. In addition, research on diseases that disproportionately affect African American males is often limited or generalized due to the underrepresentation of African American males in biomedical research and clinical trials. We conducted a 46-question survey to understand major factors that influence African American male participation in biomedical research studies. Data from 204 survey respondents suggest that 1) African American males are willing to participate in all types of research studies, but at a lower rate than their female counterparts, 2) that money is not necessarily required for their participation, 3) that the legacy of the Tuskegee Syphilis Study influences their motivation for participation, and 4) that their participation is significantly influenced by their educational level. Our data also show that many men, at all educational levels, do not understand the informed consent process (even if they had signed one), and its impact on studies that require human subjects. We conclude that while many African American males are willing to participate in biomedical research studies, much education is needed to inform this population sufficiently to recruit adequate numbers of them into biomedical research studies that address health disparities. Significant amounts of community based outreach and knowledge sharing will significantly increase minority male participation in biomedical research studies and reduce the need for generalization of data for many disease based studies.

Characterization of a male chromosome loss mutant in *Drosophila melanogaster*

Jeffrey Chmielewski*, Claire Davis, John Tomkiel

University of North Carolina at Greensboro

(Cell and Developmental Biology, Poster, Carnegie Room, Fri: 6-7:30 pm)

We have genetically and cytologically characterized a male meiotic mutant, male chromosome loss Z3 2566, in the fruit fly *Drosophila melanogaster*. This mutation causes chromosome loss of the sex and fourth chromosomes during meiosis. The major autosomal chromosomes are not affected. While gametes are produced that lack one or more chromosomes, we have not found evidence for nondisjunction of homologous chromosomes (at meiosis I) or sister chromatids (at meiosis II). We used recombination and deletion mapping to localize the mutation to salivary chromosome bands 79-85 of the right arm of chromosome 3. We are using P-element mediated male recombination to further refine our mapping. To date, no other mutations with this phenotype have been described. Identifying this gene and its role in chromosome transmission could provide insight into the similar processes in humans.

Using a DNAzyme to Probe RNA Secondary Structure

Christopher Coburn

Western Carolina University

(Biotechnology, Oral presentation, FFSC 220, Sat: 15:45)

Small double-stranded RNA molecules can induce sequence-specific post-transcriptional gene silencing in eukaryotic cells. The mechanism by which this occurs is referred to as RNA interference (RNAi). RNAi has become an essential tool for analyzing gene function and is believed to have therapeutic potential for silencing genes associated with human disease. RNAi is triggered in the cell by the introduction of double-stranded short interfering RNA (siRNA). To be effective, the siRNA must be homologous to an accessible loop within the secondary structure of the target mRNA. This severely complicates the development of an RNAi strategy. With no knowledge of an mRNA's structure, a suitable target sequence can be difficult to find. A novel assay designed to overcome this difficulty uses a DNAzyme to probe mRNA secondary structure.

Ratings of Happiness and Liking for Auditory Stimuli Varying in Pitch: A Preliminary Study

William G. Collier

University of North Carolina at Pembroke

(Behavioral Sciences, Oral presentation, FFSC 220, Sat: 16:15)

Previous research has found that auditory tones that are higher in pitch are rated as being happier than auditory tones that are lower in pitch. Even though participants in previous studies rated higher pitch tones as being happier than lower pitch tones that does not necessarily mean that participants would prefer higher pitch tones to lower pitch tones. Thus, the purpose of this study was to examine ratings of happiness and liking for auditory tones varying in pitch. The findings of this study generally support earlier research on ratings of happiness with participants rating higher pitch tones as being happier than lower pitch tones. A different pattern, however, was found for ratings of liking: an inverted U pattern. Participants rated the auditory tones in the middle (i.e., the C4 octave) as being liked the most with the ratings of liking being smaller as the auditory tones moved towards the extremes (i.e., both lower and higher in pitch). Some implications of the research findings, along with some recommendations for future research, will be discussed.

Development of a behavioral assay to examine the spectral sensitivity of the quadramodal geomagnetic landing alignment of adult *Drosophila melanogaster*

Lauren E. Condon*, Christina D. Segraves, Caitlin D. Skislak, Sharrie J. Faison, Mickael J. Cariveau, and David H. Dommer.

Mount Olive College, Mount Olive NC 28365.

(Behavioral Sciences, Oral presentation, FFSC 220, Sat: 10:15)

While a myriad of organisms show sensitivity to geomagnetic cues, the underlying biophysical and molecular basis of this sensory system remains enigmatic. Experiments in both adult and larval *Drosophila melanogaster* show that they possess a robust light-dependent magnetic compass utilizing long-lived radical pair intermediates, and can respond to a trained unimodal magnetic direction. While these studies have demonstrated spectral antagonism and a dependence on the axis of the geomagnetic field they are intrinsically difficult to replicate in that they rely on organisms to demonstrate a learned response. Innate responses, previously thought to have little experimental value, are increasingly more reliable in terms of reproducibility. This highly replicable behavior in concert with new age molecular studies of *Drosophila* mutants can be invaluable in regards to studying the fundamental spectral sensitivity (i.e. intensity and

wavelength ranges) of the photoreceptors involved in magnetoreception, and can provide a framework to visually “dissect” *Drosophila* adults in attempts to identify components of the magnetoreception pathway. This study represents ongoing experiments attempting to reproduce a quadramodal landing response in wild type adult *Drosophila*, which will allow us to study the spectral dependence of the magnetosensory system under full spectrum, ultraviolet (365nm), blue (470nm), and infrared (660nm) light.

Monitoring the Pathogenic Activation of Calpain to Assess Potential Neuroprotectants

Joanna Cooper,¹ Queenie Brown,^{2,3} Matthew G. Varga,³ Jeannie Hwang,^{1,3} and Ben A. Bahr¹⁻³

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(Biotechnology, Oral presentation, FFSC 109, Sat: 10:30)

The protease calpain has been linked to a variety of neurodegenerative conditions. Pathogenic activation of calpain can be monitored by its cleavage of the cytoskeletal protein spectrin, which results in breakdown products (BDP). Development of antibodies against BDP allowed the sensitive measure of early pathogenic events, as well as the sensitive assessment of potential neuroprotective agents that reduce neuronal compromise. The breakdown-specific antibodies (anti-BDP) recognize epitopes exposed by the calpain cleavage event. We have routinely exploited the sensitive monitoring of BDP to assess neuroprotection as part of drug development. In particular, BDP assays have helped screen for improved Ampakines, positive modulators of the AMPA receptor-MAP kinase axis linked to cell survival. Recent work found that Ampakine CX691 protects against excitotoxic damage in hippocampal slice cultures. Tested against glutamatergic excitotoxicity (AMPA, 15 min), CX691 reduced calpain-mediated BDP measured 1 h and 20 h post-insult. In line with the close correspondence between spectrin breakdown and synaptic/neuronal deterioration, CX691's ability to reduce BDP was also linked to improved maintenance of pre- and postsynaptic proteins and the prevention of neuronal death. These results show that AMPA receptor modulation is neuroprotective, and they indicate the value of aberrant calpain activity assessment for developing therapeutic agents.

A Comparison of Fungal Abundance and Species Richness in Different Successions of Australian Rainforest

Nathaniel Coppock

Guilford College

(Ecology, Oral presentation, FFSC 320, Sat: 9:30)

In Australian Rainforests, Fungi Provide an indispensable role of breaking down organic matter, and returning the nutrients therein back to the plants. In this study, the leaf litter layer of two different successions of a particular type of rainforest were examined closely to observe the different population's fruiting bodies, both in the number present, and the number of distinct fruiting body types. One environment was an established rainforest, while the other was a replanted rainforest of thirty years of age. Physical characteristics of each environment were also tested to determine a correlation. I found a distinct difference in the number of fruiting body types without a clear supporting physical characteristic to account for the difference. While the leaf litter layer mass correlated with both species richness and abundance significantly, and to almost exactly the same degree, they did not correlate within one rainforest type. This shows that one environmental characteristic tested for does not account for differences in fungal communities.

This could mean that these differences in diversity could be found from another environmental characteristic, or is due to a combination.

Long-term retention of ^{15}N in an arctic beaded stream.

Rachel P. Cuellar* UNC Greensboro, Anne E. Hershey UNC Greensboro, and Lindsey D. Pollard
UNC Greensboro

(Ecology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Many arctic streams are characterized by a pattern of large pools (beads), formed by freeze-thaw activity, separated by narrow channels, resembling beads on a string. Beads may be significant sites of N retention in arctic streams, but their role is not well studied. During the summer of 2009, we studied a beaded stream downstream of an arctic lake that had been experimentally enriched with ^{15}N during the previous four summers, but received no new ^{15}N in 2009. There was a general pattern of decreasing $\delta^{15}\text{N}$ in beads with increasing distance from the lake outlet, which suggests that significant N retention occurred over the previous 4 seasons. $\delta^{15}\text{N}$ of seston was correlated with that of FBOM in beads and with FBOM at bead inlets and outlets. Furthermore, over a 17-day period, there was no significant change in $\delta^{15}\text{N}$ with downstream distance. These data suggest that beaded streams are highly retentive of N, and that retention occurs over relatively long time scales.

In Search of Heterocarpy in *Packera tomentosa*

Meaghan D. Cutchin, Dr. Claudia L. Jolls

East Carolina University

(Ecology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Heterocarpy, the production of seeds on the same plant that differ in size, morphology, dispersal and germination, may be adaptive in unpredictable environments. Heterocarpy is common in the *Asteraceae*, and has been reported for the genus *Senecio*. This study investigated the possibility of heterocarpy in woolly ragwort, *Packera tomentosa*, (Michaux) C. Jefferys (*Senecio tomentosus*), a flowering spring perennial of the southeastern United States. We collected seeds from 55 plants in Pitt Co., NC in 2009. More than 1000 seeds were weighed using a CAHN electrobalance. Seed mass averaged 0.3226; however, seed mass of 61 inner and outer seeds was indistinguishable between disk and ray achenes ($F_{1,61} = 28$, $p = 0.60$), although our sample size was small. We attempted to germinate lab-stored seeds (25/15 C° 16/8 hr thermal and photoperiod), but to date, germination has been low (2%). Scanning electron microscopy holds promise for comparisons of achenes between whorl. Despite previous reports of heterocarpy in *Senecio*, molecular analyses have placed *Packera* more closely related to the genus *Elimia* rather than heterocarpic members of *Senecio sensu stricto*. Nonetheless, our data do not yet confirm a lack of heterocarpy in *Packera tomentosa*.

The Efficiency of UV Light as a Treatment Method for Mold Infestations in HVAC Systems

Ashley Coble (Campbell University), Mellisa Davies (Campbell University)*, Kaitlyn Hipp
(Campbell University)

(Ecology, Oral presentation, FFSC 320, Sat: 9:15)

The effects of indoor mold on human health can be severe if the problem is not addressed. Prolonged inhalation of spores from toxic molds such as *Stachybotrys chartarum* (black mold) can cause allergic reactions, respiratory inflammation and suppression of the immune system. Mold, bacteria and fungi commonly infest the HVAC systems of buildings and a standard method of treatment is to expose affected areas with UV light. UV light is known to damage mold DNA, disabling the formation of viable spores. Here, we investigate the efficacy of UV irradiation on

mold in the HVAC system of a 4-story, flat-roof building with a history of black mold contamination. First, air samples from each floor were collected and analyzed for species or family-specific mold content. Next, to determine the sensitivity of our mold species to UV, we grew and exposed cultures to UV light in a non-HVAC environment. Finally, culture plates were inoculated before and after UV light installation, incubated, then analyzed for mold species composition and density. Our results indicate that effective mold eradication is possible, especially when outside air intake vents are treated with UV light, air flow is unimpeded and environments conducive to mold growth are eliminated.

Examining Population Structure in Two Species of Australian Freshwater Turtle

Elliott Diggs

Guilford College, The School for Field Studies-Centre for Rainforest Studies

(Ecology, Oral presentation, FFSC 320, Sat: 9:00)

Understanding population structure is critical for freshwater turtle conservation as it aids in our knowledge of their ecological niches and demography. Two important aspects of population structure are age class and sex ratios. Age class ratios can influence the diet of freshwater turtle populations with juveniles often having different diets than adults. Sex ratios are indicators of current breeding pairs (adults) and future breeding pairs (juveniles). I examined these ratios in *Eseya stirlingi* and *Wollumbinia latisternum* populations at four pools in the North Johnstone River, north Queensland. Different pools had different age class ratios. *W. latisternum* populations favored juveniles for most pools. Two pools favored *E. stirlingi* juveniles and two pools favored adults. The differences across pools correlates with age class ratio and microhabitat preference data from past assessments. Both species had different sex ratios. For *E. stirlingi*, two pools favored females and half favored males. For *W. latisternum*, two pools favored females and half favored males. For adult *E. stirlingi*, the same trend occurred within the pools. For *W. latisternum*, one pool did not have any adults. Regardless, *W. latisternum*'s general trend was unaffected as most pools had more adult males than adult females. Pooled collectively, both species' sex ratios were nearly equal. These data suggest higher proportions of adults in both species' populations. Such ratios are consistent with the hypothesis that both species' populations would be skewed towards adult females. Our results suggest that North Johnstone River *E. Stirlingi* and *W. latisternum* populations are shifting towards a stable population structure.

Effects of Penta-Brominated Diphenyl Ether on Motor Function in *Drosophila Melanogaster*

Olga Dimov

Queens University of Charlotte

(Cell and Developmental Biology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Polybrominated Diphenyl Ethers (PBDEs) are flame retardants used in a variety of products including furniture, carpets and plastics. They have been found in the environment (water and soil) and also in human tissues (breast milk, blood and fat). Bioaccumulations of these compounds may disrupt DNA, endocrine and nervous system function. This project examined the effects of direct exposure to the PBDE, on motor function in *Drosophila*. The Motor Function Wall Climbing Assay (MFWC) was used to assess the effects of chemical on neurological function in flies. Control flies were compared to flies that were directly exposed to 0.200g penta-BDE added to 15g of growth medium for 24 hours. After 24 hours, each fly was allowed to climb the walls of a ruled vial for 10 seconds and the distance was recorded in cm. Results for the MFWC indicated that penta-BDE significantly decreased the motor function of *drosophila* ($p < 0.001$). For the control group, the range of wall distance traveled was 0 to 9 cm with a mean distance of 4.7 cm, while the range for the treatment group was 0 to 5 cm with a mean of 0.2 cm. Currently three other concentrations are being tested with amounts of 0.050g, 0.100g and 0.150g.

