Georgia Journal of Science

Volume 70 *No. 1 Program and Abstracts for the Annual Meeting of the Georgia Academy of Science*

Article 1

2012

Program and Abstracts of the Annual Meeting of the Georgia Academy of Science, 2012

Georgia Academy of Science

affiliated with the American Association for the Advancement of Science

http://www.GaAcademy.org

Georgia Journal of Science

Peer Reviewed Publication of the Georgia Academy of Science

Vol. 70 No. 1 - 2012
ISSN: 0147-9369

GEORGIA ACADEMY OF SCIENCE

President:	Bob Powell	Physics Department, Univ of W GA 1601 Maple St., Carrollton, GA 30118 O: (678) 839-4095 • bpowell@westga.edu
President Elect:	Richard W. Schmude, Jr.	Dept. of Math & Nat Sci, Gordon College 419 College Dr., Barnesville, GA 30204 O: (770) 358-0728 • schmude@gdn.edu
Past President:	Robert McDonough	Professor of Biology (retired), GA Perimeter College 2101 Womack Rd., Dunwoody, GA 30308 O: (770) 274-5061 • H: (404) 373-5627 (best) F: (770-551-7079 • rmcdonou@gpc.edu
Vice-President:	Shane A. Webb	Dept of Biology, N GA C & SU Dahlonega, GA 30597 O: (706) 867-2947 • F: (706) 867-2703 Dept: (706) 864-1953) • sawebb@northgeorgia.edu
Secretary:	Paul J. Camp	Department of Physics, Spelman College P.O. Box 373, Atlanta, GA 30314 O: (404) 270-5864 • pcamp@spelman.edu
Treasurer:	Mitch Lockhart	Biology Department, Valdosta State University Valdosta, GA 31698 •jmlockha@valdosta.edu O: (229) 333-5767 • Fax: (229) 245-6585
Journal Editor:	John V. Aliff	GA Perimeter College Online P.O. Box 506, Auburn, GA 30011 john.aliff@gpc.edu

COUNCILOR-AT-LARGE

2009-2012: James Nienow, Biol Bept, Valdosta SU, Valdosta, GA 31698
2010-2013: Doug Pohl, Chem & Physics Dept, GA C&SU, Milledgeville, 31061
2011-2014: James F. Battey, Sci Dept, GA Perimeter College, Covington, GA 30014

SECTION COUNCILORS

I. Biological Sciences
Bob Herrington, Dept of Biology, GA SW SU, Americus 31709

II. Chemistry
Abe Ojo, Dept of Sci, Math & Health Professions, Atl Metro College, Atlanta 30310

III. Earth & Atmospheric Sciences
Don Thieme, Dept of Physics, Astronomy & Geosciences, Valdosta SU, Valdosta 31698

IV. Physics, Mathematics, Computer Science, Engineering and Technology
Vacant

V. Biomedical Sciences
Jane Levinson, Sci Dept, GA Perimeter College, Dunwoody, 30338

VI. Philosophy and History of Science
Ronald Mickens, Dept of Physics, Clark Atl U, Atlanta 30314

VII. Science Education
Bonita Flournoy, Dept of Sci, Math & Health Professions, Atl Metro College, Atlanta 30310

VIII. Anthropology
Terry Powis, Geography & Anthropology, Kennesaw SU, Kennesaw 30144

Historian: Vacant
Associate Journal Editor: Vacant
Technical Program Chair: Barry Hojjatie, Dept of Physics, Astr & Geosci, Valdosta SU, 31698

GEORGIA JUNIOR ACADEMY OF SCIENCE

Executive Director: Robert McDonough, GA Perimeter College, Dunwoody 30338
Treasurer: Michael McGinnis, Georgia C&SU, Milledgeville, 31061

GEORGIA JOURNAL OF SCIENCE

Volume 70 **2012** **Number 1**

CONTENTS

GAS PRESIDENT'S WELCOME, COMMENTS AND REPORT FROM THE ACADEMY COUNCIL

Dear Academy Members:

Welcome to the 2012 annual meeting of the Georgia Academy of Science!

The Academy thanks Dr. Daniel S. Papp, President of Kennesaw State University, for the invitation to meet on this campus.

The Local Arrangements Committee (chaired by Dr. Susan Kirkpatrick Smith and Dr. Terry Powis) has prepared an outstanding meeting, including the reception at the Tellus Science Museum. Dr. Barry Hojjatie, Technical Program Chair, and the section officers have prepared an interesting and informative program of papers and posters.

The Council has accepted the invitation from Valdosta State University to host the annual meeting in 2013. One university has offered to host the annual Meeting in 2014. The Academy welcomes invitations to host future meetings in 2015, and beyond.

New people will assume leadership roles in the Academy at the annual meeting after being nominated and elected as Academy officers or section officers. Thank you for your service to those whose terms are ending as well as to the new office holders.

Do you have colleagues who are not members of the Academy? Please tell them about the Georgia Academy of Science and encourage them to join.

Sincerely,
Bob Powell
President
The Georgia Academy of Science

KENNESAW STATE UNIVERSITY

PRESIDENT'S WELCOME & MAP

Kennesaw State University — Office of the President

Welcome to Kennesaw State University, Georgia's third largest university!

All of us at KSU are pleased to welcome the Georgia Academy of Science to campus for its 89th annual meeting. Throughout its history, the Academy has done a masterful job of promoting science education and fostering scientific research in Georgia, and it continues to excel in this extremely important task that is so vital to the future of our state, our country, and our world.

Kennesaw State is deeply involved both in science education and in science research. The KSU College of Science and Mathematics offers B.S. degrees in biology, biotechnology, biology education, chemistry with a chemistry education track, biochemistry, computer science, mathematics and mathematics education. We also offer a M.S. degree in applied statistics and the Masters of Arts in Teaching degree in biology, chemistry, mathematics, and physics. And just last month the Board of Regents approved a new Master of Science in Integrative Biology.

Everyone in the College of Science and Mathematics is also excited about the impending opening of our new 73,500 square foot laboratory sciences building, slated for occupancy in the next few months. This facility will provide research and teaching laboratories for both the Department of Chemistry and Biochemistry and the Department of Biology and Physics.

We are also excited by two new chaired professorships in the College of Science and Mathematics funded by the KSU Foundations that we will fill next academic year. These positions will provide a further boost to science and math education and research at KSU. I must also note that Kennesaw State serves as the organizational home to the Georgia Youth Science and Technology Center (GYSTC), which provides educational opportunities and teacher support programs around the state in the sciences and technology to elementary and middle school students and teachers.

Finally, I would like to close by thanking KSU faculty members Dr. Susan Kirkpatrick Smith and Dr. Terry G. Powis, who are serving as our local arrangements co-chairs for the Academy's conference. I am sure that you will find the arrangements superb! And I am also sure that you will have an extremely successful and productive meeting!

Again, welcome to Kennesaw State!

Sincerely,

Daniel S. Papp

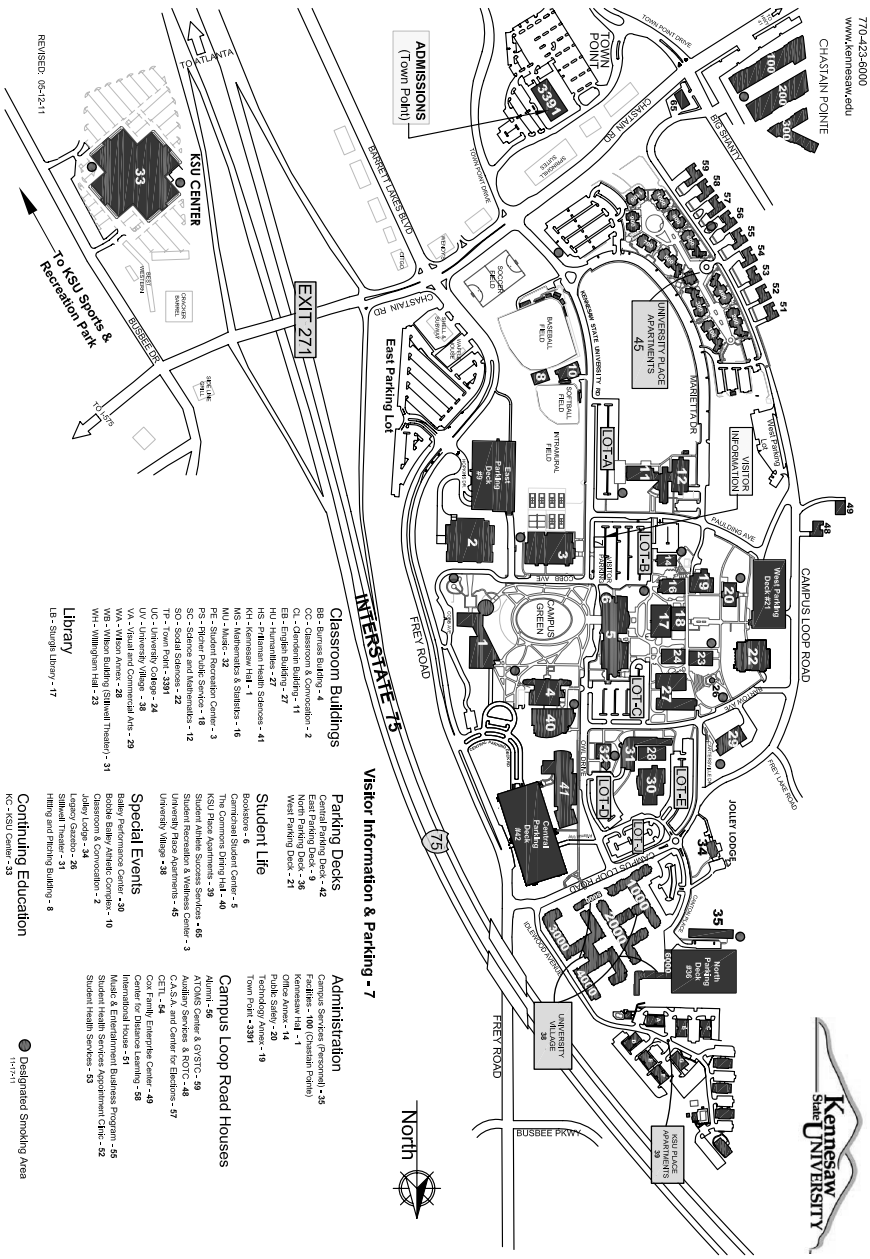
Daniel S. Papp, Ph.D.
President

1000 Chastain Road • MD 0101 • KH • Bldg. 1 • Rm. 5600 • Kennesaw, GA 30144-5591

Phone: 770-423-6033 • Fax: 770-423-6543 • www.kennesaw.edu

KENNESAW STATE UNIVERSITY MAP

The Social Science Building is Building 22 at the top center of the map. Parking is in the West Parking Deck just to the south (left) of the Social Science Building.



Visitor Information & Parking - 7

Parking Decks

Central Parking Deck - **42**
East Parking Deck - **9**
North Parking Deck - **35**
West Parking Deck - **21**

Classroom Buildings

BB - Burruss Building - **4**
CC - Classroom & Convocation - **2**
CL - Clendenin Building - **11**
EB - English Building - **27**
HU - Humanities - **27**
HS - Health and Human Sciences - **41**
KH - Kennesaw Hall - **1**
MS - Mathematics & Statistics - **16**
MU - Music - **32**
PE - Student Recreation Center - **3**
PS - Pilcher Public Service - **18**
SC - Science and Mathematics - **12**
SO - Social Sciences - **22**
TP - Town Point - **3391**
UC - University College - **24**
UV - University Village - **38**
VA - Visual and Commercial Arts - **29**
WA - Wilson Annex - **28**
WH - Willingham Hall - **25**

Library

LB - Sturgis Library - **17**

Student Life

Bookstore - **5**
Commonwealth Student Center - **5**
The Commons Dining Hall - **40**
KSU Place Apartments - **39**
Student Athlete Success Services - **65**
Student Recreation & Wellness Center - **3**
University Place Apartments - **45**
University Village - **38**

Special Events

Bailey Performance Center - **30**
Bobby Bailey Athletic Complex - **10**
Classroom & Convocation - **2**
Jolley Lodge - **34**
Legacy Gazebo - **26**
Stillwell Theater - **31**
Hitting and Pitching Building - **6**

Continuing Education

KC - KSU Center - **33**

Administration

Campus Services (Personnel) - **35**
ExcelBlue - **100** (Chastain Pointe)
Kennesaw Hall - **1**
Office Annex - **14**
Public Safety - **20**
Town Point - **3391**

Campus Loop Road Houses

Alumni - **56**
ATOMS Center & GYSTC - **59**
Auxiliary Services & ROTC - **48**
C.A.S.A. and Center for Elections - **57**
CETL - **44**
Corporate & Enterprise Center - **49**
Center for Distance Learning - **58**
International House - **51**
Music & Entertainment Business Program - **55**
Student Health Services Appointment Clinic - **52**
Student Health Services - **53**

Designated Smoking Area

GAS 2012 PROGRAM

Friday

Registration – 11:00-5:00 PM	Social Science Building Lobby
Executive Council Meeting – 10:00-11:00 AM	Social Science 2032
Paper Presentations – 2:00-5:30 PM	Social Science Building
Posters – 3:00-5:30 PM	Social Science Building Atrium
Reception – 6:30-8:30 PM	Tellus Science Museum, Cartersville, GA *(The Tellus Science Museum is located less than 25 miles north of Kennesaw just off of I-75)*

Saturday

Registration – 7:00-10:30 AM	Social Science Building Lobby
Paper Presentations and Posters – 7:30 AM - 12:00 PM	Social Science Building
Plenary Luncheon – 12:00-2:00 PM	Student Center, University Room

GAS 2012 ROOM ASSIGNMENTS

Biological Sciences	3031
Chemistry	3023
Earth/ Atmospheric Sciences	3019
Physics/Mathematics, Computer Science, Engineering and Technology	2028
Biomedical Sciences	3010
Philosophy/History of Science	2035
Science Education	2025
Anthropology	2030
Council Meeting Room	2032

FRIDAY PAPER PRESENTATIONS

***Denotes student presenter**
****Denotes student research in progress**

Section I: Biological Sciences
Social Science Building Room 3031
Paul T. Arnold, Presiding

2:00 SYNERGISTIC EFFECT OF ESSENTIAL OILS AGAINST *ASPERGILLUS FLAVUS* IN PEANUTS, P. Mungai*, P.N. Achar and M.Y. Sreenivasa

2:15 THE INFLUENCE OF A PREMATURE APPLE BLOOM IN NORTH GEORGIA ON THE ABUNDANCE OF NATIVE BEE SPECIES, Nicholas G. Stewart* and M. Schlueter

2:30 THE EFFECT OF FOREST FRAGMENTATION ON CARNIVORE SPECIES DIVERSITY AND DISTRIBUTION**, Nathaniel A. Wall* and M. A. Schlueter

2:45 ASSESSING THE SUCCESS OF A THREE-DAY BIRD DIVERSITY SURVEY IN TORTUGUERO NATIONAL PARK (COSTA RICA), Sterling R. Brown* and M. Schlueter

3:00 **Break**

3:15 EFFECT OF SPADIX REMOVAL ON POLLINATION SUCCESS OF *PINELLIA PEDATISECTA*, Mark R. Thibodeau*, Frank S. Corotto, Mark S. Davis and Ashlee R. McCaskill

3:30 EFFECTS OF HEAT SHOCK PROTEIN 90 (HSP90) INHIBITORS ON REGENERATION AND BEHAVIOR IN THE PLANARIAN *DUGESIA TIGRINA* (PLATYHELMINTES: TURBELLARIA)**, Hillary Doyle* and M.S. Bodri

3:45 MOLECULAR SYSTEMATICS OF *CHARACODON* (GOODEIDAE) BASED ON A PORTION OF THE NUCLEAR TYROSINE KINASE LOCUS *X-SRC*, A. E. Hildreth* and S. A. Webb

4:00 INITIAL CHARACTERIZATION OF THE PEL REGULATORY ELEMENT OF PITX1 IN EMPETRICHTHYINE FISHES: AN EXPLANATION FOR THE ABSENCE OF PELVIC GIRDLES?, B.J. Przygoda* and S.A. Webb

4:15 EFFECTS OF EXPOSURE TO LEAD AND MERCURY ON DEVELOPMENT OF THE POSTERIOR LATERAL LINE IN EMBRYONIC ZEBRAFISH**, Kaylin E. Canup* and Linda G. Jones

4:30 EFFECTS OF LIGHT EXPOSURE ON THE DEVELOPMENT OF MYELIN BASIC PROTEIN IN THE MYELIN SHEATH OF NEURONAL AXONS IN JUVENILE ZEBRAFISH**, Lauren K. Martin* and Linda G. Jones

Posters (will be displayed through 5:30)

Section II: Chemistry
Social Science Building Room 3023
Zewdu Gebeyehu, Presiding

2:45 PRELIMINARY STUDY ON POSSIBLE USAGE OF SEVERAL COMMERCIAL SOFTWARE AS A TOOL FOR DELIVERING ONLINE PRE-LAB QUIZZES AND ONLINE LAB REPORTS FOR AN ASSESSMENT, M.-H. Kim, A. Cook, M. Nelson, P. Roessle and M. Burkart

3:00 THE INCORPORATION OF A MODERN MOLECULAR MODELING COMPONENT (SPARTAN STUDENT) INTO THE UNDERGRADUATE CHEMISTRY CURRICULUM, D. A. Jeffrey

3:15 ANTIOXIDANT ACTIVITY AND PHENOLIC COMPOUNDS IN VARIOUS JUICES, K. Hodge*, B. Garduno* and C. Kim

3:30 **Break**

3:45 MOLECULAR MODELING OF A SERIES OF HSP90 INHIBITORS**, A. R. Hnatiak* and R. W. Zurales

4:00 MODELING THE ELECTROSTAIC INTERACTION IN ICE WITH THE POLARIZED CONTINUUM MODEL**, M. A. Knight* and R. W. Zurales

4:15 COMPUTATIONAL STUDY OF GLYCOGEN PHOSPHORYLASE INHIBITORS**, S. D. Nazerian* and R. W. Zurales

Posters (will be displayed through 5:30)

Section IV: Physics, Mathematics, Computer Science and Technology
Social Science Building Room 2028
Hasson M. Tavossi, Presiding

2:00 ON THE OPTIMIZATION OF ELECTROLYSIS OF WATER, Roger Lascorz and J. E. Hasbun