The future studies will focus on testing three other PBDE weights and if PBDE has the potential to cause genetic mutations in *Drosophila* by performing the Wing Somatic Mutation and Recombination Test.

Effect of Queen Presence or Absence on Honey Bee Worker Mortality

Luke Dixon, University of North Carolina at Greensboro*

Ryan Kuster, University of Kansas

(Zoology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Aging is inherent to all organisms. One common finding in different species is a negative correlation between reproduction and lifespan. However, in social insects, the inverse is true: Individuals that specialize in reproduction far outlive their non-reproductive workers. This is particularly true for the honey bees (*Apis mellifera*), in which summer workers live 5-7 weeks but queens can live over several years. In this study, we expanded on these findings and focused on the effects of reproductive suppression on the longevity of honey bee workers. We hypothesized that there is a connection between reproductive social structure, behavior, and mortality. Three observational hives were set up: a control hive containing a queen and two treatment hives without queens, one including brood. Equal sized cohorts of newly-emerged workers were marked with distinctive numbered tags and introduced to the hives. Mortality and different social behaviors were compared between treatments to investigate the life history of reproductive workers, as an intermediate between non-reproductive workers and queens. Workers in a queenless hive with brood had higher hazard rates than bees in a queenright hive; workers in a queenless hive without brood had lower hazard rates than bees in a queenright hive. Analyses also indicated that the demonstration of brood caring and ovipositioning are associated with lower hazard rates of workers. We conclude that reproductive structure and behavior have an effect on mortality, and that brood rearing interacts with the effect of reproductive activity.

Does availability of on-site SAT differ for high schools with high & low levels of minority presence in different types of communities?

Desiree Dorsey* Bennett College for Women

Sara C. Wrenn, Ph.D. Bennett College for Women

(Behavioral Sciences, Poster, Carnegie Room, Fri: 6-7:30 pm)

Taylor & Wrenn (2009) examined data from 20 high schools in Guilford County, NC to find out whether schools with high proportions of minority and/or economically disadvantaged students were less likely to offer the SAT on-site. No significant relationship between minority enrollment and on-site SAT availability was found, but, their sample was small and limited to schools from a single district. The present research examines whether schools serving high proportions of minority students are less likely to offer the SAT on-site in different types of communities. Publicly available data were obtained for 140 North Carolina public high schools; 35 were randomly selected from cities, towns, suburbs, and rural communities. High/low minority presence was defined by comparison to minority enrollment within each school's district and by a median split of the sample. A significant relationship was found between minority presence defined by district and availability of the on-site SAT in rural communities; $\chi^2 = 7.63$ (1, $n = 35$), $p = .006$. If minority students in some types of communities are more likely to take the SAT away from their own school, this could contribute to inequity in standardized testing.

Characterization of three newly identified bacterial isolates acquired from the tubeworm *Nereis succinea*

Sharon W Faircloth*, Caitlin L. Hall, and Michelle S. Thomas.

Dept. Biological Sciences, Campbell University, Buies Creek, NC 27506.

(Microbiology, Poster, Carnegie Room, Fri: 6-7:30 pm)

The identification of new microorganisms equates to an essential amount of knowledge that may provide insight for use in bioremediation. The goal of this study was to characterize the growth of and to determine the phenotypic relatedness of three newly discovered bacteria isolated from the gut of *Nereis Succinea*. Each stained Gram negative, showed large pleomorphic bacillus morphologies, and tested catalase and oxidase positive. Temperature range for growth was determined to be between 10oC and 37oC. All three isolates demonstrated motility in SIM media and facultative anaerobic growth in thioglycollate which was confirmed in an anaerobic chamber. Other phenotypic characteristics were studied utilizing API 20E strips and each assay was confirmed by growth on each media type. All isolates were fermentation negative but positive for nitrate reduction. BGP-1, BGP-2, and BGP-4 demonstrated identical results on all media tested. The isolates grew on general nutrient media only when supplemented with Instant Ocean which tends forms a precipitate. This hinders determination of growth rates. To define optimal growth conditions without Instant Ocean, basic solute requirements for growth were determined in various media. The phenotypic similarity between all three isolates suggests each are the same species.

The Effect of Meditative Breathing on Pulse Transit Time: An Analysis in the Frequency Domain

*Joshua C. Farris, Stephen C. Scott

Lenoir-Rhyne University

(Physiology, Oral presentation, FFSC 110, Sat: 10:00)

Breathing and beating of the heart are driven by periodic output from the central nervous system and may be modeled by periodic functions. It has been demonstrated that respiratory rate and heart rate oscillate interdependently. In this study, pulse transit time (PTT) was examined using ECG and pulse pressure plethysmography in an effort to correlate oscillations in PTT to a given physiological parameter such as respiration or heart rate. PTT was calculated during normal breathing and deep, slow breathing. The null hypothesis of this study stated that there would be no difference between the oscillatory frequencies in the normal and deep breathing states. The alternative hypothesis posited that the autonomic nervous system output would more dramatically influence the oscillations in PTT during deep breathing than in normal breathing. The effect of deep breathing on PTT was studied in an effort to better understand the interconnections between volitional deep breathing and oscillations of neural output to the cardiovascular system. Fast Fourier Transforms and Correlation spectral analysis of the PTT data showed a difference between the study groups. A Two Factor Anova test was used to evaluate the differences between the study groups and to suggest a possible explanation of this phenomenon.

Inhibition of Microsomal Triglyceride Transfer Protein by RNA Interference in *Drosophila* S2 Cells

Nicholas Faulkner*

Jeremy Sellers PhD

UNCP

(Molecular Biology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Since the sequencing of the *Drosophila melanogaster* genome, several similarities between the lipid-transfer pathways of insects and humans have been defined, thus allowing flies to serve as a

model of human lipid transport. Our efforts are focused on apolipoprotein-II/I (apoLpII/I) containing lipoproteins, which are similar to the apolipoprotein-B-containing lipoproteins in humans. In addition to apoLpII/I, the microsomal triglyceride transfer protein (MTP) is also necessary for the synthesis of insect lipoproteins. While the role of MTP in apoLpII/I biogenesis remains to be fully elucidated, mammalian MTP is known to transfer lipids to the growing particle. In this work, we ultimately wish to explore the effects of MTP inhibition, by RNA interference, on lipoprotein biosynthesis and the phenotype this confers on whole flies. To this end, we developed long dsRNAs that were incubated with *Drosophila* S2 cells at varying concentrations and MTP mRNA expression was determined by RT-PCR. The most effective dsRNA tested provides >50% diminution of MTP mRNA signal, while having no detectable effects on related and off target genes. Therefore, the anti-MTP dsRNA we have developed demonstrates specificity and knock-down potential that will be useful in further elucidating the role of MTP in insect lipoprotein biogenesis.

Pyk2: a pH-sensitive protein in outer medullary collecting duct (mOMCD1) cells

Kim Fisher,* Dept of Internal Medicine, Section on Molecular Medicine and Translational Science, Wake Forest University School of Medicine

Thomas DuBose Jr MD, Dept of Internal Medicine, Sections on Nephrology and Molecular Medicine and Translational Science, Wake Forest University School of Medicine

(Molecular Biology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Proline-rich tyrosine kinase-2 (Pyk2) is a non-receptor tyrosine kinase endogenously expressed in mouse-derived outer medullary collecting duct (mOMCD1) cells. In proximal tubule-derived OKP cells, Pyk2 has been shown to function as a 'pH sensor' activated by acid pH and required for the consequent up-regulation of the apical Na⁺/H⁺ transporter NHE3 (Li, Preisig). Collecting duct epithelial cells express different H⁺ transporters, including a V-type H⁺-ATPase and an H⁺,K⁺-ATPase, which are also involved in the kidney's response to acidosis. The present study shows that Pyk2 is activated by decreased intracellular pH (pHi) in the collecting duct, where it may regulate apical H⁺ transport via a signaling pathway involving extracellular response kinases 1 and 2 (ERK1/2). Extracellular pH (pHo) manipulation by HCl addition to cell media and pHi manipulation using NH₄Cl are some of the methods used to study the phosphorylation states of Pyk2 and ERK1/2.

Effects of Methane Producers and Consumers on the Diet of Chironomid Larvae in an Arctic Lake

Tracy Gentzel,* Anne Hershey, Parke Rublee

University of North Carolina Greensboro

(Ecology, Oral presentation, Bryan Jr. Auditorium, Sat: 15:45)

Up to 40% of methane produced in aquatic systems is oxidized before it is released into the atmosphere. Microbial oxidation of methane is an important sink and potentially an important pathway for the incorporation of detrital carbon into aquatic food webs. In this study, we tested the hypothesis that methane-derived carbon (MDC) was an important carbon source for *Chironomus* larvae in a small arctic lake, but that utilization of MDC by larvae differed with depth. We found that an order of magnitude more methane was produced at 5 m depth than at 2.5 m. PCR analysis of sediments, larval tubes, and gut contents, found methanogens in all samples, while the distribution of methanotrophs was restricted to surface sediments, larval tubes and gut contents. These results are consistent with our hypothesis that MDC is an important basal food resource in this small lake. Furthermore, the combination of biogeochemical and microbial approaches provides insight into functional differences among habitats for a ubiquitous benthic consumer.

Characterization of a Novel Transgenic Mouse Model that Over-expresses the Parkinson's Related LRRK2 & the Microtubule Related Tau

Donna W Gilchrist*, Univeristy of North Carolina at Pembroke; Loukia Parisidou and Haibin Cai, National Institutes of Health, National Institute on Aging, Laboratory of Neurogenetics
(Cell and Developmental Biology, Poster, Carnegie Room, Fri: 6-7:30 pm)

The common occurrence in several neurodegenerative diseases (NDDs) is the aggregation of abnormal proteins in the brain. The microtubule associated protein, Tau, is found in abundance in the central nervous system and is implicated in the pathogenesis of several NDDs including Parkinson's disease (PD).

There is accumulating evidence which links the tau gene to the most common known genetic cause of PD, the Leucine-Rich Repeat Kinase 2 (LRRK2) G2019S mutation which gives rise to tau-immunopositive neurofibrillary tangles.

Because the G2019S mutation lies within the kinase domain of LRRK2, tau is considered a hypothetical molecular target of LRRK2 kinase activity.

It is the intent of this research project to test the potential pathophysiological interplay between LRRK2G2019S and tau by crossing conditional mice, which express the human LRRK2G2019S mutation, with transgenic (Tg) mice, which over express the short human tau isoform.

Further analysis of these mice and the results will provide new insights into the pathogenic interaction between LRRK2 and Tau and how this interaction contributes to Parkinson's Disease pathophysiology.

Does Seaweed (Laminaria and Porphyra) Have Antibacterial Properties?

Jarred Gordon* and Michael Torres
Warren Wilson College

(Health Sciences, Oral presentation, FFSC 110, Sat: 10:45)

Seaweed has been attributed to have medicinal properties since ancient times. More specifically, *Laminara* (a brown macroscopic algae) and *Porphyra* (a red macroscopic algae) have recently been tested for their anti-bacterial properties. My objective was to determine the anti-bacterial properties of these two algae against four different types of bacteria. A methanol extract of each seaweed from the coast of Maine was tested in vitro against bacteria *Enterococcus faecalis*, *Escherichia coli*, *Klebsiella pneumoniae*, and *Staphylococcus aureus* with the disc diffusion method. A disc of pure methanol was used as the internal control and a disc of Streptomycin was used as the external control. These four treatments were replicated ten times. The size of the halo around the disc indicated the efficiency of the antibacterial effects of each extract after an eighteen-hour period. The Laminara treatments were effective against *E. coli*, *K. pneumoniae*, *E. faecalis* at the 95% confidence level. The *Porphyra* treatments were effective against *K. pneumoniae* and *E. faecalis* at the 95% confidence level. Neither treatment was effective against *S. aureus* at the 95% confidence level. These results suggest that *Laminara* and *Porphyra* have antibacterial activity against selected (or specific) bacterial species.

Analysis of lead absorption in *A. thaliana* by atomic absorption spectroscopy

Meredith Greene,* Campbell University; Dr. W. Lin Coker, Campbell University
(Chemistry, Poster, Carnegie Room, Fri: 6-7:30 pm)

Phytoremediation is a technique that can be used to remove harmful chemicals from soil that has been contaminated with such materials as hazardous waste. The goal of this project was to

determine if the plants would absorb lead and if that lead could be detected by atomic absorption spectroscopy. *A. thaliana* was grown on agar plates containing lead. The plants were digested with nitric acid, and their lead content was analyzed using atomic absorption spectroscopy. Lead was used in these experiments because it is easily accessible, it is classified as a carcinogen, and it gives a good standard curve from the AA across a reasonable concentration range. With these analytical methods, the lead that was absorbed by the plants was detected. Plants that were grown at the highest concentration, 10ppm, absorbed a significant amount of lead. Since the lead was detected in *A. thaliana*, further experiments can be done using plants that are native to central North Carolina so that the process of phytoremediation will not require the introduction of new species to the area.

Cellular Characterization of the Last of the *Dictyostelium* Myosin II Heavy Chain Kinases – MHCK-D

Jonathan Greene* and Paul Steimle

University of North Carolina at Greensboro

(Cell and Developmental Biology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Contractile processes such as cytokinesis and cell migration rely on the proper assembly and localization of myosin II bipolar filaments. In *Dictyostelium discoideum*, as well as in mammalian cells, myosin II filament disassembly can be driven by phosphorylation of the myosin II heavy chain (MHC) “tail”, preventing myosin-mediated contraction. In *Dictyostelium*, MHC phosphorylation is catalyzed by at least three kinases (MHCK-A, -B, and -C) that share homologous γ -kinase catalytic and WD-repeat domains. Another *Dictyostelium* protein, tentatively named MHCK-D, is predicted to have the same domain organization but its function in the cell is unclear.