2:15 EFFECTS OF PRESSURE ON SOUND WAVES, William I. Floyd IV and J.E. Hasbun

2:30 OBSERVATION OF OPTICAL DOPPLER EFFECT USING BEAT FREQUENCY MEASUREMENTS, D.C. McCall and T. Colbert

2:45 LOW-COST, ULTRAVIOLET-INFRARED DUAL-BAND DETECTOR BASED ON LEAD SULFIDE QUANTUM DOTS EMBEDDED TIO2 NANOPARTICLES, Victoria Martin, Ajith DeSilva, A. G. U. Perera, P. K. D. Duleepa and P. Pitigala

3:00 **Break**

3:15 A NEUTRON DIFFRACTION STUDY OF THE IRON-BASED SUPERCONDUCTOR SRFE2AS2, Phillip A. Martin, Gary N. Chesnut, Yogesh K. Vohra, Walter Uhoya and Athena S. Sefat

3:30 NEUTRON DIFFRACTION EXPERIMENTS ON ELEMENTAL HOLMIUM, G. N. Chesnut, W. Uhoya, S. A. Thomas, Y. K. Vohra and A. S. Sefat

3:45 PHOTOLITHOGRAPHY OF QUANTUM DOTS IN A POLYMER MATRIX, Brian Hubbard, Raghuveer Gadipalli, Ajith Desilva, J. E. Hasbun, and Farooq Khan

4:00 POLYMER-BASED UV PHOTODETECTOR VIA SOLUTION PROCESSING, Esther S. Machado, Ajith DeSilva, A. G. U. Perera, P. K. D. Duleepa and P. Pitigala

4:15 VECTOR MEASUREMENTS OF THE GEOMAGNETIC FIELD IN THE REGION OF WEST GEORGIA, Sara Strouss and Ben de Mayo

4:30 THE GALVANIC EFFECTS ON SURFACE ROUGHNESS OF ALUMINUM, Liqiu Zheng, Lesshon Irby, Xiaomei Zheng, Louise Wrensford and K.C. Chan

4:45 FEASIBILITY STUDIES OF WIND SPEEDS AND WIND TURBINES, Micah A. Bidwell, Robert Moore, Jr. and Bob Powell

5:00 SECOND HARMONIC GENERATION AND NON-LINEAR CORRECTIONSTO THE HIGH FREQUENCY SUSCEPTIBILITY OF A MULTIFERROIC MATERIAL, Philip D. Javernick and Trinanjan Datta

Posters (will be displayed through 5:30)

SATURDAY PAPER PRESENTATIONS

***Denotes student presenter**
****Denotes student research in progress**

Section I: Biological Sciences
Social Science Building Room 3031
Paul T. Arnold, Presiding

8:30 REGULATION OF CADHERIN-MEDIATED CELL-CELL ADHESION BY THE PROINFLAMMATORY CYTOKINE IL-β, J.G Gober*, I.N Gober* and R. Singh

8:45 COMPARISON OF METHODS FOR INVESTIGATING SMALL-MAMMAL POPULATION DYNAMICS**, Erin E. Froetschel*, Terry L. Barrett and Gary W. Barrett

9:00 A PRELIMINARY ANALYSIS OF ENAMEL HYPOPLASIA IN WHITE-TAILED DEER FROM THE PIEDMONT NATIONAL WILDLIFE REFUGE, GEORGIA**, Haley S. Davis* and Alfred J. Mead

9:15 GENETIC AND PHYSIOLOGICAL CHARACTERIZATION OF COPPER- UTILIZATION MUTANTS IN *SACCHAROMYCES CEREVISIAE*, Lauren A. Neill* and Brian W. Schwartz

9:30 BASELINE SURVEY OF ROAD-KILL VERTEBRATES IN BALDWIN COUNTY, GEORGIA**, Evan R. Boitet*, Alfred J. Mead and Doug R. Oetter

9:45 A COMPARISON OF EASTERN GRAY SQUIRREL (*SCIURUS CAROLINENSIS*) NESTING BEHAVIOR AMONG HABITATS DIFFERING IN ANTHROPOGENIC DISTURBANCE, Elizabeth C. Williams* and J. Michelle Cawthorn

10:00 **Break and Section Business Meeting**

10:30 DIVERSITY OF INDICATOR ORGANISMS IN ENVIRONMENTAL WATERS, V. L. Chivukula

10:45 IDENTIFICATION OF AN ANTIOXIDANT CAPABLE OF INHIBITING PHIP- INDUCED CELL PROLIFERATION AND DNA DAMAGE, Ashok Jain

POSTERS

THE BENEFITS OF AVIAN EGG ROTATION: NATURE'S DEFENSE AGAINST PATHOGENS, Raymond Akinnawo*, A. Aluko and A. Lester

ARGENTINE ANT (HYMENOPTERA: FORMICIDAE) MORTALITY FOLLOWING EXPOSURE TO SODIUM SALICYLATE AND SODIUM CINNAMATE**, Megan Babb*, J. Connell*, J. Parker*, M. Brinkman and C. Lee

CORRELATION BETWEEN FECAL COLIFORMS, ENTEROCOCCI, HUMAN POLYOMAVIRUSES, AND BACTEROIDES IN SURFACE WATERS AROUND ATLANTA, GA**, A.J. Beatles*, B.O. Mitchell and V.L. Chivukula

ACOUSTICALLY DETERMINED BAT ACTIVITY DURING THE SUMMER TO FALL SEASONAL TRANSITION IN LAMAR COUNTY, GEORGIA. Michael J. Bender, G.D. Hartman and V. Uzezi

BINDING OF CALMODULIN-TROPONIN C CHIMERAS TO NITRIC OXIDE SYNTHASES, Christopher C. Brown*, Stephanie A. Hill, Dipak Ghosh, John C. Salerno and Jonathan L. McMurry

DIGITAL SELF-DETERMINATION: HOW THE OPEN-SOURCE REVOLUTION BENEFITS BIOLOGISTS, S.C. Burnett

THE ISOLATION, IDENTIFICATION, AND CHARACTERIZATION OF A *STAPHYLOCOCCUS* SPECIES ISOLATED FROM THE EARS OF *CANIS FAMILIARIS***, James M. Campbell* and C. Bates

EXPLORING THE URBAN OLD-GROWTH: DENDROCHRONOLOGY OF THE FERNBANK FOREST, Megan Chapman*, M.P. Weand and E. Dickerson

HSP90 INTERACTIONS WITH NITRIC OXIDE SYNTHASES, Chioma M. Enweani, Dipak Ghosh, Carol A. Chrestensen, Jonathan L. McMurry and John C. Salerno

FALL MACROINVERTEBRATE DRIFT IN LOW-ORDER STREAMS, Liz French*, Mary Beth Dooley*, Christian Haygood*, Britton Smith* and Mark S. Davis

A UNIQUE DISCOVERY: ZINC TOLERANCE ON SERPENTINE IN GEORGIA, Mary E. Gadalla* and Zachary W. Bloomer*

THE PROPAGATION AND RE-INTRODUCTION OF ENDANGERED PLANT SPECIES *ASPLENIUM HETERORESILIENS, DRABA APRICA, GENTIANOPSIS CRINITA,* AND *OXYPOLIS CANBYI* FOR HABITATS AND ESTABLISHMENT INTO SAFE-GUARDING SITES FOR THE PURPOSE OF SPECIES PRESERVATION**, H.J. Gladfelter, J.E. Mitchell*, D.L. Coverson*, R.L. Jones*, J.B. Wallace*, L.F. Mason* and J.B. Shrout

TUMOR NECROSIS FACTOR INDUCED RELEASE OF FREE FATTY ACID FROM EPITHELIAL CELLS ANALYZED BY GAS CHROMATOGRAPHY COUPLED MASS SPECTROSCOPY**, Isaiah Gober*, Wei Zhou and Rajnish Singh

RELATIONSHIP BETWEEN CNR1 GENE VARIATION AND BEHAVIORAL DIFFERENCES AMONG *KRYPTOLEBIAS MARMORATUS* LABORATORY ISOGENIC LINES**, A. Gopinath*, J.F. Elder and B.C. Ring

SPECIES RICHNESS AND RECORDS OF BATS (MAMMALIA: CHIROPTERA) IN WEST-CENTRAL GEORGIA, Gregory D. Hartman and M.J. Bender

KINETICS AND THERMODYNAMICS OF BINDING AMONG FLAGELLAR EXPORT APPARATUS PROTEINS OF *SALMONELLA ENTERICA*, Katy A. Helms, Stephanie A. Hill*, Christopher C. Brown* and Jonathan L. McMurry

EFFECTS OF METALS ON BINDING AMONG NICKEL MATURATION ACCESSORY PROTEINS IN *HELICOBACTER PYLORI*, Stephanie A. Hill* and Jonathan L. McMurry

A THREE DAY SURVEY OF BIRD DIVERSITY IN TORTUGUERO NATIONAL PARK, COSTA RICA, Jasmine Ikejiani*, J. Lee*, V. Beverly, S. Brown, J. Conejo, M. Coger, A. Doghaimat, S. Schlueter, N. Wall, S. Wall and M. Schlueter

THE INHIBITORY EFFECT OF [10]-GINGEROL AND CURCUMIN, ON PHIP INDUCED CARCINOGENESIS**, Carissa Jackson*, Christopher B. Bevington and Ashok Jain

A FAUNAL ANALYSIS OF THE *DYTISCIDAE* (COLEOPTERA: HYDRADEPHAGA) OF THE PHYSIOGRAPHIC PROVINCES OF TENNESSEE, M. Kuninti*, G. W. Wolfe, E. H. Barman and D. Oetter

STUDENT-CENTERED BIOLOGY CLASS RESEARCH PROJECTS AT A STUDENT-CENTERED COLLEGE, E.C. Lampert

KINETIC CHARACTERIZATION OF MAP KINASE BINDING TO NITRIC OXIDE SYNTHASES, Sundeep Mummaneni*, Carol A. Chrestensen, Jonathan L. McMurry and John C. Salerno

PHYLOGENY OF MAJOR CAPSID PROTEINS OF RANAVIRUSES FROM GREAT BRITAIN, Joseph D. Nestor*, A. L. J. Duffus, G. D. Hartman, T.W.J. Garner and R. A. Nichols

OXIDATIVE INHIBITION OF MAPKAP KINASE 2 IS PREDOMINATELY MEDIATED THROUGH THE ACTIVATION LOOP CYSTEINE, Emily Rye, T. Forbes, B. Forsberg, A. Johansen, R. Patel, C. Schumacher and C. Chresten

CONDITION FACTOR OF RIVER CHUBS IN RELATION TO STREAM DISTURBANCE, Kaleigh Sims*, Lauren Jenkins*, Melissa Daigle*, Danyelle Dehner and Mark S. Davis

REPLACING THE HONEYBEE – WHY WAIT? COST-CUTTING AND SUSTAINABLE AGRICULTURAL PRACTICES FOR SMALL SCALE FARMING, Nicholas G. Stewart* and M. Schlueter

A BREEDING POPULATION SURVEY OF THE RED-HEADED WOODPECKER (*MELANERPES ERYTHROCEPHALUS*) IN A FIRE-ADAPTED ECOSYSTEM, Kathryn C. Trimble*, Salina G. Patton, Brigette N. Haram and R. Brandon Cromer

CONFORMATIONAL REALIGNMENTS IN CATALYSIS: NO SYNTHASE AND RELATED ENZYMES**, E.N. Umejiego*, S. Tulachan, V. Morricette, B.L. Hopper, D.L. Vogelien, R. Razdan, D.K. Ghosh and J.C. Salerno

ISOLATION OF ANTIBIOTIC-RESISTANT BACTERIA FROM A NECROTIC WOUND OF A RED-CLAW CRAYFISH**, Nuvonka J. Wilson*, B. Saul and C. Bates

SPECIES RICHNESS AND DIVERSITY OF THE *DYTISCIDAE* (COLEOPTERA: HYDRADEPHAGA) OF FORT CAMPBELL MILITARY RESERVATION IN KENTUCKY AND TENNESSEE USING LIGHT TRAP DATA, G. W. Wolfe, B. H. Bauer and O. Hammer

Section II: Chemistry
Social Science Building Room 3023
Ghislain Mandouma, Presiding

8:30 CALCUATION OF THE ACIDITY CONSTANT FOR AN ENZYME-BOUND SULFONAMIDE**, T. M. Warren* and R. W. Zurales

8:45 CHEMOSELECTIVE OXIDATION OF 6,13-BIS(DECYLTHIO)PENTACENE, C. E. Cho*

9:00 SYNTHESIS AND CHARACTERIZATION OF EIGHT COORDINATE EUROPIUM AND GADLONIUM DICARBOXYLATE COMPLEXES**, P. J. Perry*, Z. Gebeyehu and R. Dabke

9:15 **Break**

9:30 SNTHESIS OF B-HYDROXY AND Γ-HYDROXY PERSIN DERIVATIVES**, T. Ricks and T. Crute

9:45 SYNTHESIS OF C- AND N-SUBSTITUTED BICYCLIC SULFONES AS POTENTIAL INHIBITORS OF HHV-6**, E. J. Murray* and C. E. Stephens

10:00 **Break and Section Business Meeting**

10:30 SNTHESIS OF BENZOTHIADIAZINE DERIVATIVES AS POTENTIAL HHV-6 INHIBITORS**, H. J. Reed*, and C. E. Stephens

10:45 INTRAMOLECULAR N-ARYLATION OF CHLOROPHENYL-SUBSTITUTED 2-AMINOPYRROLES TO YIELD TRICYCLIC COMPOUNDS**, P. X. Moon* and C. E. Stephens

POSTERS

ASSESSMENT OF THE DENSITY-FUNCTIONAL TIGHT-BINDING (DFTB) METHOD FOR DESCRIBING THE STRUCTURE AND INTERACTION ENERGIES OF HYDRATED IONS, Mitchell L. Tuttle* and M. Kaledin

SPACE GROUP COMPARISON FOR THE CRYSTAL STRUCTURE OF THE CO-CRYSTAL OF 4-BROMOPHENOL AND 2-PYRIDINONE, C. A. Le*, S. E. Bettis* and K. L. Martin

COMPARISON OF CRYSTAL STRUCTURES OF 3-NITROPHENOLATE IN BODY-CENTERED AND C-CENTERED SPACE GROUPS, S. R. Harris*, S. E. Bettis* and K. L. Martin

NOVEL IMMOBILIZATION AND ENHANCED SENSITIVITY OF SILVER NANOPARTICLE SURFACE PLASMON RESONANCE IN FIBER-OPTIC CAPILLARY WAVEGUIDES**, L. M. Beasley* and B. K. Keller

METAL NANOPARTICLE SURFACE PLASMON RESONANCE BIOSENSING IN A FIBER-OPTIC CAPILLARY, N. J. Savas*, J. C. Cantrell* and B. K. Keller

A COMPARISON OF GOLD AND SILVER NANOPARTICLE SIZE ANALYSIS USING FOUR TECHNIQUES**, R. A. Godwin*, J. C. Cantrell* and B. K. Keller

EVALUATION OF CANCER PREVENTER FOODS/SPICES BY GOLD NANOPARTICLES, Y. A. Beni, G. Pippas and J. M. Love

SYNTHESIS OF CHLORINATED POLYAZA[5] AND [7]HELICENES, S. A. Jackson* and G. Mandouma

SYNTHESIS OF POLYAZA[N] HELICENES POTENTIAL INHIBITORS OF TELOMERASE, A. K. Epps and G. Mandouma

BUILDING A CALIBRATION MATRIX FOR QUANTIFYING ACTIVES IN OVER THE COUNTER MEDICINES BY TARGET FACTOR ANALYSIS**, T. T. Ho Lam* and H. Z. Msimanga

A NEW METHOD FOR EXTRACTING MYRISTICIN IN NUTMEG SPICES**, H. Z. Msimanga, T. Benedict*, J. Mericka* and A. Veney*

FLUORESCENT RHODIUM AND IRIDIUM COMPLEXES DERIVED FROM *N*-HETEROCYCLIC CARBENES, C. Ghattas*, M. Chowdhury*, L. Hutchinson* and D. Tapu

TESTING USED MOTOR OILS FOR FORENSIC RELEVANCE**, C. R. Dockery, V. Langley*, L. Mulqueeny*, K. O'Rourke*, H. Overman* and K. Truong*

ACCIDENTAL POISON: THE ANALYSIS OF 1,4-BUTANEDIOL IN TOYS, C. R. Dockery, H. Z. Msimanga, K. Drupiewski*, L. Mulqueeny* and H. Overman*

A FACILE ONE-POT SYNTHESIS OF CHIRAL AMINES ON SILICA GEL, R. Rozier*, I. Furtado*, A. Tangar* and J. T. Barbas

FORENSIC ANALYSIS OF THE CHEMICAL COMPOSITION OF TRACE EVIDENCE FROM FINGERPRINTS, LIPS AND OTHER SKIN RESIDUES**, J. G. Gober* and W. Zhou

CONFORMATIONS OF RDX ANION: A DENSITY FUNCTIONAL THEORY OF ION STRUCTURE AND ENERGETICS, D. S. Newallo*, N. K. Bose, A. Thompson and Y. Jeilani

A PRELIMINARY REPORT OF CHEMICAL ANALYSIS VIA ATOMIC ABSORPTION SPECTROSCOPY OF A CAMPUS ECOSYSTEM DURING INTENSE CONSTRUCTION ACTIVITY**, N.C. Deans*, S.C. Ryals*, C. Abraham*, N. Jopra* and D.P. Pursell

REDUCING STRENGTH OF ORGANIC TOMATOES AND A TOMATO JUICE TO REACTIVE OXYGEN FREE RADICALS, B. Garduno* and C. Kim

AVAILABILITY OF WATER-SOLUBLE ANTIOXIDANT IN ASPARAGUS AND BROCCOLI UNDER TWO DIFFERENT PREPARATION METHODS, H. Dinh*, K. Hodge* and C. Kim

SYNTHESIS OF A NOVEL DICHLORO HEXAAZA DOUBLE[4]HELICENE, T. M. Horne* and G. R. Mandouma

ATMOSPHERIC CHEMICAL MEASUREMENTS AND TRENDS IN COLUMBUS, GA, S. M. Abegaz and M. Nester

RELEASE RATE OF SALICYLIC ACID IN STOMACH RELIEF AIDS**, A. S. Durden* and M. C. Koether

THE SYNTHESSIS AND CHARACTERISATION OF NEW IMIDAZOLIUM SALTS TAGGED WITH FLUORESCENT MOIETIES, M. Chowdhury*, L. Hutchinson*, C. Ghattas* and D. Tapu