Thus, we have generated *Dictyostelium* cell lines over-expressing an amino-terminal truncation of MHCK-D that possesses both the kinase catalytic and WD-repeat domains (MHCK-D⁺⁺ cells). We found that MHCK-D⁺⁺ cells grew slowly in suspension culture and became large and multinucleated over time, with an average of 2.9 nuclei/cell after 5 days, compared with 1.2 nuclei/cell for wildtype cell. Analysis of cells expressing MHCK-D with a GFP tag, revealed a diffuse distribution of the kinase in the cell. In summary, the myosin II-null phenotype associated with MHCK-D over-expression suggests that this kinase phosphorylates MHC and drives myosin II filament disassembly in the cell.

Survival of Community-Associated Methicillin-resistant *Staphylococcus aureus* in Three Different Swimming Pool Environments (Chlorinated, Saltwater, and Biguanide non-chlorinated)

Morgan Gregg* Elon University

Dr. Robin L. LaCroix Greenville Hospital System Children's Hospital

Mentor: Dr. Yuko Miyamoto Elon University

(Microbiology, Poster, Carnegie Room, Fri: 6-7:30 pm)

This study examined the viability of methicillin-resistant *Staphylococcus aureus* (MRSA) in 3 types of swimming pool environments. Community outbreaks of MRSA have become prevalent and almost rampant since 2006. MRSA has been found to be an increasingly alarming health concern after it began to spread from hospitals and healthcare facilities into other areas of the community. The well-described outbreaks in sports teams and other group youth activities raise the question of transmission of MRSA from a swimming pool environment. This experiment was performed from May to August of 2009 and was designed to determine whether swimming pools could serve as potential sources for large community outbreaks in both recreational and competitive swimming. Twenty-five samples of purulent material (pus) were collected, and all

were plated on both a BBL™ Trypticase Soy Agar blood and also a BBL™ CHROMagar MRSA™ plate to determine presence of MRSA. This study demonstrates that after one hour, all MRSA inoculants were found to be nonviable in chlorinated, saltwater, and biguanide treated water. This study indicates that swimming pool water that is properly maintained in both public and private swim centers is not likely to be a vehicle to spread MRSA from swimmer to swimmer.

Thermal ecology and physiology of the Puerto Rican crested Anolis lizard

Alex R. Gunderson

Duke University

(Zoology, Oral presentation, FFSC 220, Sat: 9:30)

Environmental temperatures can influence community dynamics in numerous ways at multiple spatial and temporal scales. The ecological consequences of temperature result from the temperature-dependence of physiological processes, which dictate the thermal tolerance and thermal sensitivity of an organism. In addition, the direct link between temperature and the efficacy of physiological processes implicates the thermal environment as a potentially important selective agent. Thus, quantifying the thermal characteristics of habitats and their biological implications have been and continue to be a major focus of research, particularly in light of recent and projected global change. I sampled body temperatures of approximately 1500 *Anolis cristatellus* at nine locations across Puerto Rico, including populations inhabiting wet mesic forests and dry xeric scrublands. I also used a null model approach to characterize the thermal profile of each location and to examine variation in patterns of behavioral thermoregulation among localities. I found that *A. cristatellus* at xeric localities are significantly warmer than those at mesic localities, by an average of 3.5 C. In addition, I found that mesic lizards do not behaviorally thermoregulate, but that xeric lizards do by avoiding the warmest perch sites available to them. Preliminary tests of temperature-dependent endurance performance and water loss rates suggest mesic and xeric lizards are adapted to their local climatic conditions. These results are discussed within the broader context of the Anolis radiation.

Growing Marine Plants on the Ocean Surface to Weaken Hurricanes, Absorb Carbon Dioxide and Produce Biofuel

Nailong Guo*, Joseph Fail

Dept of Natural Sciences and Mathematics, Johnson C. Smith University

(Ecology, Oral presentation, Bryan Jr. Auditorium, Sat: 10:30)

A biological approach about how to weaken hurricane is proposed. Growing marine plants in the area where hurricanes are originated and/or on the pathways of hurricanes. The plants will not only reduce the temperature of the ocean surface to cut off some energy source for hurricanes, and change the ocean boundary layer beneath hurricane, but also absorb carbon dioxide which is the essential reason causing global warming and related hurricane disasters. It is even possible that we can harvest these marine plants to produce biofuel. Also, a research plan and some preliminary results are presented.

Characterization of Three Newly Identified Bacterial Isolates Acquired from the Tubeworm *Nereis succinea*

Caitlin Louise Hall*, Sharon Whitney Faircloth, and Dr. Michelle Suhan Thomas

Campbell University

(Microbiology, Oral presentation, FFSC 320, Sat: 10:15)

The identification of new microorganisms equates to an essential amount of knowledge that may provide insight for use in bioremediation. The goal of this study was to characterize the growth of and to determine the phenotypic relatedness of three newly discovered bacteria isolated from the gut of *Nereis succinea*. Each stained Gram negative, showed large pleomorphic bacillus morphologies, and tested catalase and oxidase positive. Temperature range for growth was determined to be between 10oC and 37oC. All three isolates demonstrated motility in SIM media and facultative anaerobic growth in thioglycollate which was confirmed in an anaerobic chamber. Other phenotypic characteristics were studied utilizing API 20E strips and each assay was confirmed by growth on each media type. All isolates were fermentation negative but positive for nitrate reduction. BGP-1, BGP-2, and BGP-4 demonstrated identical results on all media tested. The isolates grew on general nutrient media only when supplemented with Instant Ocean which tends forms a precipitate. This hinders determination of growth rates. To define optimal growth conditions without Instant Ocean, basic solute requirements for growth were determined in various media. The phenotypic similarity between all three isolates suggests each are the same species.

Is availability of on-site SAT related to presence of economically disadvantaged students in high schools serving different community types?

Erica N. Harris* Bennett College for Women

Sara C. Wrenn, Ph.D Bennett College for Women

(Behavioral Sciences, Poster, Carnegie Room, Fri: 6-7:30 pm)

The encoding specificity principle suggests that students are more likely to perform well when tested in the same environment in which the information was learned (Tulving 1982, 1983). If schools serving high proportions of economically disadvantaged students are less likely to offer the SAT on-site, this could place these students at an additional disadvantage. This study was conducted on 140 North Carolina high schools, 35 randomly selected from each of four community types: city, town, suburb, and rural. Schools were categorized as offering the on-site SAT or not, and as serving high or low proportions of economically disadvantaged students. When each school's economic disadvantage was assessed in comparison to other schools from the same district, no significant relationship was found. When level of economic disadvantage was assessed using a median split, a significant relationship between presence of economically disadvantaged students and availability of the on-site SAT was found for schools located in cities: ($\chi^2(1, n = 35) = 5.10, p = .024$). These findings may lead to further research to find out why this relationship appeared only when economic disadvantage was assessed by comparison to other schools statewide.

Gene Expression During Tissue Regeneration of the Earthworm *Lumbricus terrestris*

Amelia Helms

Elon University

(Molecular Biology, Oral presentation, FFSC 110, Sat: 8:45)

Terrestrial annelids (earthworms) are prime organisms for tissue regeneration studies due to their extensive capacity to regenerate. In order to understand genetic mechanisms involved in tissue

regeneration, gene expression patterns were studied in wounded *Lumbricus terrestris* (nightcrawlers) throughout the regenerative process. Reverse-transcriptase polymerase chain reaction (RT-PCR) was employed to characterize relative levels of gene expression along nine timepoints during the regenerative process (from one minute to two weeks after wounding). RT-PCR indicated that two actin genes are differentially expressed during the regeneration timecourse. The semi-quantitative results of these RT-PCR reactions suggest that the role of actin as a “housekeeping gene” is not true during tissue regeneration. It appears that rather than being expressed at the same level throughout the process, actin genes are upregulated 24 hours and two week after cutting. This pattern of actin gene expression is an indicator of the complicated mechanisms behind tissue regeneration, and reinforces the need to better understand this intricate process. It also suggests that actin is not an appropriate control for tissue regeneration experiments.

A Comparison of Two Sample Methods in the Detection of *Borrelia burgdorferi* in *Peromyscus leucopus*

Nicole Hoekstra

Queens University of Charlotte

(Microbiology, Poster, Carnegie Room, Fri: 6-7:30 pm)

The purpose of this study was two-fold: 1) To test for the presence of *Borrelia burgdorferi*, the species of bacteria that causes Lyme disease, in a population of white-footed mouse (*Peromyscus leucopus*), a common vector in the transmission pathway and 2) to compare the results of two methods of sample collection, a common invasive technique (ear clipping) and a non-invasive technique (fecal sampling). A wild population of mice was randomly sampled and an ear clipping and fecal pellet sample were taken from each mouse caught. Gram stains were performed between 24-48 hours of sample culturing. Wright-Giemsa stains were performed approximately six days after culture preparation. Visualization of the samples under a light microscope was weak with both stains. Though bacteria were present, none appeared to be *Borrelia burgdorferi*. The limitations of light microscopy may provide false-negative results using this method. The next step in this study will use PCR to more definitively determine the presence or absence of the bacteria in the tissue and fecal samples. Results from these analyses will demonstrate whether the non-invasive fecal method is as effective as the invasive technique.

The Band Gap of Liquid Water Based on the Dispersion of the Verdet Constant

Samantha Hutcheson*, Stuart Hanmer

Mentors: William D. Brandon, Tom Dooling

UNC Pembroke

(Physics, Oral presentation, FFSC 220, Sat: 10:00)

This report consists of a comprehensive review of all known measurements allowing a comparison of the band gap parameters of water semiempirically determined from the dispersion of the refractive index-normalized Verdet constant. Previous measurements and calculations are reviewed, including an analysis of data readily available and overlooked by previous researchers. In addition, a magneto-optical apparatus was constructed and an independent set of measurements of the Verdet constant in liquid water was obtained. Justification for this endeavor hinges on the methodology for achieving a high degree of precision in calibrating such an apparatus and the insight afforded to interpret and weigh accordingly the results of the preceding measurements.

Do Neutrophils Establish a Pre-Metastatic Niche?

Dare Imes*^{1,3}, Jered Meyers^{1,3}, Molishree Joshi^{2,3}, Keith Pittman³, Kathryn Verbanac³

¹Department of Biology, East Carolina University, ²Interdisciplinary Program in Biological Sciences, ³Department of Surgery, Brody School of Medicine, East Carolina University

(Health Sciences, Oral presentation, FFSC 110, Sat: 10:15)

“Pre-metastatic niche” refers to the specific microenvironment of a secondary location to which primary tumor cells migrate and metastasize. Kaplan has proposed that bone marrow-derived hematopoietic progenitor cells (HPCs) migrate to specific tissue, promoting a microenvironment that supports the attachment and growth of metastases. We hypothesize that neutrophils are one of the key bone marrow-derived cell types that establish this niche. The first responders of the inflammatory response, mobilized neutrophils share some markers with HPC, migrate along chemokine gradients and release enzymes that remodel the extracellular matrix. We tested our hypothesis in the murine Lewis Lung adenocarcinoma (LLCa) model. C57B1/6 mice were injected s.c. with 10⁵ LLCa cells and sacrificed 12-23d later. Most mice (4/18) were “pre-metastatic” with no detectable lung metastases upon H&E staining of tissue sections (d12-23); 4 of 18 mice had macroscopic lung lesions (d21-23). All had elevated circulating neutrophils at sacrifice (mean 22% segmented and 3% bands). All lungs had elevated infiltrating neutrophils identified by myeloperoxidase staining (30±23 per 200X field in pre-metastatic tissue; 55±26 in macrometastatic tissue). Identification of a significant number of tissue neutrophils prior to detectable metastases is consistent with the premise that they alter the microenvironment to promote tumor cell colonization.

Mass Production of the Beneficial Nematode, *Heterorhabditis bacteriophora*, in Submerged Culture

Floyd L. Inman III, A.A.S.*, Leonard Holmes, Ph.D.

Sartorius-Stedim Biotechnology Laboratory

University of North Carolina at Pembroke

(Microbiology, Poster, Carnegie Room, Fri: 6-7:30 pm)

The goal of this work is to mass produce, in liquid media, a submerged culture of the beneficial nematode, *Heterorhabditis bacteriophora*. Initial shake flask cultures were scaled up to 10 L in a Sartorius-stedim Biostat B® Plus fermentation system. The culture conditions that were controlled by the system include pH, pO₂, agitation, and temperature. Microscopic observations and nematode density counts were collected over a four week period to evaluate the growth and development of the nematodes in liquid culture. To evaluate nematode development, the nematode life cycles were used as markers. The system was inoculated with approximately 1,000 infective stage 3 juveniles (IJs) per mL of media and nematode development was observed within three days after inoculation.

Screening *Photorhabdus luminescens* for Bacteriocidal Properties Using a Modified Version of the Kirby-Bauer Method

Floyd L. Inman III, A.A.S.*; Leonard Holmes, Ph.D.

The Sartorius-Stedim Biotechnology Laboratory

The University of North Carolina at Pembroke

(Microbiology, Poster, Carnegie Room, Fri: 6-7:30 pm)

The aim of this work was to observe and determine the bacteriocidal properties of the bacterial symbiont, *Photorhabdus luminescens*. A modified version of the Kirby-Bauer method was used to screen this bacterium for bacteriocidal properties against a collection of 28 different bacteria. The collection of bacteria used contained bacterial species with different cellular morphologies

and Gram stain reactions. The measurements of the zones of sensitivity were used to observe and determine these bacteriocidal properties. The Kirby-Bauer method was used and slightly modified to achieve the aim of this work. The modification consisted of using blank, sterile disks that had been infused with a liquid culture of mid-log phased *P. luminescens*. From these 28 different species of bacteria, 11 bacterial species was determined to be sensitive to *P. luminescens*.