Section III: Earth and Atmospheric Sciences
Social Science Building Room 3019
Alfred J. Mead, Presiding

8:00 GROUND-PENETRATING RADAR INVESTIGATION OF SUBSIDENCE IN COVERED KARST NEAR VALDOSTA**, Benjamin Davis* and Donald M. Thieme

8:15 3D LASER SCANNING OF QUARRY EXPOSURES IN COASTAL PLAIN STRATA, Chad A. Novack*, Donald M. Thieme and Matt Luke

8:30 EARTHQUAKES IN AND NEAR JAPAN, MARCH-AUGUST, 2011, Whitney Rountree* and Donald M. Thieme

8:45 SURFACE WEATHERING OF LIMESTONE IN FLORIDA CAVERNS STATE PARK**, Mary Beth Lupo* and Donald M. Thieme

9:00 A GIS METHOD TO ANALYZE SHALLOW ELECTRICAL RESISTIVITY AND GROUNDWATER FLOW IN WETLANDS**, Sarah C. Hazzard*, S. Mutiti, L. E. Berry* and H. Sadowski*

9:15 HEAT AS A NATURAL TRACER IN WETLAND SLUG TESTS**, L. E. Berry*, S. Mutiti, S. C. Hazzard* H. D. Sadowski*

9:30 THE CAPACITY OF A STRUCTURALLY UNIQUE WETLAND TO FILTER URBAN POLLUTANTS IN MILLEDGEVILLE, GEORGIA**, Hannah B. Sadowski*, Samuel Mutiti, Christine Melvin, Sarah C. Hazzard* and Lori E. Berry*

9:45 THE FOSSIL SNAKES OF NORTH AMERICA – HOW OLD IS THAT KINGSNAKE?, Dennis Parmley

10:00 **Break and Section Business Meeting**

POSTER

TOOTH REPLACEMENT PATTERNS AND RATES IN THE LATE CRETACEOUS MOSASAUR *TYLOSAURUS PRORIGER* (SQUAMATA, REPTILIA)**, Zachary T. Ansley*, Michael D. D'Emic and Kathlyn M. Smith

Section IV: Physics, Mathematics, Computer Science and Technology
Social Science Building Room 2028
Hasson M. Tavossi, Presiding

8:00 "DYNAMICS OF A PARTICLE ACTED ON BY THE DAMPING FORCE $(1+x^2)\dot{x}$", Ronald E. Mickens

8:15 "ANALYSIS OF A HARMONIC OSCILLATOR HAVING THE DAMPING FORCE $(1+x^2)\dot{x}$", 'Kale Oyedeji and Ronald E. Mickens

8:30 WORKING WITH THE LENNARD-JONES POTENTIAL IN SOLID STATE, Javier E. Hasbun

8:45 TEMPERATURE AND HEAT TRANSFER ANALYSES OF BIOMATERIAL CERAMICS DURING VARIOUS COOLING CONDITIONS, Barry Hojjatie and Mathew Vining

9:00 LESSONS LEARNED IN THE FIRST YEAR OF THE NSF S-STEM PROGRAM AT AUGUSTA STATE UNIVERSITY, J. A. Hauger, C. J. Poppeliers, S. J. Reinke, M. E. Robbins and S. L. Robinson

9:15 RED AND INFRARED COLOR INDEX VALUES OF THE MOON, R.W. Schmude, Jr.

9:30 BINARY-ENCODED RECURSIVE GENERATION OF SPACE-TIMES, D.W. Marks

9:45 CHARACTERIZATION OF DAMAGED ZONE IN BIOLOGICAL TISSUE BY ULTRASOUND, Hasson M. Tavossi

10:00 **Break and Section Business Meeting**

10:45 COLLEGE ALGEBRA – LARGE SECTION VERSUS TRADITIONAL SIZE, Andreas Lazari and Denise Reid

11:00 LEARNING TO TEACH MATHEMATICS: PRESERVICE TEACHERS' DESIGN AND IMPLEMENTATION OF STUDENT-LED, DEMOCRATIC, MIDDLE GRADES MATHEMATICS CLUBS, Stephanie Behm-Cross, N. Bayazit and C. C. Jett

11:15 STUDENTS DOING THE UNTHINKABLE…COMING TO CLASS ONE HOUR EARLY! (INCREASING STUDENT SUCCESS IN CALCLUS- I), Q. Harris

POSTER

ELECTRICAL RESISTANCE OF MULTI-WALLED CARBON NANOTUBES AS A FUNCTION OF TEMPERATURE, Adriane M., Melnyczuk and Ben de Mayo

Section V: Biomedical Sciences
Social Science Building Room 3010
Seyed H. Hosseini, Presiding

10:00 **Break and Section Business Meeting**

POSTERS

A RECOMMENDATION FOR ACCURATE EXTRACTION OF EFFECTIVE ERMITTIVITY OF CANCER CELLS AT MICROWAVE FREQUENCIES, S. J. Timmons and A. K. Saha

ASSESSMENT OF THE QUANTITY AND FUNCTION OF MITOCHONDRIA FROM THE LIVER OF SHELL-LESS CHICK EMBRYOS, Cleonecia Forbes**, Feiruz Atta and Army Lester

BUGS AND MUCK! AN INVESTIGATION OF MACROINVERTEBRATE DIVERSITY AND WATER QUALITY AT RAES CREEK**, Christina W. Tran*, M. Y. Nakama*, L. C. Coursey*, C. Best*, A. L. Joyce* and M. Ayer*

POTENTIAL ROLES OF Gb3 IN APOPTOSIS PATHWAYS IN BURKITT'S LYMPHOMA CELLS**, Kinnari L. Matheson*, Nicole Ezeude*, Shanita S. Bishop, Leonard Anderson, Marisela DeLeon Mancia and Mark Maloney

RECOGNITION OF GB3-BINDING SITES IN NON-HUMAN PROTEINS**, Nicole O. Ezeude*, Kinnari Matheson*, Shanita S. Bishop, Leonard Anderson, Marisela DeLeon Mancia and Mark Maloney

Section VI: Philosophy and History of Science
Social Science Building Room 2035
E.T. McMullen, Presiding

9:00 SERENDIPITY IN DISCOVERIES: CASE STUDIES OF TWO ALEXANDERS, BELL AND FLEMING, Tom McMullen

9:30 WHY NEW SCIENTIFIC JOURNALS ARE CREATED, Ronald E. Mickens

10:00 **Break and Section Business Meeting**

10:30 FACTORS WALK RETAINING WALL – A FEW NOTES ON THE HISTORY OF THE STONE WALL WITH THE RESULTS OF AN UPDATED ANALYSIS OF THE WALLS EROSION AND PROJECTED REPAIRS TO BE MADE, Elliott O. Edwards, Jr.

11:00 WHEN THE MOON IS IN THE SEVENTH HOUSE: ASTROLOGY AND ASTRONOMY IN THE SCIENTIFIC REVOLUTION, Tom McMullen

Section VII: Science Education
Social Science Building Room 2025
Ollie Irons Manley, Presiding

8:30 ENGAGING GIFTED STUDENTS IN GENERAL EDUCATION CLASSROOMS USING DIFFERENTIATION, Joan B. Imand* and R. A. Cooper

8:45 SYNTHESIS OF 2-AMINOFLUORENE DERIVATIVES AS AN ORGANIC CHEMISTRY LABORATORY PROJECT, Joy T. Jenkins*, Harry J. Reed* and Chad E. Stephens

9:00 LEARNING TO TEACH MATHEMATICS: PRESERVICE TEACHERS' DESIGN AND IMPLEMENTATION OF STUDENT-LED, DEMOCRATIC, MIDDLE GRADES MATHEMATICS CLUBS, Shannon Hart,* Stephanie Behm-Cross, N. Bayazit and C. C. Jett

9:15 EFFECT OF PEDAGOGICAL STRATEGIES ON STUDENTS' INDIVIDUAL AND GROUP PERFORMANCE WHEN LEARNING COMPARABLE MATHEMATICAL CONCEPTS**, Kristen Young and Sandra Rucker

9:30 COMBINING TAXONOMY AND DNA BARCODING TO MEASURE INSECT BIODIVERSITY ON CAMPUS, A. D'Costa, J. Russell, R. Haining, C. Runck, A. Barrera, M. Schlueter and D.Barnes

9:45 USING WIMBA AS A TOOL FOR VIRTUAL OFFICE HOURS IN AN ONLINE ASTRONOMY LAB, Ulrike G. Lahaise

10:00 **Section Business Meeting And Break**

10:30 FACULTY'S PERCEPTIONS OF DISTANCE LEARNING IN AN ONLINE SCIENCE PROGRAM ACCORDING TO GENDER AND YEARS OF TEACHING, Gladys Yarbrough and Ollie Manley

10:45 OVERCOMING FEELINGS OF ISOLATION IN AN ONLINE SCIENCE COURSE, Ollie Irons Manley

11:00 DETERMINATION OF FAT IN FRENCH FRIES: AN ENGAGING CHEMISTRY LAB FOR NON-CHEMISTRY MAJORS, Michael Sakuta, T. Lampe, V. Mativo, J. Poteat, and M. Schoene

11:15 EFFECTS OF RESEARCH EXPERIENCES ON RETENTION OF UNDERGRADUATE STEM MAJORS, M. L. Lowder and B. O. Mitchell

POSTER

GPC'S STEM GRANT NAVIGATION GUIDE, Pamela Gore, Kouok Law, Pamela Leggett-Robinson, Margie Lewkowicz, Margaret Major, Bonnie Martin, Brooke Skelton and Jarrett Terry

Section VIII: Anthropology
Social Science Building Room 2030
Susan Kirkpatrick Smith, Presiding

8:15 EARLY MAYA SHELL BEAD PRODUCTION AT PACBITUN, BELIZE**, Stephanie L. Henry*

8:30 A PRELIMINARY ANALYSIS OF THE WHITES MOUND (9RI4) SITE**, Matthew T. Lyons*

8:45 LAMAR ARCHITECTURE AT THE SWEETGUM SITE, 9MG245**, K.C. Graham*

9:00 EAT, DRINK AND… WALK?: DIET AND ACTIVITY AMONG BARBADIAN MIGRANTS IN ATLANTA, Jennifer Sweeney Tookes*

9:15 THE RACIAL "QUADRANGULATION" OF THE MIGRANT WORKER IN AMERICA'S SERVICE INDUSTRY, Isabella H. Alexander*

9:30 PROS AND CONS OF LEAVING SKELETAL REMAINS ENCASED IN SOIL AFTER EXCAVATION**, Courtney Hamilton* and Susan Kirkpatrick Smith

9:45 REALISTIC VERSUS IDEALIZED PERCEPTIONS OF WOMEN AND CHILDREN IN RECONSTRUCTION ERA BLACK DALLAS, TEXAS, Megan Teague Tucker

10:00 **Break and Section Business Meeting**

10:30 CAVE ARCHAEOLOGY OF NORTH GEORGIA: PAST, PRESENT, AND FUTURE INVESTIGATIONS, J. G. Burnette* and T. G. Powis

10:45 THE GEOLOGY AT THE CORRA HARRIS 'IN THE VALLEY' HISTORIC HOMESTEAD AND ITS RELATIONSHIP TO CULTURAL LANDSCAPE USE, Kathy Wiggins* and Wayne Van Horne

11:00 PEDOLOGY AND CULTURAL LANDSCAPE AT THE CORRA HARRIS 'IN THE VALLEY' HISTORIC HOMESTEAD, Cecilia M. Mattei* and Wayne Van Horne

11:15 THE ECOLOGY OF THE CORRA HARRIS 'IN THE VALLEY' HISTORIC HOMESTEAD AND ITS RELATIONSHIP TO CULTURAL LANDSCAPE USE, Wayne Van Horne

11:30 A PRELIMINARY CHECKLIST OF THE VASCULAR FLORA OF THE CORRA HARRIS 'IN THE VALLEY' HISTORIC HOMESTEAD, BARTOW COUNTY, GEORGIA, AND ITS RELATIONSHIP TO CULTURAL LANDSCAPE USE, James Van Horne* and Wayne Van Horne

11:45 HISTORIC CULTURAL LAND USE AT THE CORRA HARRIS 'IN THE VALLEY' HISTORIC HOMESTEAD, Heather E Irvin* and Wayne Van Horne

POSTERS

ASSESSMENT OF A NOVEL METHOD FOR STATURE ESTIMATION, Tony Fitzpatrick* and Leslie Brown*

AN ANALYSIS OF CHERT ARTIFACTS AND THEIR ORIGINS AT TWO LATE WOOODLAND SITES IN NORTH GEORGIA, Lindy Crapps*

ARCHAEOLOGICAL EDUCATION OUTREACH: HOW TO BETTER REACH THE LOCAL PUBLIC**, Andrew Post* and Susan Fishman-Armstrong

FRIDAY PAPER PRESENTATIONS

***Denotes student presenter**
****Denotes student "in progress" research**

Section I: Biological Sciences
Social Science Building Room 3031
Paul Arnold, Presiding

2:00 SYNERGISTIC EFFECT OF ESSENTIAL OILS AGAINST *ASPERGILLUS FLAVUS* IN PEANUTS, P. Mungai*[1], P.N. Achar[1] and M.Y. Sreenivasa[2], [1]Department of Biology and Physics, Kennesaw State University, Kennesaw, GA 30144 and [2]Department of Microbiology, University of Mysore, Mysore, India. Infection by *A. flavus* and *A. parasiticus* significantly threatens the economic viability of the peanut industry. There is no direct action farmers can take to control aflatoxin-producing fungi. Essential oils derived from aromatic plants such as cinnamon and clove have been shown to display antifungal properties. The current study tested the synergistic effects of oils. Potato Dextrose Agar (PDA) plates with these oils were inoculated with conidia. The ultra-structural changes of the hyphae and conidia after treatment were assessed using light microscopy, and both scanning and transmission electron microscopy. A combination of 100 ppm clove oil and 500 ppm cinnamon oil, inoculated in the same PDA plate, was found to be fungicidal. In addition, colony diameter decreased with increase in oil concentrations. A lethal dose of 100 ppm clove oil and 1000 ppm cinnamon oil, used in combination, inhibited approximately 65% of fungal growth after five days of treatment as compared to control. Exposure time affected the length of the germ tubes (2.2 cm at 72 h compared to 4.4 cm at 48 h). Hyphal walls and chitin layers appeared as precipitates. Disruption of the plasma membrane, and disorganization of cell organelles were also observed. We envisage further studies on the active ingredients of these oils to test their antifungal properties. The financial support by the department and college of Science and Mathematics is fully appreciated.

2:15 THE INFLUENCE OF A PREMATURE APPLE BLOOM IN NORTH GEORGIA ON THE ABUNDANCE OF NATIVE BEE SPECIES, Nicholas G. Stewart* and M. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Nearly 60 years of regional records illustrate that apples in north Georgia begin blooming around mid-April, ultimately completing by the 1st week of May. Because of this bloom period, apple-pollinating bees are constrained to very strict emergence periods in order to parallel the bloom while not emerging too early. While the 2010 bloom was in line with seasonal trends, in 2011 a warm-snap in mid-February stimulated apple trees to bloom during the last week of March, a full 3-weeks earlier than usual. This premature bloom ended before typical apple-blooming begins, which drastically influenced the native bee abundance. Native bees typically responsible for the bulk of apple-pollination were greatly reduced in abundance during the aberrant bloom conditions of 2011, while their species diversity remained static. Reduction in abundance especially occurred in species belonging to the sub-genus *Andrena (Melandrena)* (the most abundant native pollinators within flowering orchards), and the Halictid species within the tribe Augochlorini. Nearly all native bee taxa involved in apple pollination were far reduced in abundance compared to 2010 except for two of the earliest emerging genera which exhibited sharp increases in abundance, namely the carpenter bee and mason bees (*Xylocopa virginica* and *Osmia* spp. respectively). *Osmia* in particular increased 10-fold in abundance between 2010 and

2011 – an unusually high jump for a genus which tends to be rarely sampled in north Georgia orchards.

2:30 THE EFFECT OF FOREST FRAGMENTATION ON CARNIVORE SPECIES DIVERSITY AND DISTRIBUTION**, Nathaniel A. Wall* and M. A. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. The current study surveys mammalian carnivore species diversity in Georgia piedmont forests. The project utilized DLC Covert II digital infra-red trail cameras. Approximate camera site locations were determined using Google Earth, ensuring that camera sites were at least 1 km apart. Camera sites were located using a hand held GPS unit and compass. Once the camera was strapped to the trunk of a suitable tree, a scent lure was placed approximately 1 m from the camera centered in the field of view. The lure was created by dipping a stick in bobcat urine and placing it upright in the ground. Cameras were left out for a minimum of one week at each study site and digital photographs from them were examined. A variety of species were seen in the digital images including: whitetail deer, opossum, squirrel, rabbit, armadillo, grey and red fox, raccoon, coyote, and bobcat. Of these, the most abundant by far were the deer, though the rabbit, armadillo, and raccoon were similarly abundant in certain regions. Preliminary results support the claim that fragmentation affects the abundance of predators.

2:45 ASSESSING THE SUCCESS OF A THREE-DAY BIRD DIVERSITY SURVEY IN TORTUGUERO NATIONAL PARK (COSTA RICA), Sterling R. Brown* and M. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. During May of 2011, a small group of undergraduate students from Georgia Gwinnett College performed a three day bird survey in the Tortuguero National Park located in northeastern Costa Rica. Each day students observed birds for three to four hours while travelling down several different rivers, and two hours, while walking through the rainforest. Observations were made over the course of 3 days (approximately 16 hours). The students observed 120 – 150 different birds from 36 different species. Costa Rica has approximately 850 different species of birds. It is estimated that 383 of these bird species reside in the Tortuguero region. In effect the class observed and identified almost 10% of the estimated bird diversity. This value may be an underestimate, as not all species are present in the month of May. Of the 36 species observed, the Tiger Heron was most abundant. Other common species observed on the river were the Anhinga, Cattle Egret, White Egret, Great Blue Heron, Little Blue Heron, Tiger Heron, Ringed Kingfisher, and Pygmy Kingfisher. Rare birds observed near the river included the Sun Grebe, Roseate Spoonbill, Squirrel Cuckoo, and Great Potoo. The most common rainforest birds observed were the Rufous-tailed Hummingbird and the Keel-billed Toucan. Rare rainforest birds observed in the rainforest included the Black-throated Trogon, King Vulture, and the Slaty-tailed Trogon.