Pharmaceutical Contaminants: The effects of kanamycin on growth, feeding, and reproduction in a common freshwater invertebrate

Lindsey Jackson - Catawba College

Sue Calcagni - Catawba College

(Environmental Science, Oral presentation, Bryan Jr. Auditorium, Sat: 9:00)

Antibiotics rule in the fight against bacterial infections in Western medicine, but few physicians and patients stop to consider what happens to these drugs after excretion or disposal. Numerous studies have shown that pharmaceuticals are detectable in surface waters around the world, but the effects of these compounds on aquatic organisms are largely unknown. In the present study, common freshwater crustaceans (*Daphnia pulex*), were exposed to water-borne kanamycin at concentrations of 1.0, 10, and 100 ug/L for a duration of 14 days. Data were collected every 48 hours and included measures of growth, feeding, and reproduction. Relative to the control treatment, kanamycin significantly reduced molting in the 10 and 100 ug/L treatments. Kanamycin also significantly reducing feeding and the number of offspring in all treatments. Because daphnids are part of many freshwater food webs, we conclude that kanamycin, and perhaps other antibiotics, have the potential to negatively impact aquatic life and ecosystems. Further studies are certainly warranted.

Inactivation of the FMN riboswitch in *Pseudomonas aeruginosa*

Tonya Johnson*¹ J.W. Brown², and M.J. Lee-Brown¹

¹Guilford College and ²NC State University

(Molecular Biology, Oral presentation, FFSC 110, Sat: 9:30)

Riboswitches are gene expression control elements that consist of complex folded domains within mRNAs. Fourteen classes of riboswitches have been identified in microbial genomes. Riboswitches bind specific metabolites, resulting in changes in the structure of the mRNA that modulate transcription or translation, resulting in changes in the level of gene expression. The flavin mononucleotide (FMN) riboswitch regulates transcription of the rib operon by binding FMN and forming a transcriptional terminator reducing the expression of downstream genes. FMN is derived from riboflavin (vitamin B2) and is used as an electron carrier in the electron transport chain during respiration in respiring microbes. The *Pseudomonas aeruginosa* genome contains an FMN riboswitch in the rib operon. *P. aeruginosa* is an opportunistic human pathogen that is the primary etiological agent of nosocomial infections. *P. aeruginosa* also infects *Caenorhabditis elegans*; in this study, this interaction will be used as a model infectious system. The hypothesis is the inactivation of the FMN riboswitch will decrease the virulence of *P. aeruginosa*. We will determine if *P. aeruginosa* can bypass the FMN pathway utilizing riboflavin captured from its host. This analysis will help to determine whether the FMN riboswitch could be used as a potential target for novel antimicrobials.

Utilization of woody debris by *Peromyscus leucopus*

Calley Jones* - Meredith College

Dr. Erin Lindquist - Meredith College

(Ecology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Due to the threat of predation, small nocturnal mammals such as *Peromyscus leucopus* Rafinesque (White-footed Mouse) tend to avoid open spaces. Based on this documented behavior, it was hypothesized that mice would be live-captured at a higher frequency in forested trapping sites with higher volumes of woody debris. Live-capture Sherman traps (121) were placed 10 m apart in a permanent 1-hectare plot in an urban, fragmented forest on the Meredith College campus. Small mammals were captured, marked with permanent hair dye, and measured (ear, head-body, tail, and hind foot) over two consecutive years. Volume of woody debris was measured at each trapping site. I found that there was no correlation between volume of woody debris and number of *P. leucopus* captured. This supports previous findings that *P. leucopus* are nonspecific users of microhabitat and increases knowledge of species behavior.

Measuring lipid content in algae for the purpose of biodiesel

Calley Jones* - Meredith College

Dr. Walda Powell - Meredith College

(Chemistry, Oral presentation, FFSC 109, Sat: 10:15)

Fossil fuels are becoming an ever more limited resource (as evidenced by gas prices) and research into other options such as wind, solar, or biodiesel power has become crucial. Algae may be a viable alternative to using soybean products in the production of biodiesel. Meredith College is working in conjunction with Alganomics® to determine which species of native North Carolina algae will be most efficient to grow in bulk for processing into biodiesel. The purpose of this study was to perfect a protocol to extract and measure total lipid content of multiple species of algae based on conventional methods (Soxhlet extraction, Bligh/Dyer method, etc.). The preliminary results indicate that a Soxhlet extraction using isopropanol and hexane solvents extract the highest percentage of lipids. The next step of this ongoing project is to use spectroscopic methods to determine which algae species has the highest lipid content.

Quantitative Trait Loci For Resistance to Sudden Death Syndrome (SDS) and Soybean Cyst Nematode (SCN) in Soybean [*Glycine max* (L.) Merr.]

Abdelmajid Kassem

Plant Genomics & Biotechnology Lab, Department of Natural Sciences, Fayetteville State University, Fayetteville, NC

(Botany, Oral presentation, FFSC 220, Sat: 15:30)

Soybeans [*Glycine max* (L.) Merr.] are susceptible to many diseases including fungal diseases such as soybean sudden death syndrome (SDS) and nematode diseases such as Soybean Cyst Nematode (SCN) which are complex and polygenic. Several studies reported QTL for SDS and SCN resistance on the soybean genome using different populations and low density genetic linkage maps. The objectives of this study were (1) to construct a high density SNP-based genetic linkage map of soybean using the 'PI438489B' by 'Hamilton' (PIxH, $n=50$) recombinant inbred line population, and (2) to map QTL for SDS and SCN resistance using this high-density reliable genetic SNP-based map. The PI438489B by Hamilton SNP-based map was a high density map composed of 31 LGs, 648 SNPs, and covered 1,524.7 cM with an average of 2.35 cM between two adjacent SNP markers. Nine QTL were identified for SDS resistance using both interval mapping (IM) and composite interval mapping (CIM). Seven QTL were identified for foliar

disease severity (FDS) and two QTL for root rot severity (RRS) symptoms and mapped on 7 chromosomes of the soybean genome. These QTL had peak LOD scores that ranged between 2.6 and 8.9. For SCN resistance, eight QTL were identified for resistance to races 3 and 5 on 7 different soybean chromosomes. Four QTL for resistance to SCN race 3 were identified and mapped on chromosomes 7, 13, 15, and 16. Similarly, four QTL for resistance to SCN race 5 were identified and mapped on chromosomes 5, 8, and 11. Chromosome 8 contains a cluster of SCN and sudden death syndrome (SDS) resistance QTL. A total of five QTL were identified on this chromosome: two for SCN resistance and three for SDS resistance. The QTL identified here maybe introduced in breeding programs to develop cultivars with dual resistance to SDS and SCN.

Identifying Target Binding Sites for Teflon, a Protein Required for Autosomal Homolog Conjunction in *Drosophila melanogaster* male meiosis.

Mary Keith*, Katie Hansen, John Tomkiel

(Cell and Developmental Biology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Teflon (Tef) is required for paired autosomes to maintain connections until Anaphase I in male fruit flies, and has been hypothesized to be involved in establishing a pairing complex between homologues. The protein contains three canonical zinc finger motifs, which are typically involved in sequence-specific DNA binding, suggesting that Tef directly binds to DNA. Towards identifying Tef binding sequences, we have overexpressed Tef fused to the jellyfish Green Fluorescent Protein (GFP) in salivary glands, and have used anti-GFP antibodies to localize Tef-GFP to discreet salivary chromosome bands using indirect immunofluorescence on chromosome spreads. Tef binds to approximately 100 bands with various intensities, and we mapped 23 of the strongest to individual chromosome bands. We are developing a yeast one-hybrid approach to identify the exact target sequences within one band. We have created a library of potential binding sites from a genomic DNA corresponding to the third chromosome band 66E1-2. These have been cloned into the promoter region of a lacZ reporter gene. Tef will be expressed as a fusion protein joined to a transcriptional activation domain (AD) in yeast bearing this reporter construct. Production of blue color on media containing the chromogenic lacZ substrate Xgal will indicate binding of the Tef-AD. Putative binding sequences will be identified by sequencing reporter constructs, and database searches will be used to look for similar sequences within other genomic regions to which Tef binds.

Synthesis of Biodiesel Using Morpholine

Nathaniel Kingsbury* Donna Gilchrist (Dr. Cornelia. Tirla)

University of North Carolina at Pembroke

(Chemistry, Poster, Carnegie Room, Fri: 6-7:30 pm)

Biodiesel is currently produced using vegetable Oils; Methanol and Potassium Hydroxide this reaction can be very expensive because it produces a lot of waste products. The Potassium Hydroxide is eliminated with the waste and thus more must be used for further reactions, which add to the cost. This situation brings to light the cost-effective problems with biodiesel. In an effort to solve this dilemma Heterocyclic molecules were used in this project to replace the Potassium Hydroxide. These compounds have the potential to be recovered at the completion of the reaction. The Heterocycle used in this project is Morpholine is basic and can be recovered.

Heavy Metals in Tree Cores from the Blue Ridge Plating Superfund Site

Rachel Kivela

Warren Wilson College

(Chemistry, Oral presentation, FFSC 109, Sat: 10:00)

The Blue Ridge Plating Company site was put on the National Priority list in 2005. Heavy metal pollution at the site contaminated the soil, dry sediment, surface water and groundwater. EPA cleaned up the soil and water in the early 2000's. This project looks at the occurrence of metals in trees rings from trees on the property adjacent to the BRP property. Arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, tin and zinc were analyzed for in a total of 24 trees, 10 species and dating back to 1936. Tree core samples were divided into 2-8 year segments and analyzed using inductively coupled plasma atomic emission spectrometry. Metal concentration fluctuations over time coincide with the dumping times. Tree distance from the pond and connecting stream was also a variable considered in this research. The data suggests the there is mobilization of these metals in the soil from the pond.

Natural Products as Anthelmintics

Amy Kunkel

Warren Wilson College

(Zoology, Oral presentation, FFSC 220, Sat: 9:00)

Parasitic infections prompted the use of synthetic anthelmintics, but in less than a decade parasitic resistance developed. This stimulated research for alternative anthelmintics, including the use of natural products. In this study, three natural substances were studied for their anthelmintic effects on the nematode *Caenorhabditis elegans*; clove oil (*Eugenia aromaticum*), tree tea oil (*Melaleuca alternifolia*) and papain oil (*Carica papaya*). Dose response curves were calculated for the three substances for the development of a treatment plan with swine. Only one dose-response curve was formed, for clove oil, the LD50= 0.175 % and the LD100= 2.0%. Thirty-two piglets were tagged, weighed and treated with one of three treatments; 10% clove oil (10 mL), 5 % clove oil (5 mL) or Ivomec" (positive control). The treatments were divided by a block design to rule out biological influences. Three-week weight gains and fecal floats were performed which showed no significant difference among the treatment groups. Therefore, clove oil appears to inhibit internal parasitic nematodes with the same effectiveness as the synthetic anthelmintic Ivomec.

Identifying Dachshund's role in Hedgehog Signaling and Urchin Development.

Sara Lachance*, Jacob Warner, Dr. David McClay

Duke University

(Cell and Developmental Biology, Oral presentation, FFSC 109, Sat: 9:00)

The PAX gene family contains nine genes that make up four different subgroups. These genes all play a critical role in organ and tissue formation during development. The PAX 6 genes, a subgroup of the PAX genes, co regulates along with the gene dachshund, in organ and tissue formation. In vertebrate embryos the Dachshund gene termed Dach-1, has been reported to be part of the PAX genes and play a central role in ocular development (Poplov et al. 2009). Dach-1 is a key component in the RDGN (retinal determination gene network) and participates in initiation of the morphogenetic furrow (Curtiss and Mlodzik). It is believed that Dachshund is evolutionarily conserved between species; however the role that Dachshund plays in invertebrate development is unknown. The goal of this research is to determine Dachshund's role in invertebrate development using the urchin species *L. variegatus*. At the start of this research, the gene sequence of Dachshund was unknown in *L. variegatus*. In this study degenerate primers

were found from taxonomy reports of *Danio*, *Pediculus*, *Strongylocentrotus* and *Saccoglossus* and were used in order to clone the sequence from genomic DNA isolated from *L. variegatus*. This sequence will then be used to develop an in situ probe in order to determine where Dachshund is commonly expressed in *L. variegatus* development. We will also develop an Lv morpholino in order to knock-down gene expression in *L. variegatus* embryos over the developmental period.

1.Vladimir M. Popov, Kongming Wu, Jie Zhou, Michael J. Powell, Graeme Mardon, Chenguang Wang and Richard G. Pestell. The Dachshund gene in development and hormone-responsive tumorigenesis. (2009) Trends in Endocrinology and Metabolism

2J Curtiss, and M Mlodzik. Morphogenetic furrow initiation and progression during eye development in *Drosophila*: the roles of decapentaplegic, hedgehog and eyes absent. Development 127:1325-1336.

Do College Students' Majors Impact Their Perceived Levels of Stress?

Tracey Lee

Bennett College for Women

(Behavioral Sciences, Poster, Carnegie Room, Fri: 6-7:30 pm)

While college students have traditionally held the belief that some majors are more stressful than others, there has been limited research to document this assumption. The goal of this study was to determine if a relationship exists between students' declared majors and their perceived levels of stress. Specifically this study investigated the perceived stress levels for college students majoring in the areas of biology, music, psychology and social work. Forty volunteers from Bennett College for Women, ten participants from each academic major, participated in the study. The results indicated that there was no significant difference in participants perceived stress levels between the four majors. Participants from all four majors indicated that they experienced about the same level of stress. However, the results did indicate a slight trend toward a stronger level of stress among music majors.