3:15 EFFECT OF SPADIX REMOVAL ON POLLINATION SUCCESS OF *PINELLIA PEDATISECTA*, Mark R. Thibodeau*, Frank S. Corotto, Mark S. Davis and Ashlee R. McCaskill, North Georgia College & State University, Dahlonega, GA 30597. The family Araceae comprises plants with a vase-like spathe enclosing a finger-like spadix that bears flowers towards its base. In most monoecious aroids, female flowers senesce before male flowers mature, making cross-pollination necessary. Insect pollinators are drawn by odors released from the distal spadix. We performed experiments on the aroid *Pinellia pedatisecta* to determine the role of the spadix in aroids that can self-fertilize. We found that fruit set occurs after removal of either the distal spadix or the staminate flowers but not after removal of both. These results indicate that *P. pedatisecta* self-fertilizes but also cross-fertilizes with the distal spadix attracting pollinators. Selfing would

allow sexual reproduction when there are no plants in close proximity to serve as pollen donors. Crossing would help maintain genetic diversity. Unfortunately, attempts to hand-pollinate plants that lacked staminate flowers and the distal spadix were unsuccessful. This result allows for the possibility that an injury response prevented fertilization in plants that received that experimental treatment. If so, we cannot rule out the possibility that cross-fertilization would have taken place in plants lacking male flowers and the distal spadix, with something other than the spadix attracting the pollinators. Funded by NGCSU's Center for Undergraduate Research and Creative Activities.

3:30 EFFECTS OF HEAT SHOCK PROTEIN 90 (HSP90) INHIBITORS ON REGENERATION AND BEHAVIOR IN THE PLANARIAN *DUGESIA TIGRINA* (PLATYHELMINTES: TURBELLARIA)**, Hillary Doyle*and M.S. Bodri, North Georgia College & State University, Dahlonega, GA 30597. There are no published studies that examine if heat shock proteins play any role in the regeneration of animal tissues. This study is being performed to determine if inhibitors of heat shock protein 90 (HSP90) have any effect on the behavior and ability to regenerate heads in the model organism *Dugesia tigrina* (Girard) (Platyhelminthes: Turbellaria). Serial dilutions of the geldanamycin analogs 17-AEP, 17-DMAG, 17-DMAP (500 µM, 50µM, 5 µM, 0.5 µM, 0.05 µM) and radicolol (80 µM, 40 µM, 20 µM, 10 µM, 5 µM) were used to establish toxicity concentrations for the planarian *Dugesia tigrina* (n=5/treatment). Ten groups of 10 randomly selected planaria were then exposed individually to 0.5µM or 1.0 µM concentrations of the geldanamycin analogs or 5 µM or 10 µM radicolol. Locomotor behavior was evaluated by counting the number of 0.5 x 0.5 cm gridlines crossed by the planarian during a 5-minute time span once transferred to the test solution in a 100 x 15 mm Petri plate. Atypical behaviors, if any, were noted and quantified. At the end of the behavioral evaluation, the original groups were reconstituted in identical test solutions following head amputation. Head regeneration in experimental groups and controls was monitored for ~10 days. Data will be analyzed by ANOVA and appropriate post-hoc tests.

3:45 MOLECULAR SYSTEMATICS OF *CHARACODON* (GOODEIDAE) BASED ON A PORTION OF THE NUCLEAR TYROSINE KINASE LOCUS X-SRC, A. E. Hildreth* and S. A. Webb, North Georgia College & State University, Dahlonega, GA 30597. Two extant species of *Characodon*, members of a livebearing, freshwater fish group from central Mexico, are presently recognized (*Characodon garmani* is extinct). *Characodon lateralis*, the type species of the genus, is widespread in the Rio Mezquital basin (state of Durango), while *Characodon audax* occurs within that drainage at a single northern locality. Previous morphological analysis has revealed problems with features considered diagnostic of these taxa, and recent mitochondrial DNA sequence data have revealed a strongly supported, north-south disjunction in distribution that also contradicts the taxonomy (*i.e., C. audax* was recovered in a clade with other northern populations). The present study aimed to assess the "traditional" and "mitochondrial" hypotheses through analysis of nuclear sequence data from the tyrosine kinase gene X-src. Approximately 314 bases were amplified and sequenced from four individuals (one each from two northern and southern populations) using standard molecular methods. The primers for PCR, developed from examination of alignments of previously published sequences, amplified a region spanning exons eight to ten of the gene. Sequence analysis revealed no hierarchical variation among the four populations at the X-src locus. Only one nucleotide substitution appears to have occurred among these samples collectively. These data are of limited value and are consistent with both hypotheses of relationships within the genus. Specimens for this study were graciously donated by J. Langhammer.

4:00 INITIAL CHARACTERIZATION OF THE PEL REGULATORY ELEMENT OF *PITX1* IN EMPETRICHTHYINE FISHES: AN EXPLANATION FOR THE ABSENCE OF PELVIC GIRDLES?, B.J. Przygoda* and S.A. Webb, North Georgia College & State University, Dahlonega, GA 30053. Common genetic mechanisms may explain how pelvic girdle reduction has occurred multiple times in vertebrates. Pelvic loss in sticklebacks (Gasterosteidae) has been attributed to deletion of a cis-acting regulatory region adjacent to the *Pituitary homeobox transcription factor 1 gene* (*Pitx1*). This pelvic enhancer region (*pel*) is believed to bind transcription factors that up-regulate *Pitx1* in the pelvic region of sticklebacks and presumably other vertebrates. In this study we investigated if loss of pelvic fins in the distantly-related Empetrichthyinae (Goodeidae) resulted from a deletion in this same regulatory region. DNA sequence from *Oryzias latipes* (Adrianichthyidae), the closest relative for whom data were available, was used to develop nested primers (three forward and three reverse) flanking the central pel region as described in sticklebacks. These primers were used in various combinations to PCR-amplify products from empetrichthyines *Crenichthys baileyi* and *Empetrichthys latos*, and pelvic fin-possessing goodeines *Chapalichthys pardalis* and *Goodea atripinnis* (controls). Most primer pairs failed to yield PCR products of appropriate size with the exception of 1289F-2124R (length in *Oryzias* = 836 bp). Goodeine amplification products were larger than empetrichthyine fragments—approximately 850 bp (although some much smaller secondary bands were observed) compared with 800 bp for *Crenichthys* and 475 bp for *Empetrichthys*. While 50 bp is a smaller size difference than that observed in sticklebacks, this pattern is consistent with the hypothesis that pel deletions may explain the loss of pelvic girdles in empetrichthyines. Funding was provided by the NGCSU School of Science & Health Professions.

4:15 EFFECTS OF EXPOSURE TO LEAD AND MERCURY ON DEVELOPMENT OF THE POSTERIOR LATERAL LINE IN EMBRYONIC ZEBRAFISH**, Kaylin E. Canup* and Linda G. Jones, Young Harris College, Young Harris, GA 30582. Both lead (Pb) and mercury (Hg) are environmental toxins known to have detrimental effects on development of the central nervous system leading to impairment of cognitive function and learning disabilities. In this study we compared the effects of exposure to lead (Pb) and mercury (Hg) on the development of the posterior lateral line (PLL), an important sensory system, in embryonic zebrafish (*Danio rerio*). Using a mouse monoclonal antibody against acetylated tubulin (found in newly developed neurons and their axonal extensions) we assessed the progressive linear development of the PLL by immuno-histochemistry (IHC) in zebrafish embryos. Incubations with and without Pb and Hg were started between two and four hours post fertilization (hpf) and continued until 32 hpf when embryos were anesthetized and fixed in 4% paraformaldehyde for subsequent IHC. Our preliminary results suggest that 10 nM Hg_2Cl_2 accelerates PLL development relative to control ($p < 0.05\%$). Treatment with 1 µM $PbCl_2$ and 1µM NaCl (used as a control for chloride) were not significantly different from control. We are repeating these experiments and will also determine whether Pb and Hg are toxic to hair cells along the PLL by staining with the vital dye DASPEI. *Funding for this project was from the Young Harris College Undergraduate Research Initiative.*

4:30 EFFECTS OF LIGHT EXPOSURE ON THE DEVELOPMENT OF MYELIN BASIC PROTEIN IN THE MYELIN SHEATH OF NEURONAL AXONS IN JUVENILE ZEBRAFISH**, Lauren K. Martin* and Linda G. Jones, Young Harris College, Young Harris, GA 30582. Higher latitudes and thus one's relative exposure to sunlight have been correlated with the incidence of multiple sclerosis, a degenerative autoimmune disorder of the central nervous system. In this study we compared the effects of

exposure to a full-spectrum light with exposure to no light during zebrafish (*Danio rerio*) development. We chose to assess the production of myelin basic protein (MBP) between the treatment groups because MBP is an important component of the myelin sheath that insulates neuronal axons and it is the target of autoimmunity in MS. Using a rabbit polyclonal antibody against MBP and a fluorescent secondary antibody, we assessed MBP production by immunohistochemistry at four to seven days post-fertilization. While the results were not consistent, the embryos exposed to light appeared to have better and more specific staining of MBP along axons. We are currently allowing the fish to develop for longer periods of time in order to determine whether more consistent results can be obtained. In addition, we will perform Western blotting as another means of assessing differences in MBP between the treatment groups. *Funding for this project was from the Young Harris College Undergraduate Research Initiative.*

Section II: Chemistry
Social Science Building Room 3023
Zewdu Gebeyehu, Presiding

2:45 PRELIMINARY STUDY ON POSSIBLE USAGE OF SEVERAL COMMERCIAL SOFTWARE AS A TOOL FOR DELIVERING ONLINE PRE-LAB QUIZZES AND ONLINE LAB REPORTS FOR AN ASSESSMENT, M.-H. Kim (Dunwoody), A. Cook (Decatur), M. Nelson (Clarkston), P. Roessle(Newton) and M. Burkart (Dunwoody), Georgia Perimeter College, Dunwoody, GA 30338. Several online commercial software programs (such as Respondus, OWL, WebAssign, MasteringChemistry, and others) are reviewed and explored for use as a possible tool for delivering pre-laboratory quizzes and lab reports for post-lab assessments. Most of the programs were found to be satisfactory for delivering and grading quizzes, tests and homework management. However, as far as lab reports and assessments are concerned, most of them (except WebAssign) were not satisfactory because of their limited functionality and capacity. The present work describes development of a method with WebAssign, that allows the program system to be served as a useful tool for assessment of lab work. Computer grading of lab reports for laboratory courses is desirable for many reasons. It is convenient and saves time for both students and instructors. Electronic grading offers students prompt feedback, providing accurate, uniform, and impartial grading. Some basic grading schemes and results from student's work will be presented with examples, such as acid/base titrations and other experiments.

3:00 THE INCORPORATION OF A MODERN MOLECULAR MODELING COMPONENT (SPARTAN STUDENT) INTO THE UNDERGRADUATE CHEMISTRY CURRICULUM, D. A. Jeffrey, Georgia Perimeter College, Clarkston, GA 30021. Having students of introductory college chemistry understand the complex, 3-D spatial relationships that comprise the critical aspect of molecular shape in modern medicinal and pharmaceutical chemistry is a great challenge for the instructor, student, and academic program alike. Traditionally, especially in organic chemistry, instructors have relied heavily on physical models (*i.e.*, 'ball-and-stick') to teach these topics; *e.g.*, conformational analysis. However, with the great improvement in the accessibility, cost, and usability of state-of-the-art 'molecular modeling' software applications, which now allow the student to "see" the molecules they have been studying in theory alone, it is natural to explore applications of these tools in the development and improvement of the undergraduate chemistry curriculum. The proposed presentation describes a pilot program conducted within Georgia Perimeter College over the past year or so, using the commercial pro-

gram, Spartan Student. These preliminary data, which include classroom demos followed by semi-quantitative polls, are very encouraging, and strongly suggest that further investment of resources are justified.

3:15 ANTIOXIDANT ACTIVITY AND PHENOLIC COMPOUNDS IN VARIOUS JUICES, K. Hodge*, B. Garduno* and C. Kim, Georgia Gwinnett College, Lawrenceville, GA 30043. Eight pure juices (apple, cranberry, grape, grapefruit, orange, pineapple, tomato, V8 original, and V8 essential antioxidant) were investigated for total amounts of antioxidant capacity and phenolic content. The trolox equivalent antioxidant capacity (TEAC in mmol of trolox/ml of juice sample) was used to determine total amounts of antioxidant capacity. In order to determine the total phenolic compounds, the *Folin-Ciocalteu* assay was used and the results were expressed as *Epicatechin* equivalent total phenolic amount (µmole of *epicatechin*/ml of juice sample). The juice samples were filtered and followed by centrifugation if needed to separate any solid particles. The filtrates were diluted with appropriate amount of distilled water to provide suitable absorbance data. When the original juice color interfere the absorbance of adopted methods, the absorbance was compensated. Among the nine juice samples, grape juice showed the highest total phenolic content and approximately three times more phenolic content than that for apple juice which showed the least content of phenolic compound. For the total antioxidant capacity, V8 essential antioxidant showed the highest TEAC value which is approximately seven times higher than that for pineapple juice. The results also showed that the TEAC values of the juices were positively correlated to total phenolic amounts.

3:30 **Break**

3:45 MOLECULAR MODELING OF A SERIES OF HSP90 INHIBITORS**, A. R. Hnatiak* and R. W. Zurales, Middle Georgia College, Cochran GA 31014. Inhibitors of the molecular *chaperone* heat shock protein 90 (Hsp90) are currently in clinical trials for the treatment of cancer. We have used molecular modeling and combinatorial chemistry to attempt to understand the binding strength of a series of Hsp90 inhibitors. Starting from crystal structures of three similar drugs bound to Hsp90, we identified the most important amino acid residues and deleted all other atoms. We added hydrogen atoms and performed a partial optimization. These three drugs had different groups at three different positions. We used these group geometries without further optimization to construct eighteen model drugs and determined their binding strength in a single-point calculation. We compare our calculated range and order of binding strength to the experimentally determined values.

4:00 MODELING THE ELECTROSTAIC INTERACTION IN ICE WITH THE POLARIZED CONTINUUM MODEL**, M. A. Knight * and R. W. Zurales, Middle Georgia College, Cochran GA 31014. We have used the polarized continuum model (PCM) to study the properties of ice in order to better understand the properties of water. In a PCM calculation, a solute molecule is placed in a cavity embedded in a continuum with a selected dielectric constant to approximately treat solvation effects. The cavity is formed by a series of interlocking spheres centered on each atom. The radii of the spheres are usually selected to reproduce experimental values for the solvation Gibbs energy for a small set of molecules. For pure water, this is the Gibbs energy for changing a mole of gas to a mole of liquid. At zero degrees Celsius, of course, this would be identical to changing a mole of gas to a mole of solid. We hope to better understand the PCM treatment of the enthalpic and entropic terms by comparing the treatment of pure water at zero degrees Celsius in the gas, liquid and solid phases.

4:15 COMPUTATIONAL STUDY OF GLYCOGEN PHOSPHORYLASE INHIBITORS**, S. D. Nazerian* and R. W. Zurales, Middle Georgia College, Cochran GA 31014. *Glycogen phosphorylase* (*GP*) catalyzes the key step in the breakdown of glycogen and its inhibition is a potential strategy for combating type 2 diabetes. Recently, crystal structures of *thiosemicarbazone* derivatives bound to GP have been reported. These derivatives have a *glucopyranosyl* group opposite an aromatic ring. The *glucopyransoyl* group is bound to the catalytic site while the aromatic ring occupies a nearby hydrophobic pocket. Kinetic studies determined that inhibition is most potent when halogens are attached to the aromatic ring in the *meta* position, a nitro group in the *para* position, but a hydroxyl group in the *ortho* position. We have attempted a computational study to correlate the kinetic data with the crystal structures. We have used *Gaussian09W* to model the binding of the aromatic ring using an ONIOM approach. The key interactions were calculated at the B3LYP level of density functional theory while other interactions were modeled using semi-empirical methods.

Section IV: Physics, Mathematics, Computer Science, Engineering and Technology
Social Science Building Room 2028
Hasson M. Tavossi, Presiding

2:00 ON THE OPTIMIZATION OF ELECTROLYSIS OF WATER, Roger Lascorz* and J. E. Hasbun, University of West Georgia, Carrollton, GA 30118. The goal of this research is to study the efficiency of electrolysis. If electrolysis is going to produce the hydrogen necessary for propulsion of vehicles it is imperative to try to do so with the least possible loss of energy. To this end, under a set voltage we record the current, temperature of the water, and the volumes of hydrogen and oxygen produced every 15 minutes for 3 hours. We repeated this for intervals of 0.5 volts and plotted the data using excel. We compared the experimental results with theoretical calculations. The measurements have been carried out with a particular concentration of salt. The data for the current versus voltage does not quite follow an ohmic behavior beyond a voltage of about 15 volts, and at higher voltages the current is proportional to the square of the voltage. It is also observed that current and volume are positively correlated. We have, however, observed that this is affected by the temperature. At some point the process' efficiency decreases due to I2R losses. In the hopes of achieving high efficiency and minimizing energy loss, we have investigated the minimum current to support electrolysis. This is related to the Gibbs free energy. We also believe that this is linked to the electrolyzed substance's bond energy. More recently, it has come to our attention that the rate of hydrogen and oxygen production is not the expected amount. This deviation from ideal proportions is higher for lower voltages and for higher salt concentrations.

2:15 EFFECTS OF PRESSURE ON SOUND WAVES**, William I. Floyd IV* and J.E. Hasbun, Department of Physics, University of West Georgia, Carrollton, GA 30118. In a gaseous medium, travelling acoustic wave characteristics are dependent upon the composition and thermodynamic state of the gas. We observe the changes of a particular acoustic sound wave due to a change in the atmospheric equilibrium pressure of the gaseous medium, with the use of a sound chamber; the design and construction of which has been an ongoing project with details and improvements that will be discussed. We observed the effects over a range of pressures, between 0.1 and 2.7 bar at room temperature, has on a sound pulse signal generated by computer/speaker. In our experimental measurements, we have focused on how the amplitude of the sound wave and

its speed are affected by the change in pressure. We will show our most recent measurements involving the speed of sound in the pressure range of 0.1 – 1.7 atm.

2:30 OBSERVATION OF OPTICAL DOPPLER EFFECT USING BEAT FREQUENCY MEASUREMENTS, D.C. McCall* and T. Colbert, Augusta State University, Augusta, GA 30904. Light from a Helium-Neon laser is split into two beams. One beam reflects from a moving mirror and interferes with the original beam at a photodiode detector. The reflected beam has a Doppler shifted frequency which depends on the speed of the reflecting mirror. The measured beat frequency, produced by the interference of the two beams, is used to calculate the speed of the mirror, which is then compared to a direct measurement of the mirror's speed. The moving mirror is mounted on a translator which is moved using a small DC motor. For typical mirror speeds used we measure a fractional change in the frequency, $\Delta f/f$ of 1.05×10^{-12}. We used an oscilloscope to acquire measurements of light intensity versus time. The oscilloscope allows for a direct measurement of the period of the beat signal. Alternatively we looked at a Fast Fourier Transform of an oscilloscope trace through many beat cycles, and acquire the peak beat frequency. Both measurements agree with the directly measured speed of the mirror.

2:45 LOW-COST, ULTRAVIOLET-INFRARED DUAL-BAND DETECTOR BASED ON LEAD SULFIDE QUANTUM DOTS EMBEDDED TIO_2 NANOPARTICLES**, Victoria Martin*[1], Ajith DeSilva[1], A. G. U. Perera[2], P. K. D. Duleepa and P. Pitigala[2], [1]Department of Physics, University of West Georgia, Carrollton, GA 30118 and [2]Department of Physics and Astronomy, Georgia State University, Atlanta, GA 30303. A single device capable of detecting photons in two or more spectral regions helps to reduce the cost and size of the detectors and will be useful in many applications such as mine detection and identification of the source of a fire. A photodetector, fabricated using low cost materials and techniques, and responding in the ultraviolet (UV) to infrared (IR) region is demonstrated. The device consists of a nano-porous TiO_2 film and lead sulfide quantum dots (PbS-QDs) that act as the UV and the IR absorbing layers respectively. At room temperature, the device shows a UV response from 350 – 400 nm with a peak responsivity of 2.3×10^4 V/W at 390 nm and visible-near IR response from 600 – 1100 nm with peak responsivity of 12×10^4 V/W at 720 nm for a biased of 3 V. The UV response arises from the interband absorption by TiO_2, and the IR response comes from the interband absorption of the PbS-QDs. By changing the size of PbS-QDs, the visible-near IR response can further extend into the far IR region.

3:00 **Break**

3:15 A NEUTRON DIFFRACTION STUDY OF THE IRON-BASED SUPERCONDUCTOR SRFE2AS2**, Phillip A. Martin*[1], Gary N. Chesnut[1], Yogesh K. Vohra[2], Walter Uhoya*[2] and Athena S. Sefat[3], [1]University of West Georgia, Carrollton, GA 30118, [2]University of Alabama at Birmingham, Birmingham, AL 35294 and [3]Oak Ridge National Laboratory, Oak Ridge, TN 37831. A new class of high temperature superconductors was discovered in 2009 known as iron-based superconductors (SC). The iron-based SC, $SrFe_2As_2$, was selected for a series of experiments to examine its properties and increase our understanding of the mechanisms behind superconductivity. This investigation included experiments conducted at the Spallation Neutron Source at Oak Ridge National Laboratory. Neutron diffraction experiments were conducted in order to examine the atomic, and magnetic structure of $SrFe_2As_2$. The experiments were performed in an attempt to establish a correlation between magnetic properties and structural properties in different at various pressures and temperatures.

3:30 NEUTRON DIFFRACTION EXPERIMENTS ON ELEMENTAL HOLMIUM, G. N. Chesnut[1], W. Uhoya*[2], S. A. Thomas*[2], Y. K. Vohra[2] and A. S. Sefat[3], [1]University of West Georgia, Carrollton, GA 30118, [2]University of Alabama at Birmingham, Birmingham, AL 35294 and [3]Oak Ridge National Laboratory, Oak Ridge, TN 37831. Rare earth metals like holmium have unique properties due to their electronic structure which is why they are used in applications such as lasers. The atomic structures of the rare earth metals have been studied extensively; however, the magnetic properties are not as well understood. The recent study utilizes neutron diffraction techniques to probe the magnetic structure of holmium. Experiments were performed at the Spallation Neutron Source at Oak Ridge National Laboratory. In the experiments the pressure and temperature of the sample was modified which changes the electronic, atomic, and magnetic configurations. The experiments reveal an extensive magnetic structure at low temperature and elevated pressure. The recent study provided high resolution atomic and magnetic structural data that will help us understand the fundamental behavior of rare earth metals, and insight into the effects of magnetic properties in general.

3:45 PHOTOLITHOGRAPHY OF QUANTUM DOTS IN A POLYMER MATRIX**, Brian Hubbard*[1], Raghuveer Gadipalli[1], Ajith Desilva[1], J. E. Hasbun[1] and Farooq Khan[2], [1]Department of Physics and [2]Department of Chemistry, University of West Georgia, Carrollton, GA 30118. The fabrication of optoelectronic devices with self-assembled quantum dots (QDs) is costly due to the nature of the growth techniques and the difficulty of controlling their size and uniformity, thus impractical to manufacture. Colloidal QDs are another form of inorganic semiconductor nanoparticles, which are suspended in a solution formed by inexpensive wet chemical methods. However, a major challenge in developing practical optoelectronics devices using these QDs is the difficulty of incorporating them into device structures. Patterning these colloidal QDs gives precision of structure as well as a less costly manufacturing alternative. The patterning of semiconducting QDs on glass substrates has been achieved, using ultra-violet light and laser photolithography techniques. CdSe QDs were synthesized and patterned using Cadmiumperchlorate and Selenourea salts as precursors, and 1-Thioglycerol as a capping agent. By changing UV light exposure time and or using different types of laser energies, the size of QDs can be tuned from around 1 – 300 nm. Photoluminescence spectra of CdSe QDs showed the peak energies from 600 nm to 630 nm, for various sizes of QDs produced. We used Lead Acetate and 1-Thioglycerol to synthesize and pattern PbS QDs, and explored the possibility of making hybrid polymer/QDs structures by pattering the QDs in Polyvinyl-Carbazole (PVK) layers. The synthesized methods, pattering procedures, as well as spectroscopic characterizations of the QDs will be presented.

4:00 POLYMER-BASED UV PHOTODETECTOR VIA SOLUTION PROCESSING**, Esther S. Machado*[1], Ajith DeSilva[1], A. G. U. Perera[2], P. K. D. Duleepa, and P. Pitigala[2], [1]University of West Georgia, Carrollton, GA 30118 and [2]Georgia State University, Atlanta GA 30303. Photoconductive detectors have a wide range of applications, particularly for astronomy and scientific instrumentation. Solution-processed organic films based on polyvinylcarbazol (PVK) were fabricated on Fluorine doped Tin Oxide (FTO) glass. A simple spin-coating method was employed to complete the device. The photodetector was characterized by UV-vis absorption, and photoluminescence spectra. The device's spectral response was studied, under the UV illumination, at room temperature, and it showed a UV response from 200 – 500 nm, with a peak responsivity of 1.0×10^4 V/W at 400 nm for a biased of 1 V. The UV response is attributed to HOMO – LUMO transition of PVK layer. The versatile nature of the polymer offers the ability to produce hydride flexible photon-detectors. In addition, the photon detection will be extended to a

second region; the PVK layer can be sensitized with quantum dots to transform the UV detector into a dual-band UV-IR detector.

4:15 VECTOR MEASUREMENTS OF THE GEOMAGNETIC FIELD IN THE REGION OF WEST GEORGIA**, Sara Strouss* and Ben de Mayo, University of West Georgia, Carrollton, GA 30118. Values of the geomagnetic field are very useful in locating such things as subterranean mineral deposits, and archeological habitations. We are measuring the vector components of the geomagnetic field at various locations using Vernier magnetic field sensors (MG-BTA) arranged in a mutually perpendicular configuration, along with a Vernier global positioning system (GPS) sensor (VGPS). These are connected to a Vernier LabQuest (LABQ) data logger; 1 000 measurements of the 3 magnetic field components, and the GPS location (latitude and longitude) are taken per site for a time span of 350 seconds. The data is next transferred to a computer in our lab. Excel is used to analyze the field data and Delta Graph is used for plotting. Magnetic field results so far for the east-west, north-south, and up-down components are + 0.53 Gs, + 0.32 Gs, and +0.95 Gs, respectively, where + means east, up, and north. The error is estimated to be ± 0.05 Gs; this value will become more definite as more measurements are taken. The GPS given latitude and longitude values are good to a stated radius of around 5 m. Using Google Earth satellite imagery, a three-dimensional map showing the vector representations of the geomagnetic field in our vicinity can be constructed. Supported by the Georgia Space Grant Consortium-NASA

4:30 THE GALVANIC EFFECTS ON SURFACE ROUGHNESS OF ALUMINUM, Liqiu Zheng, Lesshon Irby, Xiaomei Zheng, Louise Wrensford and K.C. Chan, Albany State University, Albany, GA 30904. It's well known that surface roughness contributes significantly to the lotus effect, also known as superhydrophobicity. It is still a technical challenge to render direct surface roughness to induce superhydrophobicity on metal. Besides roughening up metal surfaces mechanically such as sand blasting, scratching, chemical coating or vapor deposition etc. It is also possible to roughen the surface using galvanic approach. The galvanic process involves replacing metal atoms of the substrate by metal ions in the solution that the substrate submerges in. As a result the substrate surface become rough due to two processes; 1) the dissolution of surface layer resulted in craters on the surface and 2) the deposition of reduced metal ions from the solution clung to the substrate. We report here a systematic investigation of the deposition of copper ions on aluminum surface, by carefully controlling the replacement and deposition timing as well as the concentration of the solution. The roughness is measured using profilometer and electron microscope on the substrate surface as well as on deposited coatings. Initial evidence suggests that deposited coating plays a more significant role on the superhydrophobicity than that of the eroded substrate.

4:45 FEASIBILITY STUDIES OF WIND SPEEDS AND WIND TURBINES, Micah A. Bidwell, Robert Moore, Jr. and Bob Powell, University of West Georgia, Carrollton, GA 30118. Data has been collected over a 14 week period for wind speed, and electrical output of a wind turbine as the preliminary steps for consideration of on-campus generation of electricity. A Davis Vantage Vue Pro Weather Station, and an All Power America Wind Turbine - 400W have been used at the West Georgia Observatory to collect data. Wind speeds of about 14 km/hr are required to start the turbine, and it continues to turn if the wind speed is 10 km/hr. A second site is being developed for which higher and more consistent winds are likely.

5:00 SECOND HARMONIC GENERATION AND NON-LINEAR CORRECTIONS TO THE HIGH FREQUENCY SUSCEPTIBILITY OF A MULTIFERROIC MATERIAL, Philip D. Javernick* and Trinanjan Datta, Department of Chemistry and Physics, Augusta State University, Augusta, GA 30904. We consider the effects of non-linear (second order) corrections to the high-frequency susceptibilities of a material that is simultaneously ferroelectric and a canted antiferromagnet (multiferroic). The non-linear corrections introduce a second harmonic term in the magnetic, electric, and multiferroic susceptibilities. Using the Landau-Lifshitz equation of motion for the magnetic components and the Landau-Khalatnikov relaxation equation for the electric polarization we theoretically compute the non-linear corrections to the susceptibilities for the optic antiferromagnetic mode, the acoustic mode, and the electric susceptibilities up to second order. Using realistic material parameters we find that the corrections have either a noticeable or negligible effect on the first order susceptibility values.

SATURDAY PAPER PRESENTATIONS

***Denotes student presenter**
****Denotes student "in progress" research**

Section I: Biological Sciences
Social Science Building Room 3031
Paul Arnold, Presiding

8:30 REGULATION OF CADHERIN-MEDIATED CELL-CELL ADHESION BY THE PROINFLAMMATORY CYTOKINE IL-β, J.G Gober*, I.N Gober* and R. Singh, Department of Biology, Chemistry & Physics, Southern Polytechnic State University, Marietta, GA 30060. Interleukin-1β (IL-1β) is a pivotal proinflammatory cytokine associated with acute and chronic inflammation. IL-1β binds to a cell surface receptor and initiates the inflammatory response characterized by cell migration, cell proliferation, tissue repair and apoptosis. Previous research has shown that chronic inflammation is a potential cause of cancer development and may assist in the migration (metastasis) of cancerous cells. Although the mechanism is not understood, IL-1β is known to affect tumor growth and metastasis. A primary event that occurs in metastatic cells is the loss of cell-cell adhesion, which allows these cells to detach and migrate. Cadherins are transmembrane glycoproteins that mediate cell-cell adhesion and have been implicated in the metastatic process. These proteins form multi-protein adhesion complexes at the cell membrane. An essential protein present in cadherin adhesion complexes is β-catenin, which physically binds to cell surface cadherins and links them to intracellular cell components. Loss of cadherin-based adhesion can cause malignant cells to escape and metastasize. We hypothesize that cadherin and components of its adhesion complex such as β-catenin are targets of IL-1β signal transduction. Using Western blotting, we have demonstrated that the treatment of MDCK cells (canine epithelial cells) with IL-1β decreases the plasma membrane expression of cadherin and β−catenin. This suggests that IL-1β promotes the disassembly of cadherin-catenin cell adhesion complexes present at the cell membrane, leading to decreased cell-cell adhesion. By identifying the pathway through which IL-1βdisrupts cadherin-based adherens junctions, we hope to find the connection between chronic inflammation and metastasis.

8:45 COMPARISON OF METHODS FOR INVESTIGATING SMALL-MAMMAL POPULATION DYNAMICS**, Erin E. Froetschel*, Terry L. Barrett and Gary W. Barrett, Eugene P. Odum School of Ecology, University of Georgia, Athens, Georgia 30602-2202. Investigation of small-mammal populations requires an effective method to estimate population size. Various mark-recapture devices have been traditionally configured to capture small mammals, such as the HB Sherman live trap, nest box, and nest tube. This study investigated the effectiveness of each of these devices for estimating the abundance of the white-footed mouse, *Peromyscus leucopus*, a common inhabitant of the North Georgia Piedmont. Five transects, each containing twelve stations (four stations per method), were established within deciduous-forest habitat located at HorseShoe Bend Ecology Experimental Site. All devices were mounted 1.5 m aboveground on mature water oaks, *Quercus nigra*, of similar diameter at breast height (DBH; $\overline{\chi}$ = 47.9 cm). Capture of *P. leucopus* was conducted from 28 September 2010 through 1 October 2011. A total of 94 different animals were captured and marked (57 males and 37 females). There were significantly more males than females within the population (χ^2 = 4.26, df = 1; $P < 0.05$). Of 685 total captures, 82.2% were captured in live traps, 7.6% nest boxes, and 10.2% nest tubes. There was a seasonal trend in capture; nest boxes and

nest tubes were occupied frequently during autumn and winter months (*i.e.*, during the months of reproduction), whereas the HB Sherman live traps were occupied consistently throughout the year.

9:00 A PRELIMINARY ANALYSIS OF ENAMEL HYPOPLASIA IN WHITE-TAILED DEER FROM THE PIEDMONT NATIONAL WILDLIFE REFUGE, GEORGIA**, Haley S. Davis* and Alfred J. Mead, Georgia College, Milledgeville, GA 31061. Amelogenesis involves the formation of enamel by sheets of cells called ameloblasts. Interruption of this process, typically due to a severe physiological stress, results in a permanent defect, known as enamel hypoplasia, on the tooth crown. Three main types of enamel hypoplasia are generally recognized: linear furrows, single large pits or a row of pits, and slight creases in the enamel known as swales. Hypoplasia in humans has been linked to premature birth, fever, diabetes, vitamin deficiency, and weaning stress. In addition to these physiological stressors, fluoride toxicosis, malnutrition and illness have been correlated with the occurrence of enamel hypoplasia in other mammals. In this study, the mandibles of 343 white-tailed deer, *Odocoileus virginianus*, were examined for signs of enamel hypoplasia using a dissecting microscope. For each observed defect, we recorded the affected tooth, crown location, and type and severity of the enamel hypoplasia. The sex and age of each animal was recorded in an earlier study and will be utilized along with our data to determine if enamel hypoplasia is linked to a particular developmental age and /or gender in white-tailed deer.

9:15 GENETIC AND PHYSIOLOGICAL CHARACTERIZATION OF COPPER-UTILIZATION MUTANTS IN *SACCHAROMYCES CEREVISIAE*, Lauren A. Neill* and Brian W. Schwartz, Columbus State University, Columbus, GA 31907. The yeast *Saccharomyces cerevisiae* serves as a useful model system for identifying genes involved in basic cellular functions, including copper utilization. Copper is an essential cofactor for many enzymes, and it is toxic when present in excess. We have identified a number of yeast mutants that are defective in copper utilization. Specifically, the mutants form brown colonies in the presence of copper, whereas the reference strain (HA0) forms white colonies. Previous work indicates that mutations in three genes (*brn1, brn2*, and *brn3*) produce the brown phenotype. An additional four mutant strains have been isolated that develop color more slowly than those described previously. The objectives of this study were (1) to determine the relationships among the new mutants and between the new mutants and those isolated previously and (2) to determine the sensitivity of the brown mutants to copper compared to the reference strain. Complementation test results indicate that two of the strains express mutations in a previously unknown gene designated *brn4*, and one of the strains expresses a mutation in a new gene designated *brn5*. Results for one of the mutants so far are inconclusive. Results of studies on the growth of normal and mutant strains in the presence of various concentrations of copper (1, 2, 3.5, and 5 mM) indicate that the mutants that express the brown phenotype more quickly are substantially more sensitive to copper than the normal strain, whereas those mutants that express the brown phenotype more slowly may be slightly more sensitive to copper than the normal strain.

9:30 BASELINE SURVEY OF ROAD-KILL VERTEBRATES IN BALDWIN COUNTY, GEORGIA**, Evan R. Boitet*, Alfred J. Mead and Doug R. Oetter, Georgia College, Milledgeville, GA 31061. The spatial arrangement of differing landscapes along roadsides and seasonal patterns of animal movements influence the distribution of road-kill found along highways. Identification of landscape patterns contributing to aggregations of all vertebrate road-kill, and identification of seasonal movement for individual

species will assist predictions of road-kill locations and rates. The road type and traffic volume on an individual road are also expected to influence the frequency of vertebrate fatalities. In the present study, beginning in January 2011 and ending in January 2012, 19.79 km of roadways in Baldwin County, GA were surveyed for vertebrate road-kill. The survey route consisted of 6.92 km on a five-lane state highway, 7.72 km on a two-lane state highway, and 6.76 km on a two-lane paved county road. The route was travelled three days a week throughout the year. Each roadway was coded for differing habitat types and obstacles along its length. Four times during the observation period the route was travelled each day of one week in order to determine the length of time an individual road-kill specimen typically remains on the roadway. For each specimen we recorded the species, date, and location (using a handheld GPS). Specimens that remained on the roadway for the succeeding survey were only counted once. Spatial data will be mapped in ArcGIS to display the spatial arrangement and distribution of all road-kill found during the study.