Human Hunger for Information from Personal Electronic Communication Devices, Extending the Models of Rewarding Stimuli

Thiri Lin

Queens University of Charlotte

(Behavioral Sciences, Poster, Carnegie Room, Fri: 6-7:30 pm)

It seems that our need for information has become almost an addiction. Our pleasure center of the brain, the dopamine system is activated by finding something unexpected or something new. My question is why are our electronic communication devices such as email, facebook, texts and google so rewarding? Is electronic information just another rewarding stimulus that triggers our dopamine neurons? My hypothesis is that the unexpected new facts and information that we get from our electronic communication devices triggers excitement and seeking behaviors in the Disciplines. Ten undergraduate students, five males and five females, ages ranging from 19-22, were asked to fill out a survey regarding their usage of electronic-communication devices and their reaction towards them. The survey questions included the frequency of electronic communication devices usages and occurrence of the rewarding behaviors. 80% of the Disciplines used either text, email, facebook and google more than 10 times a day. 80% of the Disciplines showed excitement and curiosity to the cues of new informations from electronic communication devices. Additional rewarding behaviors were also expressed in 50% or more of the Disciplines. Futhermore, 90% of the Disciplines failed to go through a day without using any

electronic communication devices. Psychologist Kent Berridge stated that our brains are designed to more easily be stimulated than satisfied. The dopamine system can lead us to irrational wants and excessive wants that we may be better off without (Berridge et. al. 2006). This explains why we find ourselves letting one google search lead to another. I conclude that these electronic communication devices, email, facebook, text and google are feeding our reward system and stimulating the seeking/wanting system of the brain. Thus, due to the nature of our dopamine system, we find these unexpected rewards, the new facts from our electronic communication devices, particularly exciting.

Establishing an Ecological Research/Education Network (EREN) at Primarily Undergraduate Institutions

Erin Lindquist, Meredith College; Laurel Anderson, Ohio Wesleyan University; Tracy Gartner, Carthage College; Karen Kuers, Sewanee: The University of the South; Jose-Luis Machado, Swarthmore College; Bob Pohlada, Ferrum College; Jeffrey Simmons, Mount St. Mary's University; and Carolyn Thomas, Ferrum College

(Science Education, Oral presentation, FFSC 320, Sat: 15:45)

Complex ecological questions are difficult to address through short-term studies at single sites, yet such experiments are often conducted by ecologists at primarily undergraduate institutions (PUIs) because of typical practical and financial constraints. By coordinating data collection at a network of sites and using the expertise of faculty across institutions, these site-level studies can be used to identify and analyze important regional and national ecological patterns. By engaging undergraduate students in authentic, large-scale, collaborative projects we can enhance their scientific education and preparedness for graduate school or other professional pursuits. In the past year, we have been working with a group of scientists from over 20 institutions and 15 states to establish the Ecological Research/Education Network (EREN). We have selected three pilot research projects: (1) decomposition rates of invasive plants across aquatic and terrestrial habitats; (2) carbon sequestration patterns across sites and environmental conditions; and (3) the effects of urbanization on ecological processes (Urban Plots by Undergraduate Students – UP by US). In addition to involving undergraduate students in these research projects, the network will develop standard laboratory exercises and protocols, a continental ecology course module taught by faculty across the country, and a shared online database available to registered members. We expect that the students involved in the network will gain an enhanced sense of geographic connectivity, an understanding of the diversity of ecological drivers at multiple scales, and an appreciation of research collaboration.

Micropropagation of Indigenous Plants

Brittany Locklear,* Leonard Holmes ,Ph.D

The Sartorius Stedim Biotechnology Laboratory

University of North Carolina at Pembroke

(Biotechnology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Micropropagation is a technique that utilizes cuttings from a parent plant for rapid multiplication of clones. These parental cuttings are very sensitive to many environmental factors and require a hard cleaning phase to sterilize and clean before implantation into solid media. The following growth hormones were added to increase the rate of production: Ga₃, BA, and IBA. The cuttings go through four growth stages before they are able to be transplanted into soil. The stages are listed as the following: Stage 1- Establishment; Stage 2-Multiplication; Stage 3- Rooting; Stage 4-Hardening off. To achieve rapid growth, additional growth hormones and antimicrobial fighting agents are used. The following plants were micropropagated: african violet, mini roses, asiatic lilies, boston fern and holly bush.

The Use of the Fluorescent Organisms *Pseudomonas fluorescens* and *Pseudomonas aeruginosa* to Study the Physical Microbiology of Shear Forces Under Simulated Microgravity and Hypergravity

John Locklear*, UNC Pembroke; Dr. Len Holmes, UNC Pembroke

(Microbiology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Fluid dynamics has direct effects on basic environmental parameters of suspension cultures of microorganisms, both within the cell and in the bulk fluid. Fluid dynamics effects can be modified by changing the level of gravity acting on the fluid. We Disciplined liquid cultures of fluorescent organisms to changes in gravity and monitored the cellular reaction via cell growth and fluorescent output. Previously our approach used the bioluminescent bacteria *E.coli* MM294Lux+, which we have concluded is not the best model to observe metabolic changes. Bioluminescent readings show a significantly higher sample standard deviation and range than fluorescent results. Batch suspension cultures of the fluorescent bacterium *Pseudomonas fluorescens* and *Pseudomonas aeruginosa* provide a better model to observe and measure gravitational effects on cell physiology. It is the purpose of this research to investigate the utility of such an approach. The effects on fluorescent response have been recorded via fluorometer. Cell population data and fluorescent output have been monitored under experimental conditions to determine which force has a greater effect on the cells, hypergravity or microgravity.

Mitochondrial DNA reveals heteroplasmy and no evidence for reproductive isolation of two parasitoid fly populations

Danielle Lucas(1), Nikolaus Koeniger(2), Salim Tingek(3), Olav Rueppell(1)

1: Department of Biology, University of North Carolina at Greensboro

2: Institut fuer Bienenkunde, Oberursel, Germany

3: Agricultural Research Station, Tenom, Malaysia

(Molecular Biology, Oral presentation, FFSC 110, Sat: 9:15)

Flies of the genus *Physocephala* parasitize two distinct but sympatric species of honey bees, *Apis cerana* and *A. dorsata*. The flies act as parasitoids and cannot be morphologically distinguished between hosts. To investigate whether each host bee species was attacked by a cryptic, yet specific fly species, we sequenced a part of the mitochondrial DNA from flies collected from the two different hosts. The sequences revealed extensive homoplasmy but no consistent evidence for two separate species of flies. We conclude that the studied *Physocephala* represent one generalist parasitoid species that is capable of parasitizing two distinct hosts. This generalist strategy suggests an increased risk for a host range expansion of this species to *A. mellifera* with consequences for economic beekeeping throughout the world.

New Training Guides for Facilitators of Science Notebook Workshops for Elementary and Middle School Teachers

Brenda Lytle, NC State University and Charles Lytle, NC State University.

(Science Education, Poster, Carnegie Room, Fri: 6-7:30 pm)

Science notebooks have recently gained wide acceptance by educators as effective tools for improving student learning and understanding of science concepts and processes in elementary and middle school classes. The increased popularity of science notebooks has created a pressing need for well-designed training materials for the use by professional developers serving those teachers. Most in-service teachers lack training in the use of science notebooks and few colleges include such training in their pre- service programs. Thus effective training guides would also be useful for use in college level teacher preparation courses for elementary and middle school teachers.

We have developed a series of training guides for this purpose based on ten years of successful experience in developing science curricula and conducting workshops for classroom teachers. These guides focus on the importance of science notebooks coupled with inquiry in developing student understanding: integration of mathematics, reading and writing with science: the use of notebooks for student assessment: giving effective feedback on student work: and the usefulness of student notebooks as tangible records of student progress for students, teachers, parents, and administrators.

Cytotoxicity of sodium dodecyl sulfate on onion cells (*Allium cepa*) relative to its presence in water supplies in Catawba County, North Carolina

Carrie E. Mahoney* and Marsha Fanning

Lenoir-Rhyne University

(Environmental Science, Oral presentation, Bryan Jr. Auditorium, Sat: 8:30)

Sodium dodecyl sulfate, a surfactant, was used to represent common surfactants found in many consumer cleaning products. There were two main objectives of this study, to determine if this particular surfactant was found in local water supplies and to determine what concentration of SDS could cause potential harm to the environment and organisms living within it. SDS concentrations were determined using Stains-all indicating dye and measured at 438nm using a Spec20. SDS was found in all water supplies tested; concentration levels were found to vary according to weather and human activity. Concentrations of SDS similar to those found within the water supply were then tested on the epidermal cells of a sweet onion (*Allium cepa*). Cytotoxicity was measured using rhodamine dye and fluorescence microscopy to visually assess cytoplasmic changes which caused cellular injury. SDS concentrations of all environmental samples tested were found to be lower than the concentration necessary for onion cell cytotoxicity.

Introduction to Scientific Inquiry: A discipline-specific writing course for biology majors

Michele Malotky* and Melanie Lee-Brown

Guilford College

(Science Education, Oral presentation, FFSC 320, Sat: 16:15)

Undergraduate students generally find reading primary scientific literature difficult and frustrating. Scientific literature is typically dense with information, often referencing techniques and methods that are deeply embedded in the history of the discipline but obscure to the general public. Once students learn the stylistic conventions used in scientific discourse and recognize that the scientific method forms the template for every scientific paper, professional literature becomes more understandable and the authors become real people working on relevant problems. Students cannot reach this level of understanding without guidance, practice and familiarity. With this in mind, we designed a core course in our curriculum to develop our students' understanding and ability to judge scientific information from a variety of sources including; secondary popular sources, and peer-reviewed, primary research papers. During the course of the semester, students are incrementally guided through each step of the scientific method from hypothesis generation and experimental design to data analysis and reporting. In the process, students are exposed to a variety of basic laboratory protocols and equipment. The ultimate goal of the course is to provide students with tools necessary for the development and refining of their own writing. This presentation will provide an outline of the course content. The course objectives and their relation to student outcomes and the college's quality enhancement plan (QEP) will also be discussed.

Impacts of Managing Loblolly Pine Plantations for Biofuels Production on Rodent Abundance, Distribution, and Demographics

M.M. Marshall*, M.C. Kalcounis-Rüppell, D.A. Miller, J.A. Homyack

Biology Department, University of North Carolina at Greensboro, Greensboro, NC 27402-6170 (MMM and MCKR); Weyerhaeuser Company, P.O. Box 2288, Columbus, MS 39701 (DAM); Weyerhaeuser Company, 1785 Weyerhaeuser Road, Vanceboro, NC 28586 (JAH)

(Ecology, Oral presentation, Bryan Jr. Auditorium, Sat: 16:15)

To help meet demands for renewable sources of energy for transportation fuels, Weyerhaeuser Company is investigating intercropped switchgrass (*Panicum virgatum* L.) within intensively managed loblolly pine (*Pinus taeda*) stands as a biofuels crop. Changes to understory composition and structure may affect ecologically important rodent communities. Therefore, we surveyed rodent populations using mark-recapture techniques to determine their responses to switchgrass intercropping. We captured rodents on experimental plots within newly established pine plantations subjected to five different intercropping treatments (pine with woody biomass in place, pine with woody biomass removed, pine and switchgrass with woody biomass in place, pine and switchgrass with woody biomass removed, and switchgrass only with woody biomass removed). We trapped each plot for 24 nights from July-December 2009, resulting in 1,832 rodent captures during 13,428 trap nights. We captured *Peromyscus leucopus* (n=390 tagged individuals), *Mus musculus* (n=278 tagged individuals), *Sigmodon hispidus* (n=149 tagged individuals), and *Reithrodontomys humulis* (n=12 tagged individuals). Preliminary examination of the effect of intercropping treatment on the number of individuals and total captures revealed that only *Mus musculus* was influenced by treatment type (number of individuals: $\chi^2=11.01$, d.f.=4, p=0.03,; total captures: $\chi^2=13.55$, 4 d.f.=4, p<0.01), with more *Mus musculus* in treatments containing switchgrass. Ongoing analyses will be discussed.

PCB accumulation in aquatic biota inhabiting an EPA superfund watershed

Randal McLean* & Emma Weavil*

Peace College, Raleigh, NC 27604

(Environmental Science, Oral presentation, Bryan Jr. Auditorium, Sat: 9:15)

The Ward Transformer Company is located in a predominantly industrial area of Raleigh (Wake County), North Carolina. The facility was built in 1964 and operated until 2006 when it was closed as a designated EPA superfund cleanup site due to elevated levels of polychlorinated biphenyls (PCBs), among other toxins and carcinogens. The US Department of Health and Human Services have reported PCBs in water, sediments and fish downstream of the facility, and fish consumption advisories are currently in effect for the water bodies related to the Ward Site in the Briar and Crabtree Creek tributaries. We assayed water, sediments and the biota from seven sites in this drainage system and found PCB's at all sites with variable concentrations distributed from the contamination site toward the confluence with the Neuse River. While PCBs may be transmitted cutaneously, most exposure is through ingestion where the chemicals accrue in lipids within organisms and are not excreted. As such, our data suggest differentiated accumulation between muscle and visceral tissue, with especially high concentrations in some fish species having high seasonal adipose deposition. Examination of all aquatic invertebrate and fish species tested revealed elevated PCBs, and relative concentrations among trophic levels suggest biological magnification may be evident.

Creating a Regional Partnership to Address Honey Bee Collapse Disorder

Brian McMullen, B.S.* (UNC Pembroke)

Len Holmes, Ph.D (UNC Pembroke)

(Zoology, Poster, Carnegie Room, Fri: 6-7:30 pm)

The worldwide economic value of the pollination service provided by honey bees is estimated to exceed \$300B for the main food crops. The honey bee (*Apis mellifera*) is the most important pollinator of food crops for humans and wildlife in North Carolina. Colony Collapse Disorder (CCD) has caused wide-spread honey bee die off, threatening to wipe out crops that depend on pollination. Approximately 80% of fruits and vegetables that require pollination are threatened. The cause of CCD is not yet clear but may be related to a spectrum of agents which include pesticides, parasites, disease, urbanization and harmful insects. The UNCP Biotechnology Center has established a regional beekeeping support service to provide technical assistance and information to local farmers. The UNCP Honey Bee Center is (1) promoting the increase of regional beekeeping; (2) collecting data to map the regional beekeeping sites and (3) launching studies on the biological and environmental agents of hive disorders.