9:45 A COMPARISON OF EASTERN GRAY SQUIRREL (*SCIURUS CAROLINENSIS*) NESTING BEHAVIOR AMONG HABITATS DIFFERING IN ANTHROPOGENIC DISTURBANCE, Elizabeth C. Williams* and J. Michelle Cawthorn, Georgia Southern University, Statesboro, GA 30460. Eastern gray squirrels inhabit a large range of heterogeneous habitats and climates and live with various levels of anthropogenic disturbance. Previous studies have examined this species in unmodified and modified surroundings; however, a comparison of populations between these habitats has yet to be published. Their widespread occurrence, coupled with their success in urban areas and the invasive nature of introduced populations, suggests that this species is behaviorally flexible in terms of both food choice and reproductive behavior. The purpose of this study was to determine the effect of anthropogenic disturbance and development on gray squirrel nesting behavior by comparing variables related to nesting habitat preference among habitats of differing levels of anthropogenic disturbance. Among the habitats, food trees were preferred over non-food trees and nests were built at a height of approximately 12 m. Tree size preferences tended toward those at least 10 cm in diameter. Trees used in developed areas were larger than trees in natural areas, due to availability; but a trend toward larger trees was observed in undeveloped areas as well. Based on nesting behavior, eastern gray squirrel populations do not appear to be adversely affected by anthropogenic modification.

10:00 **Section Business Meeting**

10:30 DIVERSITY OF INDICATOR ORGANISMS IN ENVIRONMENTAL WATERS, V. L. Chivukula, Atlanta Metropolitan College, Atlanta, GA. Identification of sources of fecal contamination in water can contribute to accurate risk assessments and water quality restoration. Water quality studies have rarely considered the diversity of indicator organism populations, yet disturbance to an ecosystem (such as fecal contamination) may impact the diversity and/or community structure of the microbial population, which could in turn affect the performance of microbial source tracking (MST) efforts. The hypothesis that fecal contamination in bodies of water affects both indicator organism (IO) diversity and bacterial community structure was investigated in river waters and sediments in watersheds with different human population densities, and also in sewage. 16S rRNA restriction fragment length polymorphism, ribotyping, and denaturing gradient gel electrophoresis determined total coliform, *Escherichia coli*, and bacterial community population structures, respectively. IO concentrations were significantly different among sites in sediment, but not water samples. Population diversity measurements were

not significantly different among the river sites, but tended to be highest in sewage. Accumulation curves used to estimate the sample size indicated that at most sites, more than 20 isolates per sample are needed to represent the dominant populations, and many curves did not reach saturation (slope 0) suggesting inadequate sampling with 30 isolates. Indicator population and bacterial community structures were dissimilar in water column vs. sediment samples, and the E. coli population in unimpacted (minimal anthropogenic impact) sediments formed an outgroup, suggesting differential survival of certain subtypes. Currently, our lab is focused on the enumeration of IOs including *Bacteroides spp*. and Human Polyomaviruses in surface waters in and around Atlanta, GA.

10:45 IDENTIFICATION OF AN ANTIOXIDANT CAPABLE OF INHIBITING PHIP- INDUCED CELL PROLIFERATION AND DNA DAMAGE, Ashok Jain, Albany State University, Albany, GA 31705. Heterocyclic amines (HCAs) are formed when meat products such as beef, chicken, pork, and fish are cooked at high temperatures. These amines have been shown to be carcinogenic and are considered major risk factors of cancer initiation, especially breast cancer. 2-Amino-1-methyl-6-phenylimidazol [4, 5-b]-pyridine (PhIP) is the most abundant HCA found in well-done and grilled meats. The objective of this study is to identify an antioxidant that is effective in inhibiting the PhIP toxicity. Breast epithelial (MCF 10A) cells were treated with PhIP (50 µM and 100 µM) in the presence and absence of antioxidants namely ascorbic acid (AsA – 10mM), Glutathione (GHS – 10mM), and N-acetyl-cysteine (NAC – 10mM), alpha-tocopherol (Vitamin E - 50 µM), [6]-gingerol (50 µM and 100 µM), [10]-gingerol (5 µM and 10 µM), lycopene (1 µM and 5 µM), and curcumin (25 µM and 50 µM). The interaction of PhIP and phytochemicals were evaluated by cell proliferation, cell viability assay and for DNA damage by comet assay. The results indicate that PhIP causes induction of Reactive Oxygen Species (ROS) and induces cell proliferation and DNA damage. Cell viability is not affected by the presence of PhIP or antioxidant as compared to the control. Antioxidants show protective effects because they inhibit PhIP induced cell proliferation and DNA damage. However, the degree of protective effect varies with the type of antioxidant present. NAC is highly effective in inhibiting the PhIP induced cell proliferation and DNA damage. GHS, lycopene and alpha-tocopherol are quite effective, whereas, [6] gingerol, [10] gingerol and curcumin are moderately effective in inhibiting the PhIP induced proliferation and DNA strand breakage. Further, studies will uncover the interaction of genotoxic/carcinogenic heterocyclic amines and chemopreventive effects of dietary supplements.

POSTERS

THE BENEFITS OF AVIAN EGG ROTATION: NATURE'S DEFENSE AGAINST PATHOGENS, Raymond Akinnawo*, A. Aluko and A. Lester, Department of Biology and Physics, Kennesaw State University, Kennesaw, GA 30144. Avian egg rotation has been characterized as a beneficial practice to improve the hatchability of avian eggs in nature as well as in the poultry science industry. While there is common agreement that this process is beneficial, there is considerable question as to how this process works. This study proposes that egg rotation has antimicrobial effects that protect the developing embryo from harmful pathogens. Pathogens that penetrate the top side of the eggshell pores gain ready access to the defenseless developing embryo while pathogens that penetrate from the bottom of the egg become trapped in the immobilizing lysozyme-rich albumen. Results indicate that bacteria transformed with an antibiotic resistant plasmid fail to grow when cultured in the presence of egg white albumen, while similar bacteria grow in the absence of albumen. Additionally, embryos contaminated with bacteria incubated 24 hours in the presence of albumen show little or no contamination, while embryos

contaminated with untreated bacteria quickly die. Results indicate that egg white albumen is an effective antimicrobial agent to control bacterial growth. Additionally, egg white albumen appears to be highly effective in protecting the embryos from fatal bacterial contamination. These results suggest that natural selection may have favored egg rotation as a mechanism to protect the developing embryo prior to the embryological development of an effective immune system.

ARGENTINE ANT (HYMENOPTERA: FORMICIDAE) MORTALITY FOLLOWING EXPOSURE TO SODIUM SALICYLATE AND SODIUM CINNAMATE**, Megan Babb*, J. Connell*, J. Parker*, M. Brinkman and C. Lee, Gordon College, Barnesville, GA 30204. The Argentine ant, *Linepithema humile* (Mayr), is native to South America and has become a significant pest in the southern United States, so safe methods of control are needed for domestic environments. Sodium salicylate and sodium cinnamate are water soluble derivatives of organic compounds found in nature in the form of plant defensins. Mortality of worker ants was assessed following exposure to phenolic compound powders. Three replicates of 20 ants were used in each experiment. Compounds used were salicylic acid, cinnamic acid, coumaric acid, caffeic acid, and untreated control. Ants were housed in 708 mL plastic containers with the powders evenly distributed on the bottoms, and were fed 10% sucrose. Argentine ant mortality after three days exposure to salicylic acid and cinnamic acid powder was significantly ($F= 92.27$, $P<0.0001$) higher than mortality for ants in untreated control, coumaric acid, and caffeic acid. Mortality of worker ants exposed to untreated control (10% sucrose dissolved in deionized water) and a range of concentrations of sodium cinnamate was evaluated by laboratory bioassay. Sodium cinnamate was tested in 10% sucrose at 0.675, 1.25, 2.5, and 5.0% concentration. Three replicates of 20 ants were used in each treatment. Mortality was measured as the percentage of worker ants that died within 72 hours post-exposure. Mortalities of workers were 18, 31, 7, 29, and 68%, from lowest (control) to highest exposure concentration, respectively. Mortality after three days exposure to 5.0% sodium cinnamate solution was significantly higher ($F=9.08$, $P<0.0001$) than for the other sodium cinnamate treatments and the control.

CORRELATION BETWEEN FECAL COLIFORMS, ENTEROCOCCI, HUMAN POLYOMAVIRUSES, AND *BACTEROIDES* IN SURFACE WATERS AROUND ATLANTA, GA**, A.J. Beatles*, B.O. Mitchell and V.L. Chivukula, Atlanta Metropolitan College, Atlanta GA 30310. Fecal coliforms and enterococci are used as indicators for water quality both for fresh and marine waters as pathogen enumeration is not only laborious and time consuming but also practically impossible. Previous studies have shown poor correlation between these indicators and pathogenic viruses in the environment. This study is to determine the correlation between indicator organisms, specifically fecal coliform, enterococci, and *Bacteroides* spp. and human polyomaviruses, a human pathogen that can cause diseases of the respiratory tract, and urinary tract, especially in immunocompromised patients. Water samples will be collected from various watersheds around Atlanta and transported aseptically to the lab on ice. These samples will be filtered through a 0.45µm membrane filter and placed on mFC and mEI media to enumerate the fecal coliform and Enterococci respectively. After that is done the water samples will be adjusted to pH 3.5 and filtered through the membrane filter. Then they will be processed for DNA extraction. Next the DNA will be amplified by PCR using specific primers for *Bacteroides* spp. and Human Polyomaviruses and their presence will be determined using electrophoresis. The correlation between the bacterial indicators and the viruses will be determined using statistical analysis. This study is funded by LSAMP and NASA.

ACOUSTICALLY DETERMINED BAT ACTIVITY DURING THE SUMMER TO FALL SEASONAL TRANSITION IN LAMAR COUNTY, GEORGIA, Michael J. Bender, G.D. Hartman and V. Uzezi, Gordon College, Barnesville, GA 30204. Bat activity during the warm summer months is well documented, but little information is available concerning activity patterns as the season progresses from summer to winter in Georgia. We hypothesized that bat activity would decline, but that bats would remain active during the seasonal transition. To test this hypothesis, we measured bat activity in Barnesville, Georgia using echolocation calls as an index of bat activity. Nightly activity was recorded using an ANABAT SD2 bat detector every night from 11 August 2011 to 11 November 2011. Activity level often varied markedly from night to night, but preliminary analyses suggest that higher average nightly temperatures correlated with higher activity levels. Within-night results for the first month of monitoring indicate that activity increased to a peak between 5 and 6 hours post-sunset and then decreased gradually to sunrise. This pattern differs from the bimodal activity peaks often observed using acoustic monitoring.

BINDING OF CALMODULIN-TROPONIN C CHIMERAS TO NITRIC OXIDE SYNTHASES, Christopher C. Brown[1]*, Stephanie A. Hill[1], Dipak Ghosh[2], John C. Salerno[2] and Jonathan L. McMurry[1], Departments of [1]Chemistry & Biochemistry and [2]Biology, Kennesaw State University, Kennesaw, GA 30144. Endothelial and neuronal nitric oxide synthases (eNOS and nNOS) are signal-generating enzymes with numerous physiological effects including angiogenesis and signaling at synapses. Calmodulin (CaM) is an important regulator of NOS activity. Following on our recent report describing the kinetics of CaM-NOS binding, present results describe binding of nNOS and eNOS to Calmodulin-Troponin C (CaM, TnC) chimeras differing in EF hand domain composition. CaM and TnC have similar structures consisting of two globular domains linked by a central helix with each domain consisting of two EF hands. Chimeras examined included each of the four domains of TnC exchanged for the analogous CaM domain. Chimeras exhibited a wide range of rate and affinity constants as determined by optical biosensing, generally reflecting their ability to activate eNOS and nNOS. Affinities ranged from subnanomolar to micromolar. Binding was rapidly dissociable in the presence of EDTA, confirming that observed binding was calcium-dependent.

DIGITAL SELF-DETERMINATION: HOW THE OPEN-SOURCE REVOLUTION BENEFITS BIOLOGISTS, S.C. Burnett, Clayton State University, Morrow, GA 30260. Changes in the way software and hardware are distributed have produced dramatic changes in the way these technologies can be used. Of particular interest is the widespread development of open-source technologies in the 1990's in contrast to the proprietary technologies that are associated with most hardware and software. The proliferation of open-source tools provides biologists with low-cost, easily modified solutions that can be used for both research and teaching. The benefits of open-source technologies also include direct control over your data collection and a worldwide group of users who can provide feedback and technical support when you encounter difficulties. I have focused on the use of the Arduino, a general-purpose microcontroller device, which allow one to collect data and interface with those data in a variety of ways. I have used Arduino-based devices as teaching tools in classrooms from elementary schools to college and as data recording devices for a variety of research projects. The flexibility to design and quickly implement solutions to different problems allows these devices to serve multiple purposes easily. These tools are designed for those with limited experience with electronics or programming. This makes them useful for most faculty and students they as they do not require extensive training to use. Partial funding for these projects was provided by the College of Arts & Sciences at Clayton State University.

THE ISOLATION, IDENTIFICATION, AND CHARACTERIZATION OF A *STAPHYLOCOCCUS* SPECIES ISOLATED FROM THE EARS OF *CANIS FAMILIARIS***, James M. Campbell* and C. Bates, Augusta State University, Augusta, GA 30904. The purpose of this study was to identify and characterize one or more bacterial species isolated from the ears of *Canis familiaris*. Bacterial isolates were characterized by various microbiological techniques including: microscopy and staining, biochemical and physiological assays, and susceptibility to various antibiotics. We have identified one isolate as either *Staphylococcus simulans* or *Staphylococcus warneri*, and we plan to utilize PCR to amplify and sequence the 16S rRNA gene to distinguish between the two. This *Staphylococcus* species produces an extracellular β-lactamase and is resistant to both ampicillin and oxacillin, however the full contribution to drug resistance by β-lactamase is unknown.

EXPLORING THE URBAN OLD-GROWTH: DENDROCHRONOLOGY OF THE FERNBANK FOREST, Megan Chapman*, M.P. Weand and E. Dickerson, Department of Biology, Chemistry and Physics, Southern Polytechnic State University, Marietta, GA 30060. Urban forest fragments are often small, even-aged, frequently disturbed, and therefore dominated by early successional tree species. In contrast, Fernbank Forest in Atlanta is a 65 acre forest with a relatively anomalous history. Despite changing ownership several times in the last century, the inner area of the forest (50 acres) has been maintained largely intact, free from significant disturbance, and currently contains many large diameter trees thought to be "old-growth" or "virgin forest." The existence of old-growth trees in an urban setting would add conservation value to the forest. The preliminary goal of our study was to age Fernbank's trees and determine historical tree population dynamics. An increment borer was used to take tree cores from 38 trees representing 12 species within Fernbank Forest. Cores were aged by counting the growth rings from pith to bark. Mean tree age was 132 ± 10 years and the oldest tree sampled was a 285 year old *Quercus alba*. Twenty-eight trees were older than 100 years (74%) and *Liriodendron tulipifera* tended to be the oldest with a mean age of 186 ± 22 years. Tree age was significantly correlated with tree diameter at breast height (r^2=0.55, P<0.0001). The oldest species in the forest (present for at least 170 years) are *L. tulipifera, Q. alba, Quercus stellata*, and *Liquidambar styraciflua*. Younger species (aged 50 years or less) included *Carpinus carolina, Nyssa sylvatica* and *Oxydendrum arboretum*. The uneven age distribution, with a large number of old trees, suggests that Fernbank represents unique habitat within urban Atlanta and supports the conservation value of the forest.

HSP90 INTERACTIONS WITH NITRIC OXIDE SYNTHASES, Chioma M. Enweani[1], Dipak Ghosh[2], Carol A. Chrestensen[1], Jonathan L. McMurry[1] and John C. Salerno[2], Departments of [1]Chemistry & Biochemistry and [2]Biology, Kennesaw State University, Kennesaw, GA 30144. HSP90 has been implicated in interactions with both eNOS and nNOS that have regulatory significance. Phosphorylation of NOS may influence complex formation, and interaction with HSP90 may be an obligatory part of the trafficking mechanism that localizes eNOS. HSP90 has been shown to increase the cytochrome c reductase and NO synthesis activities of NOS in the presence of calmodulin (CaM), as well as permit NO synthesis at lower Ca^{+2}. Here we show that both eNOS and nNOS bind to immobilized HSP90 with moderate affinity (~200-500 nM). Above the K_d, both bind with near diffusion limited rates and show a second slow phase during which the shift of the interference pattern is significantly reduced. HSP90 binding to both eNOS and nNOS greatly increases the rate of cytochrome c reduction. The rates of CaM stimulated cytochrome c reduction in the absence of HSP90 are ~1200 and 1600 min^{-1} respectively for eNOS and nNOS holoenzyme; HSP90 increased these rates 3-5 fold, giving a maximum rate of ~4800 min^{-1} for eNOS and ~6500min^{-1} for nNOS. Results from FMN

fluorescence lifetime experiments show that, like calmodulin, HSP90 binding reduces conformational restrictions that favor a conformation in which FMN is in close contact with FAD, allowing operation of the shuttle in which FMN supplies reducing equivalents to the oxygenase site.

FALL MACROINVERTEBRATE DRIFT IN LOW-ORDER STREAMS, Liz French*, Mary Beth Dooley*, Christian Haygood*, Britton Smith* and Mark S. Davis, North Georgia College & State University, Dahlonega, GA 30597. Drift, the downstream transport of aquatic organisms in stream current, enables organisms to colonize new areas and escape conditions that are potentially unfavorable. We investigated drift diversity of benthic macroinvertebrates in two low-order streams in the foothills of the southern Appalachians (Lumpkin County, GA) during October and November 2011. Standard drift nets were established in two streams, both tributaries of Yahoola Creek in the Chestatee River watershed. One was an unnamed first-order stream, and the other was Bryant Creek, a third-order stream. Each stream was sampled eight times on different dates for two-hour intervals. There were four samples were taking in the evening (a period of two hours after sunset) and four samples were taken in the morning (a period of two hours after sunrise). Captured specimens were preserved in ethanol and identified using stereomicroscopes within 24 h of retrieval. Samples typically yielded less than 10 specimens each, and were mostly composed of Plecoptera, Ephemeroptera, Trichoptera, and Diptera. We quantified sample diversity using the Shannon Index (H'). H' values were transformed with a standard square root transformation and analyzed using a two-way ANOVA, with time of day and stream order as independent variables. There was no significant main effect of time of day ($F_{1,1}$ = 1.13, P = 0.31) or stream order ($F_{1,1}$ = 1.6, P = 0.23) and no time*order interaction effect ($F_{1,12}$ = 0.58, P = 0.46). Our data indicate minimal drift in these streams during the fall, and we plan to compare these results with spring 2012 samples.

A UNIQUE DISCOVERY: ZINC TOLERANCE ON SERPENTINE IN GEORGIA, Mary E. Gadalla* and Zachary W. Bloomer*, Augusta State University, Augusta, GA 30904. *Pediomelum piedmontanum* (Fabaceae) is a recently discovered endangered plant species that exists in the lower piedmont of Georgia and South Carolina. It features only one known serpentine population in Georgia at Burke's Mt. in Columbia County. It remains unclear why this species is so rare and restricted in habitat. We hypothesize that local adaptations to metals present in the substrate may provide insight into its limited distribution. Serpentine [$Mg_3Si_2O_5$] refers to a mineral and a soil derived from ultramafic rocks, which are high in magnesium and iron. A typical characteristic of serpentine soil contains a high abundance of toxic heavy metals particularly nickel and chromium. Our lab has previously shown that this species is tolerant from 10-50µM $NiSO_4$. Because many serpentine species in Europe and a few in the Western United States are co-tolerant to both Ni and Zn, we tested zinc tolerance and found that this plant is tolerant to up to 100µM Zn. To find zinc tolerance above 10µM Zn from a population on serpentine in the Southeastern United States is a unique discovery. This research is important for bioremediation purposes. We thank the Augusta State University Biology Department for providing funding for this research.

THE PROPAGATION AND RE-INTRODUCTION OF ENDANGERED PLANT SPECIES *ASPLENIUM HETERORESILIENS, DRABA APRICA, GENTIANOPSIS CRINITA*, AND *OXYPOLIS CANBYI* FOR HABITATS AND ESTABLISHMENT INTO SAFE-GUARDING SITES FOR THE PURPOSE OF SPECIES PRESERVATION**, H.J. Gladfelter, J.E. Mitchell*, D.L. Coverson*, R.L. Jones*, J.B. Wallace*, L.F. Mason* and

J.B. Shrout, Brenau University, Gainesville, GA 30501. With many native and endangered plants, seed collection is a challenge because of inherent difficulties in collection, low seed yield, viability, and germination. In addition, sites for collection are few and the amount of seed and plant material is limited. This research project focuses on using plant tissue culture methods, specifically *in vitro* micro-propagation, as well has traditional horticultural propagation methods, to enhance the population of four endangered species in Georgia: *Asplenium heteroresiliens* Wagner (Marl spleenwort), *Draba aprica* Beadle (Sun-loving draba), *Gentianopsis crinita* (Froelich) Ma (Fringed gentian), and *Oxypolis canbyi* (Coulter & Rose) Fernald (Canby's dropwort). The results of our investigation will shed light on the use of alternative propagation methods for preserving some of Georgia's endangered plants and potentially increasing the populations of these species.

TUMOR NECROSIS FACTOR INDUCED RELEASE OF FREE FATTY ACID FROM EPITHELIAL CELLS ANALYZED BY GAS CHROMATOGRAPHY COUPLED MASS SPECTROSCOPY**, Isaiah Gober*, Wei Zhou and Rajnish Singh, Department of Biology Chemistry & Physics, Southern Polytechnic State University, Marietta, GA 30060. Tumor Necrosis Factor-α (TNF-α) is one of the principle cytokines that are secreted by macrophages and plays a central role in the regulation of inflammation, immune response, cell survival, proliferation and apoptosis. TNF-α binds to a specific cell surface receptor to elicit its cellular effects. One of the primary effects of TNF-α is on lipid metabolism. TNF-α induces the activation of enzymes such as phospholipaseA_2 which cleave cell membrane phospholipids to release fatty acids such as arachidonic acid. These fatty acids become precursors for lipid derived metabolites that are required to mediate the effects of TNF-α in cells. Several lipid metabolites such as arachidonic acid have been identified using in vitro assays with cells in tissue culture and recombinant TNF-α. These assays are not very sensitive and rely on the addition of radio labeled exogenous fatty acids because the release of endogenous fatty acids from membranes is very small. The goal of this project was to use gas chromatography - mass spectroscopy (GC-MS) to identify and quantify lipids released by epithelial cells when stimulated with recombinant TNF-α. Canine epithelial cells were treated with TNF-α for 3 hours and lipids from the culture media were extracted and initially analyzed by thin layer chromatography. TNF-α stimulated cells showed a greater presence of lipids in cell culture media than the control cells. GC-MS analysis of the lipid extract suggested the presence of a carbon sixteen, saturated fatty acid: palmitic acid. More quantitative analysis of palmitic acid is pending. However, preliminary data shows that TNF-α induces an increase in release of palmitic acid and that palmitic acid maybe involved in mediating TNF-α signal transduction in cells.

RELATIONSHIP BETWEEN CNR1 GENE VARIATION AND BEHAVIORAL DIFFERENCES AMONG *KRYPTOLEBIAS MARMORATUS* LABORATORY ISOGENIC LINES**, A.Gopinath*, J.F.Elder and B.C.Ring, Valdosta State University, Valdosta, GA 31698. The endocannabinoid system (ECS) is composed of molecules that include endogenous cannabinoids (endocannabinoids), cannabinoid receptors and the enzymes that regulate the concentration of endocannabionoids. In human beings and other vertebrate models the ECS is implicated in the regulation of several bodily functions from appetite regulation to processing rewards. The cnr1 (Cannabinoid receptor 1 gene) gene encodes the CB1 receptor (Cannabinoid receptor 1) which is an integral part of this system. Polymorphism in the cnr1 gene in humans is associated with substance addiction, depression, anorexia and several other disorders. *Kryptolebias marmoratus* (kmar) are self fertilizing hermaphrodites that produce clonal progeny. This study aims to sequence the cnr1 gene in four isogenic lines of kmar and correlate polymorphism to behavioral differences. Since the dynamics of the ECS is yet to be fully characterized in any organism,

a significant result could help provide the spark to encourage study of the ECS in this simple vertebrate.

SPECIES RICHNESS AND RECORDS OF BATS (MAMMALIA: CHIROPTERA) IN WEST-CENTRAL GEORGIA, Gregory D. Hartman and M.J. Bender, Gordon College, Barnesville, GA 30204. Lack of occurrence data hampers the ability of wildlife professionals to assess and manage many mammal populations in Georgia, including bats. Although bats account for 20% of terrestrial mammalian species in Georgia, large portions of the state have likely never been surveyed resulting in incomplete distribution records. Within an area encompassing 16 contiguous counties and more than 5,200 square miles in west-central Georgia, there are published occurrence records of only two bat species, both from Lamar County. Using roost-site surveys, mist-netting, and salvage, we are conducting an ongoing study to document species richness of bats in west central Georgia. As of November 2011, we have increased the number of species of bat known to occur in Lamar County from two to seven, and have recorded one species from Pike County.

KINETICS AND THERMODYNAMICS OF BINDING AMONG FLAGELLAR EXPORT APPARATUS PROTEINS OF *SALMONELLA ENTERICA*, Katy A. Helms, Stephanie A. Hill*, Christopher C. Brown* and Jonathan L. McMurry, Department of Chemistry & Biochemistry, Kennesaw State University, Kennesaw, GA 30144. The bacterial flagellum contains its own type III secretion apparatus that allows for self-assembly by effecting export of more than 20,000 proteins. While interactions among proteins of the flagellar Type III secretion (T3S) export apparatus have been reported, few have been examined with respect to the dynamic relationships that must govern the mechanism of export. Using biolayer interferometry (BLI) and surface plasmon resonance (SPR), we have undertaken a survey of protein-protein interactions among the soluble apparatus proteins (FlhAc, FlhBc, FliH, FliI, FliJ, FliK) and between apparatus proteins and export substrates. Proteins were purified prior to screening for binding partners. One of each potential pair was immobilized and then exposed to others in solution. Interactions identified by yes/no screens were subjected to rigorous characterization to measure affinity and rate constants. Our screen may uncover important interactions heretofore unknown because they are of insufficient affinity for copurification or affinity blotting experiments. Characterization will also allow us to pursue efforts such as identifying export signals in substrates by searching for kinetic changes in variant constructs. Binding was also analyzed by isothermal titration calorimetry (ITC) to confirm interactions with a non-surface dependent method and to determine enthalpies and entropies if binding.

EFFECTS OF METALS ON BINDING AMONG NICKEL MATURATION ACCESSORY PROTEINS IN *HELICOBACTER PYLORI*, Stephanie A. Hill* and Jonathan L. McMurry, Department of Chemistry & Biochemistry, Kennesaw State University, Kennesaw, GA 30144. 23 *Helicobacter pylori* causes peptic ulcers and gastric cancers in humans. Two nickel-containing enzymes, the hydrogen uptake hydrogenase and urease, are required for colonization and persistence in the stomach. Hydrogenase requires a number of accessory proteins, namely HypA, HypB, HypC, HypD, HypE and HypF. Similarly, urease maturation requires several accessory proteins: UreE, UreF, UreG and UreH. To investigate interrelationships between each set of accessory proteins, a kinetic survey of potential binding among HypA, HypB, UreE and UreG using optical biosensing was conducted. Interactions between HypA and UreE and UreE and UreG were observed and competition binding results show that UreG and HypA compete for binding to UreE. Full kinetic characterization of HypA-UreE revealed complex binding that fit a two-state model. UreG-UreE binding exhibited fast-on, fast off kinetics. Binding was faster and tighter

in the presence of zinc than its absence, perhaps reflecting a change in oligomeric state but also significant kinetic differences. The effects of nickel were also examined. Experiments examining the stoichiometry and thermodynamics of binding will also be described

A THREE DAY SURVEY OF BIRD DIVERSITY IN TORTUGUERO NATIONAL PARK, COSTA RICA, Jasmine Ikejiani*, J. Lee*, V. Beverly, S. Brown, J. Conejo, M. Coger, A. Doghaimat, S. Schlueter, N. Wall, S. Wall and M. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Costa Rica has approximately 850 species of birds, of which 383 are estimated to reside in the Tortuguero region. During May 2011, a three day bird survey was performed in the Tortuguero National Park, located in the northeastern coastal region of Costa Rica. Each day, birds were observed for 3-5 hours while traveling down river, and for an additional 2-3 hours while walking through the rainforest. The students observed between 120 and 150 different birds. Of the birds that were observed, 36 verified species identifications were made. Of the 36 verified species, the Tiger Heron was most abundant. Other common species observed on the river were the Anhinga, Cattle Egret, White Egret, Great Blue Heron, Little Blue Heron, Ringed Kingfisher, and Pygmy Kingfisher. Rare birds observed near the river included the Sun Grebe, Roseate Spoonbill, Squirrel Cuckoo, and Great Potoo. The most common rainforest birds observed were the Rufous-Tailed Hummingbird and the Keel-Billed Toucan. Rare rainforest birds observed in the rainforest included the Black-Throated Trogon, King Vulture, and Slaty-Tailed Trogon.

THE INHIBITORY EFFECT OF [10]-GINGEROL AND CURCUMIN, ON PHIP-INDUCED CARCINOGENESIS**, Carissa Jackson*, Christopher B. Bevington and Ashok Jain, Albany State University, Albany, GA 31705. PhIP (2-amino-1-methyl-6-phenylimidazo[4-5,-*b*] pyridine) is a carcinogenic, heterocyclic amine that is formed during the cooking of meats at high temperatures which is being metabolized and forms DNA adducts. These adducts are the source of DNA damage and mutations, which can initiate carcinogenesis. In this study, the antioxidant properties of [10]-gingerol (5μM and 10μM) and curcumin (25μM and 50μM) were observed. Both antioxidants were investigated in the presence and absence of PhIP (50μM and 100μM) using breast epithelial (MCF10A) cells. Cells were cultured in 6-well plates and the respective treatments were added. After 48 hours of treatment cells were harvested and data for cell proliferation and cell viability was collected. Cell samples were analyzed for DNA damage by comet assay for olive tail moments. The results for [10]-gingerol indicate that: (1) both concentrations of [10]-gingerol do have an inhibitory effect on cell proliferation caused by 100μM PhIP; (2) 10μM [10]-gingerol had a 50% inhibitory effect of 100μM PhIP induced cell malfunction; (3) 50μM PhIP induced DNA damage is inhibited by 10μM [10]-gingerol 67% and 100μM PhIP induced DNA damage is inhibited by 10μM [10]-gingerol 83% of the time. The results for curcumin indicate that: (1) Cell proliferation caused by 50μM PhIP was inhibited to some degree in ≤32% of trials using curcumin at 25μM and 50μM. Approximately 66% of trials using 100μM PhIP indicate curcumin at 25μM and 50μM is protecting against cell malfunction to some degree. (2) Viability remained ≥90% for all treatments in trials 2 and 3 and 75% of treatments in trial 1. The data indicates that [10]-gingerol and curcumin have some protective properties against PhIP induced carcinogenesis.

A FAUNAL ANALYSIS OF THE *DYTISCIDAE* (COLEOPTERA: HYDRADEPHAGA) OF THE PHYSIOGRAPHIC PROVINCES OF TENNESSEE, M. Kuninti*, G. W. Wolfe, E. H. Barman and D. Oetter, Georgia College & State University, Milledgeville, GA 31061. Three hundred and seven collections were made throughout Tennessee for a to-

tal of 11,023 specimens and 101 species of dytiscids. All data were exported to ArcMap as a data table and each locality was displayed on the map by its geographic coordinates. Biodiversity of the provinces was analyzed using the Simpson diversity index and rarefaction. The five most common species were *Neoporus undulatus, Hydroporus rufilabris, Heterosternuta pulcher, Neoporus clypealis*, and *Laccophilus maculosus*. These five species constituted 40.48 % of all specimens. The five most species rich provinces were the Ridge and Valley, Western Highland Rim, Eastern Highland Rim, Cumberland Plateau, and Coastal Plain Upland with 54, 53, 46, 41, and 40 species respectively. Simpson index diversity values were remarkably uniform. The five most diverse (Simpson index) provinces were the Ridge and Valley, Western Dissected Cumberland Plateau, Blue Ridge, Western Highland Rim, and Coastal Plain Upland with Simpson index values of 0.95, 0.94, 0.93, 0.93, and 0.92 respectively. Although species richness and/or diversity indices are commonly employed in ecological investigations their use is flawed because they are influenced by sample size. To compensate for this rarefaction was performed. The results of rarefaction contradicted Simpson index values in some instances. For example the Ridge and Valley province had the highest values for species richness value and Simpson index; however, this province plotted below the rarefaction curve and outside the confidence limits indicating significantly less diversity than most other provinces.

STUDENT-CENTERED BIOLOGY CLASS RESEARCH PROJECTS AT A STUDENT-CENTERED COLLEGE, E.C. Lampert, Gainesville State College, Oakwood, GA 30566. College science courses are often perceived by students as exercises in rote memorization, while in reality they serve to provide needed experience in experimental design, data collection, and analysis. To provide this experience two guided-inquiry projects using live animals were developed for two introductory science courses, a nonscience-major's course and a science-majors course, at Gainesville State College. Both required students to work in groups for data collection and present posters to their classmates. In the first, nonscience students completed semi-structured plant feeding trials with two caterpillar species. Students identified and selected 4 plant species to feed caterpillars, and recorded growth rate for caterpillars fed one plant species. This project resulted in over a dozen new plant-feeding records as well as new growth rate data. In the second, students supplemented an artificial diet with primary nutrients and measured the effect on caterpillars. Students in this course were given complete freedom to select nutrients, develop a hypothesis, devise an experimental protocol, and analyze data. This project resulted in new information in areas such as growth rate, developmental abnormalities, mortality, and energetics. Student feedback indicated that difficulties in data collection and analysis were offset by the benefits of "hands-on" science. Routes to publishing such studies in peer-reviewed periodicals are discussed.

KINETIC CHARACTERIZATION OF MAP KINASE BINDING TO NITRIC OXIDE SYNTHASES, Sundeep Mummaneni*[1], Carol A. Chrestensen[1], Jonathan L. McMurry[1] and John C. Salerno[2], Departments of [1]Chemistry & Biochemistry and [2]Biology, Kennesaw State University, Kennesaw, GA 30144. Endothelial nitric oxide synthase (eNOS) contains a motif similar to recognition sequences in known MAPK binding partners. In optical biosensing experiments, eNOS bound p38 and ERK with ~100 nM affinity and complex kinetics. Binding is diffusion-limited (kon ~ .15 x 106 M-1sec-1). Neuronal NOS also bound p38 but exhibited much slower and weaker binding. p38-eNOS binding was inhibited by calmodulin. Evidence for a ternary complex was found when eNOS-bound p38 was exposed to CaM, increasing the apparent dissociation rate. These observations strongly suggest a direct role for MAPK in regulation of NOS with implications for signaling pathways including angiogenesis and control of vascular tone.

PHYLOGENY OF MAJOR CAPSID PROTEINS OF RANAVIRUSES FROM GREAT BRITAIN, Joseph D. Nestor*[1], A. L. J. Duffus[1], G. D. Hartman[1], T.W. J. Garner[2] and R. A. Nichols[3], [1]Gordon College, Barnesville, GA 30204, [2]Institute of Zoology, Zoological Society of London, London, England NW1 4RY and [3]School of Biological and Chemical Sciences, Queen Mary University of London, London, England E1 4NS. The ranaviruses are a group of double stranded DNA viruses that can cause systemic infections in reptiles, amphibians, and teleost fishes. Genetic sequences of different ranavirus isolates obtained from tissue samples taken from frogs in Great Britain were used to produce phylogenetic trees. Analyses of the genetic sequences for the major capsid protein of the isolates were conducted using Molecular Evolutionary Genetic Analysis (MEGA), a free genetic analysis program. Two trees were generated, one using the neighbor-joining method and the other using maximum likelihood. We compared the two proposed phylogenies for the ranavirus isolates and found that, regardless of the method used to construct the phylogenetic trees, the relationships amongst the isolates were very similar. Isolates from the same geographic area tended to group together, which is indicative of a single introduction event.