Trace Mineral Composition of *Acanthocampa belina* (Mophane worm), a Common Food in Botswana

*Kopano Mmalane

Warren Wilson College

Academic/Presentation Advisor: Victoria Collins

(Health Sciences, Oral presentation, FFSC 110, Sat: 10:30)

Acanthocampa belina (Mophane caterpillar), is a common food source in Botswana. The study involved analyzing the Mophane caterpillar for zinc, iron, copper and for toxic metals arsenic and lead. Two sampling pools were used to determine if there is a difference in trace metal content between the December and May harvests. Another sampling pool was added to the analysis to determine if the caterpillars in Selebi Phikwe, where a copper nickel smelter is situated, are different in trace metal content from the Bobonong area caterpillars. The average metal content (+ standard deviation) for all the caterpillars was: Zinc 2190 ± 878 $\mu\text{g/serving}$, iron 3000 ± 1990 $\mu\text{g/serving}$, copper 104 ± 59.5 $\mu\text{g/serving}$, Lead 1.11 ± 3.56 $\mu\text{g/serving}$ and arsenic 25.0 ± 29.5 $\mu\text{g/serving}$, where a serving is 10 caterpillars. A serving of caterpillars provides 44% of the zinc RDA for children, 30% of the iron RDA for children and 24% of the copper RDA for children. The toxic metal content of the caterpillars per serving was well below the FDA and European Union acceptable levels. There was no significant difference in trace metal content between the two different locations. The December harvest season had significantly higher ($p < 0.05$) levels of zinc, iron and arsenic than the May harvest season. The Mophane caterpillar appears to be a safe and nutritious food.

Moderate marijuana use: Behavioral and neural effects on decision making

Malaak Moussa*, Michael Wesley, Erin Shannon, Katy Lack, Colleen Hanlon, Linda Porrino

Wake Forest University

(Behavioral Sciences, Poster, Carnegie Room, Fri: 6-7:30 pm)

Heavy marijuana (HMJ) use has been linked to deficits in decision-making, with users exhibiting poor behavioral performance and altered neural activity. It is not known, however, if moderate marijuana (MMJ) use is sufficient to cause similar changes. The aim of this study was to determine whether MMJ use ($n=16$) significantly affects performance on the Iowa Gambling Task (IGT) as compared to controls ($n=15$). Brain activity was assessed using functional

magnetic resonance imaging. There were no significant differences on overall performance score between the groups. In contrast, controls and MMJ users showed distinct patterns of brain activation during different phases of the IGT. During decision and feedback conditions, MMJ users had significantly greater BOLD responses in the bilateral middle frontal gyri and anterior cingulate cortices, compared to controls. These results demonstrate that MMJ use is sufficient to significantly compromise brain activity, despite the lack of overt behavioral differences from controls.

Bioinformatics for the uninitiated: the design of a non-majors course

Linda M. Niedziela* and Lynn R. Heinrichs

Elon University

(Science Education, Oral presentation, FFSC 320, Sat: 16:00)

Bioinformatics combines the distinct disciplines of biology, information technology and computing science. It is crucial in molecular biology and genomics research because of the large amount of complex data. Practitioners of bioinformatics must have skills in multiple areas. Most bioinformatics courses are upper level courses that focus on teaching either computer skills to biology majors or genetics and molecular biology to computer science or information systems students. The challenge was to create a Bioinformatics course that was accessible to non-majors at Elon University. Two faculty members, one a geneticist and the other a computer information systems specialist, collaborated on a semester long course for the honors program. Students enrolled in the course came from a diverse set of backgrounds including human services, history, communications, and biology. This presentation will describe the process of course design, the choice of course goals and learning objectives, summarize activities and assignments used during the course, share feedback collected from students, and discuss future curricular plans.

Calcium and Chloride Bi-Substrate-Like Activation of Oxygen Evolution by Photosystem II

Brandon Ore* and Alice Haddy

University of North Carolina at Greensboro

(Chemistry, Poster, Carnegie Room, Fri: 6-7:30 pm)

Within plants and cyanobacteria, the enzyme complex responsible for the photosynthetic oxidation of water to molecular oxygen is photosystem II (PSII). Past research has shown that calcium and chloride are important cofactors in this process and without them the function of PSII becomes drastically impaired. The interdependence of calcium and chloride on the activation of oxygen evolution was tested using PSII from which two extrinsic subunits with molecular weights of 23 kDa and 17 kDa had been removed to facilitate the removal of calcium and chloride. Exposure to light and EDTA was used to further remove calcium from the enzyme complex. The maximum activity induced by calcium increased with increasing chloride concentrations, however, some substrate-like inhibition by calcium was observed at low chloride concentrations. Our analysis of the data led to Michealis constants (K_m) of 1.8 mM for calcium and 2.5 mM for chloride. Therefore a bi-substrate-like enzyme kinetics model of activation by calcium and chloride is consistent with our findings. (Supported by a Research Experiences for Undergraduates grant from the National Science Foundation.)

TREX1 Mutations in Autoimmune Disease Reveal Essential Dimer Interactions

Clinton D. Orebaugh*, Scott Harvey, Fred W. Perrino

Wake Forest University Department of Biochemistry

(Molecular Biology, Oral presentation, FFSC 110, Sat: 9:00)

Mutations in the human TREX1 gene cause an array of autoimmune disorders, including systemic lupus erythematosus and Aicardi-Goutieres syndrome (AGS). TREX1 is the major 3' DNA exonuclease in mammalian cells that catalyzes the release of deoxynucleoside monophosphates from DNA substrates, and disease-causing mutations diminish exonuclease activity. Deficiency in nucleic acid metabolism leads to immune activation and production of anti-nuclear autoantibodies, which results in an aberrant inflammatory response. TREX1 is homodimeric, and compound heterozygotes with autosomal recessive AGS may express three different TREX1 dimers: Protomer A/Protomer A, Protomer B/ Protomer B, and Protomer A/ Protomer B. The dimer interface mutation R114H is paired with the mutants A124ins and D201ins in AGS compound heterozygotes. Recombinant homodimers and heterodimers containing these mutations were expressed and assayed for activity. R114H homodimers exhibit 1/40 WT activity, and A124ins and D201ins homodimers are 10,000 and 3,500 fold reduced, respectively. R114H/A124ins and R114H/D201ins heterodimers exhibit 1/3 WT activity, which is 25 fold greater than predicted from homodimer activities. This increase in activity is best understood in structural terms, because of the cross-dimer interaction provided by Arg-114. Arg-114 extends from Protomer A to Protomer B, where it hydrogen bonds with and stabilizes a flexible loop proximal to Protomer B's active site. The R114H mutation in Protomer A disrupts this interaction with little consequence for its own active site, while distorting active site geometry in Protomer B and reducing its catalytic capacity. This is a novel demonstration of the necessity of dimerization for TREX1 exonuclease activity.

Ecological Relationship of *Corbicula fluminea* and Physa species

Dr. Francie Cuffney, Brittany Pearl *

Meredith College

(Ecology, Oral presentation, Bryan Jr. Auditorium, Sat: 16:00)

Corbicula fluminea, the Asiatic clam, and a snail of the physa species are found in freshwater streams in North Carolina. The importance of this research is to see how the Asiatic clams interact with the physa snails and what impact the physa snails may have on the population of the Asiatic clams. The Asiatic clams were collected from Swift Creek and the Neuse River. The snails were collected from Swift Creek, where clam populations are low. No snails were observed in the Neuse River, where clam populations were high. Both organisms were collected and taken back to the lab for research experiments. The first experiment quantified the effect of snail predation on Asiatic clam populations. The hypothesis was that snail predation would decrease clam populations. The second experiment examined effect of clam population density on predation rate. The hypothesis was that predation would be greatest in higher density populations. Results indicate that snails are active predators of the Asiatic clam, but no relationship to population density and rate of predation was observed.

Domain Structure/Function Analysis of the *Drosophila* Homolog of the Human Tumor Suppressor Topors

Kristen Perez*, Komal Desai, John Tomkiel

University of North Carolina at Greensboro

(Cell and Developmental Biology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Dtopors is the *Drosophila* homolog of the human tumor suppressor Topors, which is the only known protein that functions as both a ubiquitin and SUMO ligase. We are studying its function in meiosis as a model for the human protein. Male flies mutant for dtopors show nondisjunction at meiosis and a nuclear dysmorphology in primary spermatocytes. We are performing a function/structure analysis of Dtopors by expressing various domains of the protein fused to the jellyfish Green Fluorescent Protein, and assaying protein localization and effects on chromosome segregation. We will report the cellular localizations of these fusion proteins, and results of genetic assays of chromosome transmission to determine if the ubiquitin and/or sumoylation domains are necessary and sufficient to rescue dtopors mutants.

Individual Context of Ultrasonic Vocalizations Produced by Wild Brush Mice (*Peromyscus boylii*)

Radmila Petric* and Dr. Matina Kalcounis-Rueppell

Bat and Mouse Lab, University of North Carolina at Greensboro

(Behavioral Sciences, Oral presentation, FFSC 220, Sat: 10:45)

North American deer mice (*Peromyscus*) frequently produce ultrasonic vocalizations (USVs). As has been hypothesized for other muroid rodents that include *Mus* and *Rattus*, USVs likely function to mediate social processes that include courtship and mating. We examined the context of USV production in wild brush mice (*Peromyscus boylii*) to better understand function of USVs in natural contexts. *Peromyscus boylii* is a typical muroid rodent in having a mating system that ranges from polygynous to promiscuous depending on population density. At the Hastings Natural History Reserve, in California, we investigated the individual context of USVs produced by wild *P. boylii* using a remote sensing technique that integrated telemetry, thermal imaging and a microphone array. During the 2008 breeding season, we recorded the first USVs from free living individual *P. boylii*. We recorded 162 multisyllabic vocalizations from 17 females and 8 males. Analyses are ongoing with preliminary results suggesting sex differences in which males produce more of the 1 syllable vocalizations and females produce more of the 2,3 and 4 syllable vocalizations ($F_{3,162}=11.61$, $p=0.008$). Understanding the individual context of USVs produced by wild *P. boylii* will provide a foundation for us to understand the function of USVs in this species and other Muroid rodents with similar breeding systems.

Solenopsis invicta (red imported fire ant): Colony Density in Clay-based Bays (Antioch and Goose Pond Bays, North Carolina)

*Sidney Post and Lisa Kelly

University of North Carolina at Pembroke.

(Ecology, Oral presentation, FFSC 320, Sat: 8:30)

The invasive red imported fire ant (*Solenopsis invicta*) is one of the most important pest species in the United States, causing extensive ecological harm. While typically associated with disturbance habitats, we report the species from two relatively pristine, clay-based Carolina bays -- Antioch and Goose Pond Bays, North Carolina. Owned by The Nature Conservancy, these bays support a rich biota, including rare plants and animals, a dense herbaceous groundcover, and unique savanna habitat dominated by pond cypress (*Taxodium ascendens*). During summer and autumn 2009, we used line transects to determine colony density and relative distribution of *S.*

invicta within each bay. We mapped all colonies from a 40 X 40-m area, located randomly within the interior of each bay. Colonies densities were greater in Antioch Bay. Colonies were distributed throughout both bays, but were uncommon in the interior of Goose Pond Bay, where a dense stand of *T. ascendens*, *Nyssa biflora*, and the rare shrub *Ilex amelanchar* occurred. The establishment of some colonies atop buttresses of *T. ascendens* may allow the species to persist in the bays even during prolonged winter flooding.

Kleptoparasitism in *Onthophagus taurus*: The role of density, dung, and males

*Erin Raspet, Shunda Rushing

University of North Carolina at Greensboro

(Ecology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Kleptoparasitism, the stealing of resources, has been documented throughout the animal kingdom. Within the dung beetle species *Onthophagus taurus*, the most commonly observed form of kleptoparasitism involves the stealing of reproductive resources; specifically, the stealing of each other's brood balls in which a female either destroys the brood ball created by another female or kills the existing egg to then replace it with her own. The purpose of this study was to test the mathematical model describing this behavior as well as to examine the factors that influence the frequency of kleptoparasitic behavior within this species. We hypothesized that factors that increased the difficulty of reproduction (i.e. increased density) as well as elements that increase the desire to reproduce (i.e. the presence of a major male) would increase the observed stealing behaviors. Indeed, a positive relationship between density as well as the presence of a major male and kleptoparasitic behavior was observed. Interestingly, egg replacement was not seen under circumstances of either increased difficulty or increased need to reproduce while egg destruction was seen with a significantly higher frequency under both conditions. This indicates that the motivation to kleptoparasitize is governed by more than relative brood ball production time, as was originally hypothesized; since engaging in these behaviors is necessarily time consuming without producing an obvious reproductive advantage.

Effect of Calcium on Chloride Activation of Oxygen Evolution by Photosystem II

Rachel Reed*, Alice Haddy

The University of North Carolina at Greensboro

(Chemistry, Poster, Carnegie Room, Fri: 6-7:30 pm)

Photosystem II is a protein complex in higher plants which produces molecular oxygen from water at a manganese cluster through a series of catalytic steps coupled with the absorption of light. It has been known that calcium (Ca²⁺), in addition to chloride (Cl⁻) is required for oxygen evolution. Through oxygen evolution assays, the interdependence of calcium and chloride as activators in oxygen evolution was studied. Experiments were performed measuring chloride dependence of oxygen evolution at various constant calcium concentrations. Data were analyzed using Michealis-Menten enzyme kinetics and results showed that the maximal initial velocity increased with greater calcium and chloride concentrations. For 0.10 mM calcium the maximal initial velocity was 184 micromoles oxygen/mg chlorophyll/hr, while 3.00 mM calcium resulted in 266 micromoles oxygen/mg chlorophyll/hr. The Michaelis constant, which gives the affinity of the substrate for the enzyme, varied from 1.2 to 1.8 mM for different concentrations of calcium and chloride. The data were additionally analyzed using Lineweaver-Burk plots and results were consistent with random or sequential bisubstrate enzyme kinetics. It has been shown through these experiments that there is interdependence between calcium and chloride as activators in oxygen evolution. (Supported by a grant from the NSF-REU program.)

Observations of an Ectocommensal Protozoan, *Lagenophrys* sp (*Ciliphora: Peritricha: Lagenophryidae*) on Seed Shrimp (*Crustacea: Ostracoda*) Found in Gardner-Webb University Pond (Boiling Springs, NC)

C. Ritchey* and D. Judge

Gardner-Webb University. Boiling Springs, NC 28017.

(Zoology, Poster, Carnegie Room, Fri: 6-7:30 pm)

While examining plankton in Gardner-Webb University's small campus pond (Lake Hollifield, Boiling Springs, NC) to make a general identification key for non-major science classes, dome-like structures with internal movement were observed on carapaces (valves) of a species of seed shrimp (*Crustacea: Ostracoda*). The dome-like structure resembles "bubble wrap" (65-85 μm in diameter) on ovoid *Ostracoda* valves (ca. 450 μm in length). Initially, there were two theories: reproductive structure or a separate external organism (epibiont). Measurements, observations, pictures, and video of the dome-like structures were recorded. Dr. J. Clamp at NC Central University identified the epibiont as an obligate ectocommensal protozoan (*Ciliphora: Peritricha: Lagenophryidae*), likely *Lagenophrys discoidea*. Apparently, the association of *Lagenophrys* sp with *Ostracoda*, as well as other arthropods is common worldwide. The seed shrimp has been identified to the genus *Cypria*, and, depending on species identity and verification of both members, the association could be a novel reporting.

Repertoire size and territory quality in Northern Mockingbird (*Mimus polyglottos*)

Dan Rousseau*, Dr. Lou Weber

Warren Wilson College

(Zoology, Oral presentation, FFSC 220, Sat: 8:30)

Northern Mockingbirds (*Mimus polyglottos*) defend their territories using a variety of visual and auditory displays, most notably the mockingbird's characteristic mimicking song. Previous studies suggest song repertoire size may affect mating success and territory quality. My objective is to determine if there is a correlation between repertoire size and territory quality. Five male Northern Mockingbirds on Warren Wilson College core campus were selected. Each bird's territory was mapped by hand. Territory quality was defined according to seven shared habitat characteristics, which will be used to break territories down by percentage areas and assigned point values according to their benefit to the mockingbird and its offspring. Recordings were taken using a Sennheiser condenser microphone on an 18" Saul Mineroff Parabolic mounting, recorded on a ZOOM Handy Recorder H4. The recordings were used to produce sonograms in the program RavenLite. Sonograms were analyzed to produce repertoire estimates according to the equation developed by Wildenthal (1965):

$$n = N(1 - e^{-T/N})$$

where n is the number of distinct syllable-patterns in the sample, T is the total number of syllable-patterns in the sample, and N is the total number of distinct syllable-patterns in the repertoire.

Results will compare territory qualities and repertoire sizes of individual birds.

How Field Conditions Influence Brood Ball Production By the Dung Beetle *Onthophagus taurus*

Shunda Rushing* and Erin Raspet

University of North Carolina at Greensboro

(Ecology, Poster, Carnegie Room, Fri: 6-7:30 pm)

We are interested in looking at the conditions that affect brood ball production in the field by the dung beetle *Onthophagus taurus*. Some conditions that could influence brood ball production include competition, both inter- and intraspecific, temperature, and/or the age of the dung. We examined at the production of brood balls in the field with two experiments. In the first experiment we randomly selected pats of varying age to document the presence of our beetles, buried dung and brood balls at three depths below the surface: 0-5 cm, 5-10 cm, and 10-15 cm. In the second experiment, every 12 hr after cow pat creation, we sampled the pat and substrate to document when *O. taurus*, entered the dung pat, buried dung and produced brood balls. The results suggest that *O. taurus* enter the cow pat sooner than expected (within 12 hrs of initial creation), and that the burying of dung began immediately, with the most dung buried within 48 hrs. We found our brood balls and the majority of dung was within 10 cm of the surface, shallower than expected. The overall sex ratio of our beetle is 1:1, they are about the same number of major and minor males, and they are most likely found within the first 5 cm of the surface.

The Binding of Secretory Leukocyte Proteinase Inhibitor to Actin Filaments: Implications for Cystic Fibrosis

*Lori Seischab, Western Carolina University

Sanford Simon, Stony Brook University

(Health Sciences, Poster, Carnegie Room, Fri: 6-7:30 pm)

Cystic fibrosis (CF) airways contain significant quantities of actin filaments, which contribute to the hyperviscosity of CF airway secretions, act as a scaffold for bacterial biofilm formation, and reduce the potency of antibiotics. Inflamed CF airways also contain secretory leukoproteinase inhibitor (SLPI), which helps control the excessive proteolysis caused by neutrophil elastase. Interactions between SLPI and actin were examined in this study. In fluorescence enhancement assays, SLPI induced polymerization of pyrene-labeled actin monomers. This is characteristic of a protein that binds stoichiometrically to actin and prefers actin filaments over actin monomers. This was supported by co-sedimentation assays in which full length SLPI, the N-terminal domain, and the C-terminal domain of SLPI were shown to bind actin filaments. In addition, actin filaments were stabilized by SLPI, resulting in a reduction of actin filament disassembly. Other consequences of SLPI binding to F-actin, e.g. bundling of actin filaments and an increased extent of actin polymerization, were mitigated by the presence of neutrophil elastase. Historically, SLPI has been considered important in lung defense and a potential therapeutic agent for CF and other chronic airway infection diseases. These results, however, indicate that SLPI may contribute to CF pathology by facilitating the persistence of actin filaments.

Lead and Arsenic Concentrations in Western North Carolina Aquatic Sediment

Emily Shanblatt*, Dr. John Brock

Warren Wilson College

(Chemistry, Poster, Carnegie Room, Fri: 6-7:30 pm)

Lead and arsenic are toxic heavy metals which can cause a variety of adverse health effects. Both metals enter the natural environment through many processes, including agricultural or industrial runoff, coal combustion, and construction. Once in lakes, rivers and streams, these metals are

ingested by aquatic organisms, and bioaccumulate in their tissues. Upon ingestion by an organism higher in the food chain, the metal content is transported to the predator organism, eventually reaching humans through the ingestion of fish. There is a direct correlation between metal content of fish and metal content of sediment. The main objective of the study was to determine lead and arsenic concentrations in sediment collected from three Western North Carolina aquatic sites: the Swannanoa River, Lake Julian and Lake Fontana. The method involved acid digestion, to extract metals from the sediment and liquefy the samples. Samples were analyzed with an ICP-AES. Calibration curves with strong linear regression correlations were made. Comparison to similar sites in the area shows that averages in the three examined sites are statistically similar to or less than other aquatic sites in the area. Therefore, the three examined aquatic sites render a reduced cause for concern in regards to unsafe levels of lead and arsenic.

Population Demographics of Woody Goldenrod (*Chrysoma pauciflosculosa*) in Lumber River State Park, North Carolina

*Doshie Smith and Lisa Kelly

University of North Carolina at Pembroke.

(Ecology, Oral presentation, Bryan Jr. Auditorium, Sat: 10:15)

Understanding population demographics is critical for management of rare species. Woody goldenrod (*Chrysoma pauciflosculosa*), a habitat specialist of xeric soils, is a state endangered species in North Carolina. This shrub is found in three coastal plain counties of the state. The largest population, located on Big Sandy Ridge (Columbus County) in Lumber River State Park, exists as multiple subpopulations separated by forest patches and dirt roads. During fall 2009, we estimated population densities and sizes for three subpopulations by counting all plants (≥ 10 cm in crown diameter) in 1-m wide belt transects. To determine size classes for two subpopulations, we counted number of internodes and measured height and crown diameter for all plants (≥ 10 cm in crown diameter) in a single belt transect. A community analysis was conducted using a 0.1-ha plot, in which all vascular plants were inventoried. Mean population densities ranged from 1.1-2.2 plants m^{-2} (11000-22000 plants ha^{-1}). Most plants belonged to small size classes (10-20 cm tall and 10-20 cm crowns), but large plants (≥ 40 cm tall and ≥ 50 cm crowns) were observed. Differences in subpopulation densities could be related to past site disturbances (e.g, logging and horse traffic).

The Effects of Resource Delivery Pattern on the Transient Dynamics of an Aquatic Ecosystem

*Isaac Smith¹, Hayley McLeod², Michael McCoy³, and James Vonesh⁴

¹Lenoir-Rhyne University, ²University of South Carolina, ³Boston University, and ⁴Virginia Commonwealth University

(Ecology, Oral presentation, FFSC 320, Sat: 8:45)

Nutrient influxes can alter ecosystem function in aquatic environments. Research suggests that these resource pulses applied to systems at equilibrium should create transient dynamics within the ecosystem. The rate at which nutrients are introduced into a system (resource delivery pattern) has also been shown to be at least as important as the total amount of nutrients added. No studies, to our knowledge, have examined the effects of resource delivery pattern on the transient dynamics of an aquatic ecosystem (productivity, structure, competition, etc.) in the presence of an aquatic vertebrate. In this experiment, we raised tadpoles of the neotropical tree frog, *Agalychnis callidryas*, at varying densities with two distinct resource delivery patterns. Every five days, tadpoles were digitally photographed and measured, DO and periphyton growth data were collected, and zooplankton abundance and diversity were evaluated. Community production measurements were highly variable, and our data were inconclusive. Increased tadpole density

negatively affected tadpole growth, while resource delivery pattern had no significant effect on growth rates. However, resource delivery pattern did have a significant effect on zooplankton abundance. Increased zooplankton abundance may negatively affect tadpole growth rates; if so, this provides the first experimental evidence that tadpoles may compete with zooplankton for resources.

Characterization of Bivalve Populations along a Stream/ Swamp Continuum

Roberta Smith-Uhl

Meredith College

Faculty Sponsor: Francie Cuffney, Biological Sciences.

(Environmental Science, Oral presentation, Bryan Jr. Auditorium, Sat: 15:30)

The Asiatic clam, *Corbicula sp.* has become a very invasive species, pushing out the native species, within the creeks and streams of North Carolina. This research is part of a continuing monitoring program that compares *Corbicula sp.* populations in various streams of North Carolina. This project focuses on Crooked Creek in Franklin County, NC. Crooked Creek is home to a large species of native mussel. Populations of *Corbicula sp.* and the native mussel were compared. *Corbicula sp.* was found in the sandy soil, of three sites within the creek, ranging from upstream to a swamp. *Corbicula sp.* populations were quantified per unit area. Individual clams were measured in order to classify by age. The water was also chemically tested for pH, Dissolved Oxygen, temperature, and conductivity. Water levels in the sampled area ranged from 6 inches to 3 feet. *Corbicula sp.* were found in all three sites within the stream/ swamp continuum. *Corbicula sp.* were found in all depths of water, yet the larger *Corbicula sp.* were found predominantly in the deeper water. The native species were found, but in very few numbers.

Patterns of metal concentrations in the shells of Blue Crabs (*Callinectes sapidus*) as a tracking mechanism for adult females

Stephen Somerville*, Dr. Stephen Cartier, Dr. Fritz Riedel

Warren Wilson College

(Environmental Science, Oral presentation, Bryan Jr. Auditorium, Sat: 9:30)

Population monitoring and enhancement efforts for Blue Crab, *Callinectes sapidus*, in the Chesapeake have been hampered by an inability to determine where populations are succeeding and where they are struggling. The objective was to determine if female crabs from different estuaries are distinguishable by the patterns of metal concentrations found in their shells. Mature female crabs were collected from three sites around the bay. The tissue was removed from the shells and the carapace, claw, and swimmeret were sampled and dried. The samples were digested and analyzed by ICP-OES for Ca, K, Mg, Mn, P, and Sr. The Calcium concentration data were used to normalize the data for the five other metals. A two-way ANOVA with two-way Tukey post-hoc test at a level of $p > 0.01$ was used to show that the three pieces as well as the three sites differed significantly for K, Mg, P, and Sr. Manganese levels differed significantly between the shell pieces but not the different sites. These results suggest there is a potential for estuary-identifying patterns within the shells of spawning female crabs, which could lead to better population tracking and population enhancement efforts for this economically vital species.

Determining Carbon Accumulation in Trees on the Meredith College Campus

Jillian Stancil* and Erin Lindquist

Meredith College

(Environmental Science, Oral presentation, Bryan Jr. Auditorium, Sat: 8:45)

For years, researchers have been interested in determining the net productivity of plants. With more and more carbon being released into the atmosphere, it is important to measure the carbon accumulation in plants. This study focused on carbon accumulation in trees on the Meredith College campus in Raleigh, NC and is part of a larger campus-wide study investigating total carbon emissions from electric, gas heating, and transportation use. Using diameter-at-breast-height (DBH) measurements on parking lot trees collected in 2008, I remeasured the DBH and permanently tagged the trees allow future assessment of carbon accumulation by Meredith students. After conducting an extensive literature review, I was able to determine appropriate equations for calculating tree biomass to accurately predict carbon accumulation (50% of accumulated biomass). I calculated the biomass and carbon accumulation for a total of 68 trees in seven different parking lots on campus. The combined carbon accumulation was 67,504.7 kg over the one year period which is 0.422% of the total annual carbon emitted (16,003 metric tonnes) by Meredith College. My project is a pilot study for larger projects that are estimating tree growth and carbon accumulation in urban plots on college campuses around the country.

A Phylogeny for *Uvularia* (Colchicaceae) Derived From Morphology

Isaiah Thalmayer*, Warren Wilson College

Amy Boyd, Warren Wilson College

(Botany, Oral presentation, Bryan Jr. Auditorium, Sat: 11:00)

The five species of bellworts in the genus *Uvularia* are common woodland flowers endemic to eastern North America. A previous study completed phylogenetic analysis of *Uvularia* based on *matK* and *rbcL* gene sequences. However, molecular phylogenetics does not always suggest the same patterns of evolution as morphological phylogenetics. The objective of this study was to create a phylogeny for *Uvularia* based on morphology, and to compare it to a molecular phylogeny for the genus. 32 structural morphology characters, and 16 morphometric characters were selected for observation. All 48 characters were observed in 15 herbarium specimens of each species of *Uvularia*, except *U. floridana* of which 6 specimens were observed. The same characters were also observed in 15 specimens of the outgroup, *Disporum lanuginosum*. Two phylogenies were made, one including all 48 morphological characters and one including only the 32 structural morphology characters and excluding the 16 morphometric characters. The phylogeny derived from all 48 morphological characters was not completely congruent with the molecular phylogeny, though several branches occurred in both phylogenies. The phylogeny derived from the 32 structural characters was congruent with the molecular phylogeny. This suggests that the morphology of *Uvularia* represents the same hypothesis of evolution within the genus as the molecular data, and that this phylogeny, supported by two data types, is the best current hypothesis for relatedness within the genus *Uvularia*.

Folate deficient cells display increased sensitivity to oxidative stress

Fanuel Tibebe* and Karen S. Katula

University of North Carolina at Greensboro

(Cell and Developmental Biology, Oral presentation, FFSC 109, Sat: 9:30)

Folate is an essential B vitamin that is used for one-carbon reactions. Folate deficiency in humans has been associated with numerous health conditions such as cancer, heart disease, and

developmental defects. The basis for this link is complex and not clearly defined. One possibility is that the level of reactive oxygen species (ROS) increases due to more homocysteine in the cell, as a consequence of folate deficiency. In this study we measured the level of ROS in folate deficient and sufficient Caco-2 cells, with and without treatment with hydrogen peroxide. The level of ROS was detected using the fluorescence dye, C400. Cells were analyzed using a flow cytometer for individual cell analysis and a fluorescence plate reader for total fluorescence. Results show that folate deficient cells are more sensitive to oxidative stress. At all hydrogen peroxide concentrations, folate deficient cells had higher levels of ROS in comparison to folate sufficient cells. Flow cytometry data gave similar results. In untreated cells the level of ROS was slightly higher in the folate deficient cells in comparison to the folate sufficient cells. These data suggest that folate deficient cells are more sensitive to oxidative stress.

Effects of use of Debbie Meyer Green Bags and temperature on ripening and spoiling in banana fruits

Christine Todd

Lenoir-Rhyne University

(Botany, Oral presentation, Bryan Jr. Auditorium, Sat: 10:45)

Ethylene gas is one factor responsible for the ripening of many fruits. When a fruit begins to release ethylene gas, the color, softness, smell, and flavor all undergo significant changes. After the fruit ripens, it continues to release ethylene; at this point, the spoiling process has begun. Developers of Debbie Meyer Green Bags claim the bags absorb ethylene gas, which prevents it from settling around the fruit and stimulating the ripening process. This allows fruit to progress more slowly through the ripening and spoiling processes. This experiment was designed to test the effectiveness of Green Bags at different settings and temperatures. Bananas were tested for 14 days to see if temperature, enclosure in a Green Bag, or movement of air affected color, smell, and firmness of the fruit. At room temperature, fruits kept in Green Bags ripened more slowly than those with no Green Bag, as evidenced by a greater length of time for the fruit to lose firmness and for color changes to occur. Firmness and color of refrigerated fruits changed over time, but in a manner different than those kept at room temperature. Consumers would thus expect to see a greater shelf-life for fruits in Green Bags.

Phylogenetic positions of two species of peritrich ciliates (Protista, Ciliophora, Peritrichia) with atypical morphologies

Franziska Turner*, John C. Clamp

N.C. Central University

(Zoology, Oral presentation, FFSC 220, Sat: 8:45)

Peritrichs, a large group of ciliated protists, are usually attached to a solid substrate as trophonts and disperse with a non-feeding motile stage, the telotroch. A few atypical species exist as a feeding telotroch. Conversely, others exist as free-swimming, stalkless trophonts that lack a telotroch stage. Originally, atypical species were classified into separate families on the basis of their differences in life cycle, but there was no way to relate them to other peritrichs because these were classified by morphological features of the attached trophont. Recent molecular studies based on sequences of the gene coding for small-subunit rRNA (ssu rRNA) revealed that most of the atypical peritrichs were in a single clade with some typical species of the largest genus of peritrichs, *Vorticella*; however, one species with telotroch morphology associated with another clade. We have added the ssu rRNA sequences of two unidentified species of atypical peritrichs, a feeding telotroch and a swimming trophont, to this phylogenetic analysis, and both

associated with yet a third clade. These results strongly support the hypothesis that a phase of the life cycle has been lost multiple times in three different peritrich lineages.

The Sense of the Spider

Sandy Van Every

Queens University of Charlotte

(Zoology, Poster, Carnegie Room, Fri: 6-7:30 pm)

The purpose of this study was to describe the spider community of 5 pine forest fragments of various ages in Redlair, an 1100 acre nature preserve in Belmont North Carolina. I hypothesized that there would be more spiders and greater diversity in younger, denser pine forest fragments than in the older forest fragments because of the increased habitat complexity of the younger forests. Five 2x2 meter sub plots were randomly chosen within each of the five pine forest fragments. Each plot was surveyed for web spiders in the trees and understory vegetation, and ground spiders in the leaf litter and grass. The data collected shows that the oldest pine forest fragments had the least amount of total web and ground spiders and lowest diversity of spider families. The youngest pine forest had the most ground spiders. Intermediate aged forest fragments showed the greatest diversity of spider families.

Does water temperature affect efficiency in hand washing?

Thais Faggion Vinholo*, Jennifer Easterwood

Queens University of Charlotte

(Microbiology, Poster, Carnegie Room, Fri: 6-7:30 pm)

This study compared the efficacy of water temperature used in hand washes. It was expected that the hot water would be more effective than cold water based on the speculation that hot water is more efficient in breaking up oils, releasing bacteria. Students' hands were first inoculated with a broth containing *Serratia marcescens*; then they washed their hands as directed by the researcher. Half of the students washed their hands under cold water, and the other half washed them under hot water. Next, samples were obtained from their hands and cultures were grown over a period of 42 hrs. Colonies were counted and comparison was made between the hot and cold hand washes. The data were compared using a t-test. In contrast to other studies, hot water was significantly more effective than cold water at removing bacteria. There were significantly fewer colonies after hot water washing than after cold water washing.

Technology in the classroom

Courtney Ward

Bennett College for Women

(Behavioral Sciences, Oral presentation, FFSC 220, Sat: 10:30)

Does use of electronic devices by college students in the classroom affect one's GPA? This research project involves students' use of electronic devices, such as cell phones and MP3 players/iPods, during class time and their GPAs. It was predicted that students who are most likely to report the use of these devices during class would also report lower GPAs. Forty female college students, ten from each classification strata, volunteered to participate in this study. A survey was developed to assess students use of electronic devices during class. Self-reported GPAs were also attained from the participants. The results did not support the experimental hypothesis. The results indicated that students who were most likely to use electronic devices in the classroom tended to have higher GPAs.

Ensifer adhaerens: a microbial cave predatorMelissa Wilks*¹, Hazel Barton², James W. Brown³, Melanie Lee-Brown¹¹Guilford College, ²University of Northern Kentucky, ³North Carolina State University

(Microbiology, Oral presentation, FFSC 320, Sat: 10:00)

Ensifer adhaerens are predatory, Gram-negative, nitrogen fixing, rod shaped soil bacteria. They attach non-preferentially to Gram-positive or Gram-negative prey cells and cause lysis. During predation, an external bar-like structure of unknown composition has been reported in electron micrographs of sections stained with uranyl acetate. This structure appears wider at one or both poles and elongates between *E. adhaerens* and prey cells. For this study, three wild strains of *E. adhaerens* were isolated from three caves in the United States. The type strain (ATCC 33212) will be used as a control strain. 16S rRNA phylogenetic analysis suggests that the four strains are all very closely-related. Predatory assays using *Micrococcus luteus* as prey, and the morphological details of the host-prey interaction including this elongated bar structure will be visualized using transmission electron microscopy. In addition, phylogenetic analysis using MultiLocus Sequence Typing (MLST) will be used to define the relationships between different *E. adhaerens* cave strains and the type strain.

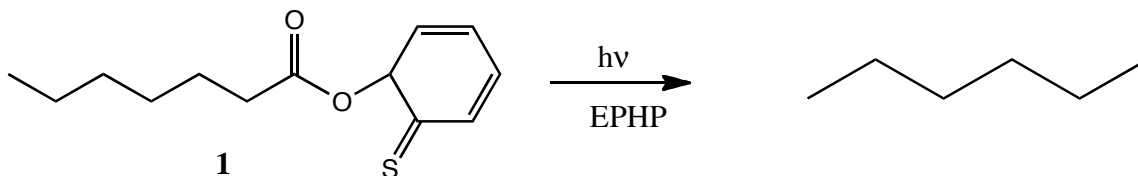
Radical Reactions in Ionic Liquid Solvents

John Willis* and Anne Glenn

Guilford College

(Chemistry, Poster, Carnegie Room, Fri: 6-7:30 pm)

Radical reactions of the Barton ester of heptanoic acid (**1**) were studied using N-ethylpiperidinium hypophosphite (EHP) as a hydrogen atom donor using and using both water and the ionic liquid butylmethylimidazolium tetrafluoroborate (bmimBF₄) as solvents. Our first goal was to determine if EHP is a suitable hydrogen atom donor for this reaction and second was to see if the reaction would proceed in an ionic liquid solvent. Initial results were inconclusive, as gas chromatography showed that reaction did not appear to produce the expected product, hexane, in either water or bmimBF₄ solvent. Possible issues that will be investigated in the future are difficulties in carrying out the reaction, including in accurately weighing and transferring EHP, a sticky low melting solid, and extraction of products from the water and bmimBF₄ solvents for analysis. Other solvents for the reaction, including benzene and THF will also be studied.



Characterization of the Role of Myosin II During Insulin-Stimulated Glucose Uptake in 3T3-L1 Adipocytes

Shelly Woody* and Yashomati Patel

Department of Biology, UNCG

(Cell and Developmental Biology, Poster, Carnegie Room, Fri: 6-7:30 pm)

Insulin-stimulated glucose uptake requires the activation of the nonmuscle motor protein myosin II. Our previous studies using pharmacological inhibitors suggest that insulin signaling results in the phosphorylation of myosin IIA during insulin-stimulated glucose uptake in 3T3-L1

adipocytes. Since pharmacological inhibitors are not specific, we wanted to use a siRNA approach to compliment our previous studies. In this report we demonstrate that knockdown of myosin IIA using a myosin IIA specific siRNA resulted in impaired insulin-stimulated glucose uptake. We then pursued possible upstream regulators of myosin IIA to delineate a signaling pathway by using siRNA specific to myosin light chain kinase (MLCK), calcium-calmodulin dependent kinase II delta (CaMKII delta), and extracellular-signal regulated kinase 2 (Erk2). Our results revealed that knockdown of Erk2 impaired insulin-stimulated glucose uptake. The knockdown of MLCK appeared to have no effect on glucose uptake, whereas knockdown of CaMKII delta indicated a slight increase in insulin-stimulated glucose uptake. Taken together, our results suggest a pathway involving Erk2, and possibly CaMKII delta in myosin IIA-mediated insulin-stimulated glucose uptake in 3T3-L1 adipocytes.

The Relative Impact of Shade and Kudzu (*Pueraria lobata*) Extract on the Growth of Lettuce (*Lactuca sativa*) Seedlings

Lindsay Yount

Lenoir-Rhyne University

(Ecology, Oral presentation, Bryan Jr. Auditorium, Sat: 10:00)

Kudzu (*Pueraria lobata*) is an invasive woody vine that has out-competed many plant species in the southeastern United States. The primary reason for its competitive dominance is not fully understood. Kudzu has large, flat leaves that cover other plants and shade them from sunlight. The leaves have also been found to contain chemicals that are precursors to other known allelopathic chemicals (Kato-Noguchi 2003). In the current study, lettuce (*Lactuca sativa*) plants were assigned to treatments that were exposed to full light or shade (80-85 percent) and were watered with either distilled water or kudzu extract to determine whether sunlight competition or allelopathy was the greater inhibitor of lettuce seedling growth. The Holm-Sidak statistical test was used to interpret data. The shoots of plants grown in the shade were significantly taller than those grown in full light. The average weights of the seedlings in water versus extract treatments were significantly different while the root:shoot ratios of seedlings in light versus shade treatments were significantly different. A germination experiment was also conducted to determine the effects of kudzu extract on lettuce seed germination.

A study of PB-PEO diblock copolymers in ionic liquid [EMI][TFSI]

Lei Zhang*

Winston Salem State University

(Chemistry, Oral presentation, FFSC 320, Sat: 15:30)

Three poly(1, 2-butadiene-b-ethylene oxide) diblock copolymers (PB-PEO) has been studied in ionic liquid – 1-ethyl-3-methylimidazolium bis(trifluoromethylsulfonyl)imide([EMI][TFSI]) across the complete concentration range. The Rh sizes (hydrodynamic radius of a sphere) have been measured by dynamic light scattering (DLS) at different concentrations at room temperature. The study will help in explaining the mechanism of formation of diblock copolymer micelles.

Enzyme, Chemical, Heat and pH Treatment of a Growth Inhibitor from *Bacillus cereus* GS1

Kimberly Zullo* and Joe Wolf.

Department of Biology, Peace College, Raleigh, NC 27604.

(Microbiology, Oral presentation, FFSC 320, Sat: 10:45)

Bacillus cereus GS1 was isolated in our lab from soil and secretes a diffusible molecule that inhibits the growth of *Bacillus subtilis* 6633 and certain other species of bacteria. The inhibitor is

secreted during the late growth/early stationary phase of broth cultures when grown in a variety of media that permit high cell densities to be obtained. From what is known about the organism's habitat and the behavior of the inhibitor so far, we hypothesize that the inhibitor molecule is a bacteriocin and susceptible to factors that affect protein activity. To test our hypothesis we Disciplined the inhibitor, in impure form as culture filtrate, to proteolysis by a battery of proteases and tested the resulting activity in a spot-on-the-lawn assay with *Bacillus subtilis* 6633. We also tested the inhibitor for residual activity following treatment with chemicals and a range of temperature and pH values. The results of these experiments support our hypothesis that the molecule is protein in nature. They also describe a durable molecule that is largely resistant to chemical and physical treatments. The activity profile that emerges from these studies suggests that our bacteriocin is distinct from those secreted by other strains of *Bacillus cereus*.

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