OXIDATIVE INHIBITION OF MAPKAP KINASE 2 IS PREDOMINATELY MEDIATED THROUGH THE ACTIVATION LOOP CYSTEINE, Emily Rye, T. Forbes, B. Forsberg, A. Johansen, R. Patel, C. Schumacher and C. Chrestensen, Department of Chemistry and Biochemistry, Kennesaw State University, Kennesaw, GA 30144. MAPKAP kinase 2 (MK2) is a member of the mitogen activated protein kinase activated protein kinase family. MK2 is activated by p38 MAP kinase and this signaling pathway is important in cellular responses to inflammatory cytokines and stress (*e.g.* UV, osmotic shock, oxidative stress). MK2 has 7 conserved cysteines that are not known to participate in disulfide bonds. Among these is a cysteine residue in the activation loop that is conserved in other kinases including protein kinase A (PKA) and protein kinase C (PKC). PKA and PKC are inhibited by oxidative modification at this conserved cysteine residue. Two non-radioactive assays were used to assess MK2 activity after various treatments using either bacterially expressed active-MK2 or myc tagged MK2 immunoprecipitated from transiently transfected cells. MK2 was inhibited by oxidized glutathione *in vitro* and in cells by treatment with diamide. Mutation of the activation loop cysteine residue produced an active kinase that was considerably less sensitive to oxidative inhibition. This work was supported by the Research Corporation (CC6942), the NSF (MCB-1020261), and a Mentor Protégé grant from Kennesaw State University.

CONDITION FACTOR OF RIVER CHUBS IN RELATION TO STREAM DISTURBANCE, Kaleigh Sims*, Lauren Jenkins*, Melissa Daigle*, Danyelle Dehner and Mark S. Davis, North Georgia College & State University, Dahlonega, GA 30597. River chubs (*Nocomis micropogon*, Actinopterygii: Cyprinidae) are small minnows that inhabit freshwater streams in the eastern United States. We investigated the putative effect of habitat disturbance on body condition of river chubs in six low order streams in the southern Appalachian foothills (Lumpkin County, GA). Body condition has been used as a predictor of reproductive output in fish. Streams were categorized as either disturbed (subjected to apparent agricultural disturbance) or less disturbed (without apparent agricultural impact). During June to August 2011 each stream was sampled twice. Fish were collected using a backpack electrofisher and euthanized for further laboratory analysis. The specimens were then sexed, aged (juvenile vs adult), eviscerated, gonadectomized, weighed, and measured (standard length) in the laboratory. Fulton's condition factor (K), an index of well-being based on mass and standard length, was determined for adult fish in disturbed and less disturbed streams. Data (K values) were analyzed using a nested (hierarchical)

ANOVA with streams nested within disturbance. There were significant differences between streams ($F_{4,132} = 3.15$; $P = 0.02$), but there was no significant effect of disturbance ($F_{1,5} = 1.41$; $P = 0.30$). These preliminary results indicate that agricultural disturbance may not influence Fulton's condition factor in river chubs. During summer 2012 we will investigate the effects of disturbance on ovary mass and egg number in river chubs. These variables may be better predictors of disturbance effects on fish reproduction.

REPLACING THE HONEYBEE – WHY WAIT?: COST-CUTTING AND SUSTAINABLE AGRICULTURAL PRACTICES FOR SMALL SCALE FARMING, Nicholas G. Stewart* and M. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Honeybees are responsible for an estimated 90% of agricultural pollination worldwide. However, declining stocks of commercial honeybees over the past two decades due to Colony Collapse Disorder (CCD) has brought to the forefront how fragile mono-specific systems can be. Reliance upon a single pollinator species for food production has been called into question. Fortunately, in addition to the exotic honeybee, almost 4500 native bees are endemic to temperate North America. Specifically, 300 species exhibit varying degrees of importance to non-cereal crop pollination/production (*i.e.* apples, melons, squash, etc.) in Georgia. However, regional, temporal, and seasonal biogeographical data on the compositon of native pollination guilds is largely incomplete – especially in Georgia. This lack of knowledge has hindered alternative pollination systems from gaining momentum. The current study assesses biodiversity, abundance, and emergence periods for native bees in four north Georgia apple orchards. The two smallest orchards, indicative of the majority of apple farming in North America, possessed the highest bee diversity and abundances of all study sites. In stark contrast, the largest commercial orchard, with over 200,000 trees, possessed the lowest diversity. The most abundant 'target' bee species during the apple bloom have been identified, as well as their nesting behavior. These bees will be the focus of specific habitat enrichments to artificially maximize future abundance, beginning next season. With these protocols, small-scale farmers can utilize the native bees present on their property, without spending money each year on bringing honeybees to pollinate their trees.

A BREEDING POPULATION SURVEY OF THE RED-HEADED WOODPECKER (*MELANERPES ERYTHROCEPHALUS*) IN A FIRE-ADAPTED ECOSYSTEM, Kathryn C. Trimble[1]*, Salina G. Patton[1], Brigette N. Haram[2] and R. Brandon Cromer[1], [1]Augusta State University, Augusta, GA 30904 and [2]University of Georgia, Athens, GA 30602. Surveys of the breeding population of red-headed woodpeckers, *Melanerpes erythrocephalus*, were conducted in two fire-maintained pine forests at the Silver Bluff Audubon Center (SBAC) of Jackson, South Carolina and the McDuffie Fish Hatchery (MFH) of Dearing, Georgia. Tracts of previously burned loblolly pine (*Pinus taeda*) and longleaf pine (*P. palustris*) with a large number of standing dead trees (snags) were chosen. Adult red-headed woodpeckers (RHW) were observed to identify cavities of interest. Information was collected on nest trees (diameter, cavity height, cavity orientation, and distance between nest trees). A wireless camera mounted on an extendable pole was inserted into potential nest cavities to confirm activity. Once confirmed as active, nests were monitored weekly and photos were taken to document young RHW development. A total of seven active nest cavities were identified and monitored from May – August, 2011 (four nest trees from MFH and three from SBAC). All nest cavities at MFH produced at least one successful nest, two of which successfully re-nested. No pattern was detected in tree diameter, cavity height, and cavity orientation at MFH. At SBAC, all clutches produced at least one fledgling. Each nest cavity was oriented to face the northeast quadrant and nest trees were approximately the same distance apart.

CONFORMATIONAL REALIGNMENTS IN CATALYSIS: NO SYNTHASE AND RELATED ENZYMES**, E.N. Umejiego*, S. Tulachan, V. Morricette, B.L. Hopper, D.L. Vogelien, R. Razdan, D.K. Ghosh and J.C. Salerno, Biology Department, Kennesaw State University, Kennesaw, GA 30144. The NOS reductase unit, comprising three C terminal domains, is closely related to homologs that have been intensively studied. Several groups proposed ping-pong models for NADPH P450 reductase and NOS reductase mechanisms. We developed a kinetics model featuring an FMN domain shuttle in which cytochrome c interacts with the FMN binding domain only when it is dissociated from the reductase complex, explaining kinetics results without extra inhibitory binding sites. The major effect of calmodulin binding on nNOS and eNOS is to increase the rate of dissociation of the FMN binding domain. FMN fluorescence is sensitive to enzyme conformation and CaM binding. Striking differences in FMN fluorescence of NOS constructs are due to states that we assign to FMN in different environments. OxyFMN and holoenzyme share an open conformation with a lifetime of 4.3 nsec. The majority state in holoenzyme has a short lifetime (~100ps) because of FAD/FMN interactions. FMN in a state with a lifetime of 0.9 nsec is quenched by heme. Occupancy estimates and kinetic data yield a heme edge to FMN distance estimate of 12-15 A. Calmodulin activation increases release of the FMN binding domain from the input state, making FMN available to reduce the oxygenase active site heme. Similar effects can be obtained with chaotropes, which increase the cytochrome c reductase activity of eNOS and nNOS. This study was funded by NIH 3R15GM080701-01 and NSF 0950920.

ISOLATION OF ANTIBIOTIC-RESISTANT BACTERIA FROM A NECROTIC WOUND OF A RED-CLAW CRAYFISH**, Nuvonka J. Wilson*, B. Saul and C. Bates, Augusta State University, Augusta, Georgia 30901. A red-claw crayfish (*Cherax quadricarinatus*) under our care developed a necrotic wound which eventually led to its death. In this project our goal was to identify bacteria associated with the wound. We were able to isolate and grow three distinct types of bacteria on nutrient rich media. We then utilized a battery of biochemical and physiological tests to identify one isolate, and have currently narrowed it down to either a member of the genus *Acidovorax*, a member of the genus *Vibrio, Pseudomonas stutzeri*, or *Halomonas aquamarina*. This isolate is resistant to Ampicillin and Oxacillin, but appears to be susceptible to several others. We plan to complete the identification process utilizing polymerase chain reaction to amplify the 16S rRNA and sequencing of the product. Additionally, we plan to identify the other 2 isolates and screen them for their susceptibility to various antibiotics.

SPECIES RICHNESS AND DIVERSITY OF THE *DYTISCIDAE* (COLEOPTERA: HYDRADEPHAGA) OF FORT CAMPBELL MILITARY RESERVATION IN KENTUCKY AND TENNESSEE USING LIGHT TRAP DATA, G. W. Wolfe[1], B. H. Bauer[2] and O. Hammer[3], [1]Georgia College & State University, Milledgeville, GA 31061, [2]BHE Environmental, Inc., Knoxville, TN 37918 and [3]University of Oslo, Blindern, 0316 Oslo, Norway. The diversity of dytiscid water beetles at Fort Campbell Military Reservation was analyzed. All beetles were captured in commercial, universal black light traps. Two hundred light trap samples from 30 locations on 11 creeks from six drainages were sampled. Specimens of *Dytiscidae* were collected at 24 of 30 light traps. A total of 2429 specimens (34 species and 18 genera) were collected. The most common genus was *Neoporus* Guignot (48% of specimens captured) and the most common species was *Neoporus shermani* (Fall) (32% of specimens captured). The three most common genera (*Neoporus, Uvarus* Guignot, and *Copelatus* Erichson) contained 75% of the specimens. The three most common species (*Neoporus shermani, Uvarus lacustris* (Say), *Coptotomus venustus* (Say)) constituted 58% of all specimens. Fisher's α index ranged from

2.64 to 7.19. Rarefaction indicated an absence of significant difference among α values since only one collection was clearly outside the 95 percent confidence intervals around the rarefaction curve. The degree of association between pairs of species was examined with Chi-square species association analysis which revealed only two pairs of species that showed a marginally significant degree of association. In conclusion, these data indicate that communities are composed of a few common taxa and many rare ones. Furthermore, diversity is rather uniform between drainages.

Section II: Chemistry
Social Science Building Room 3023
Ghislain Mandouma, Presiding

8:30 CALCUATION OF THE ACIDITY CONSTANT FOR AN ENZYME-BOUND SULFONAMIDE**, T. M. Warren* and R. W. Zurales, Middle Georgia College, Cochran, GA 31014. Drug resistance to *β-lactam* antibiotics can be provided by bacterial enzymes known as *β-lactamases*, including metallo-*β-lactamases* (MBLs) that require zinc. Due to their different catalytic mechanism, MBLs are not inhibited by any commercially available *β-lactam/β-lactamase* combinations. Interestingly, sulfonamides may be potential inhibitors of MBLs since they are known to inhibit other zinc-dependent enzymes. A crystal structure of *4-nitrobenzenesulfonamide* (NBSA) complexed to an MBL indicates that the nitrogen of the sulfonamide is bound to zinc, but the ionization state is not clearly determined because of the absence of hydrogen atoms. It has been assumed that the nitrogen atom is negatively charged because the zinc(II) ion increases the acidity of NBSA. We have used the polarized continuum model to test this hypothesis by calculating the acidity constant of NBSA, of an actual compound that models NBSA bound to carbonic anhydrase, and of a small model that simulates NBSA bound to the MBL.

8:45 CHEMOSELECTIVE OXIDATION OF 6,13-BIS(DECYLTHIO)PENTACENE, C. E. Cho*, Columbus state University, Columbus, GA 31907. Recent research interests in the use of organic semiconductors as an alternative source for green energy have sparked widespread studies into the optimization of such devices for practical and efficient use and application in semiconductor industry. Pentacene and pentacene derivatives are promising candidates for organic semiconductors because they exhibit similar conduction mechanisms to inorganic semiconductors. The research was performed to chemically control the chemoselective oxidation of *6,13-Bis(decylthio)pentacene*, a thio substituted pentacene derivative. The products of oxidation: *6-(decylsulfinyl)-13-decylthio)pentacene* and *6,13-Bis(decylsulfinyl)pentacene* were characterized by nmr, uv, mass spectra, and electrochemical techniques. The half–life of *6-(decylsulfinyl)-13-decylthio)pentacene* was longer (2900min) compared to the starting material and *6,13-Bis(decylsulfinyl)pentacene*. However, both products had similar HOMO-LUMO gaps as determined by cyclic voltammetry. Using 0.5 equivalent of *m*CPBA gave the maximum yield (72%) of *6-(decylsulfinyl)-13-decylthio)pentacene*. This product was a better semiconductor due to higher stability.

9:00 SYNTHESIS AND CHARACTERIZATION OF EIGHT COORDINATE EUROPIUM AND GADLONIUM DICARBOXYLATE COMPLEXES**, P. J. Perry*, Z. Gebeyehu and R. Dabke, Columbus State University, Columbus, GA 31907. The fluorescence properties of lanthanide (III) carboxylate complexes are of considerable interest because of their importance in energy transfer processes and laser system. In this study,

europium and *gadlonium dicarboxylate* complexes were synthesized and characterized. The reaction of two equivalents of $MCl_3 \cdot 6H_2O$ (M = Eu and Gd) with three equivalents of *2,2'-Bisquinoline-4,4-dicarboxylic acid dipotassium salt*, $C_{20}H_{10}N_2O_4K_2 \cdot 3H_2O$, in methanolic solution gave white and yellowish precipitates in good yield for Eu and Gd respectively. The precipitates were characterized by means of FTIR, and elemental analysis. The IR-spectra of both complexes showed similar absorption bands as the ligand with slight shift to a lower wave number. Elemental analysis results for CHN and IR spectra suggested the formation of bimetallic complexes, $M_2(C_{20}H_{10}N_2O_4)_3 \cdot 4H_2O$. A structure for the complexes is proposed in which the two carboxylates ions on each ligand serve as bidentate ligand and also bridge the two metal centers. The three chelating carboxylate ions and two water molecules attached to each metal center resulted in a coordination number of eight to both Eu and Gd. The complexes are stable in air and are insoluble in polar as well as non-polar solvents. Both products decompose and darken between 300-350°C. In the future, we plan to investigate the solubility of these complexes in different solvents, their electrochemical and fluorescence properties and their reaction with other carboxylate ions.

9:15 **Break**

9:30 SYNTHESIS OF Β-HYDROXY AND Γ-HYDROXY PERSIN DERIVATIVES**, T. Ricks and T. Crute, Augusta State University, Augusta, GA 30904. *Persin*, a lipophilic compound found in the leaves and fruit of avocados, has been shown to be effective against lines of breast cancer cells by causing bim-dependant apoptosis. To date literature reports have been limited to the β-hydroxy derivatives of the fatty acid chains and suggest that the β-hydroxy portion of the polar head is needed for biological activity. Synthetic studies for creation of novel β-hydroxy and γ-hydroxy analogs of *persin* will be discussed.

9:45 SYNTHESIS OF C- AND N-SUBSTITUTED BICYCLIC SULFONES AS POTENTIAL INHIBITORS OF HHV-6**, E. J. Murray* and C. E. Stephens, Augusta State University, Augusta, GA 30904. Human herpes virus 6 (HHV-6) is a member of the *betaherpesvirus* family and one of eight known human herpes viruses. HHV-6 commonly manifests itself by age three in more than ninety percent of the world's population as *roseola infantum*, an illness characterized upper respiratory congestion, fever, febrile seizure, and rash. HHV-6 is also thought to play a role in the progression of pathogenic diseases such as epilepsy, multiple sclerosis, chronic fatigue syndrome, and some cancers. Currently, only two drugs, *Cytovene* and *Foscavir*, are commonly used for treatment of HHV-6. Unfortunately, both have high toxicity levels and viral resistance is building against them. Previous research in our lab and that of our collaborator has shown that certain bicyclic sulfones are potent inhibitors of HHV-6. Our goal in this research has been to develop C- and N-substituted analogs of the original lead compound. Currently, one novel compound that contains both a cyclopropyl group on the nitrogen and a benzyl group on one of the carbons has been successfully synthesized by a multi-step process beginning with *1-cyanomethylsulfonyl-2-fluorobenzene*. Reactions employed in the synthesis include Nucleophilic Aromatic Substitution (NAS), Aldol Condensation, and SN2 Substitution. This new sulfone derivative has been sent to the Rega Institute in Belgium for testing, and we are currently awaiting antiviral results. Meanwhile, work is ongoing to create additional analogs for testing. This work was funded in part by the HHV-6 Foundation.

10:00 **Section Business Meeting**

10:30 SYNTHESIS OF BENZOTHIADIAZINE DERIVATIVES AS POTENTIAL HHV-6 INHIBITORS**, H. J. Reed* and C. E. Stephens, Augusta State University, Augusta, GA 30904. HHV-6 can establish lifelong latency and become active again after initial infection in adults. HHV-6 is associated with the pathogenesis of multiple sclerosis, *meningoencephalitis*, progressive multifocal *leukoencephalitis*, and *lymphocytic leukemia*, and in immunodeficient patients, HHV-6 can cause death. New drugs are needed that are active against HHV-6 and are not toxic if taken for long periods of time or in combination with other antivirals. Certain bicyclic sulfones have been shown to be very effective in treating HHV-6. The novel *benzothiadiazines* that we have created have very similar structure to the previously mentioned sulfones, except one of the carbons in a ring has been replaced with a nitrogen. These *benzothiadiazines* were produced by a multi-step synthesis route starting with *2-nitrobenzensulfonyl chloride*. The synthesis route involved a bimolecular substitution by primary amine nucleophilic attack on the sulfonyl chloride group, followed by a traditional reduction of the nitro group, and then an intramolecular cyclization/condensation reaction involving a *benzaldehyde*. The characterization of the resulting *benzothiadiazine sulfone* compounds were carried out using melting point determination, proton nuclear magnetic resonance, carbon magnetic resonance, and infrared spectroscopy, which all confirmed that the desired products were obtained. The six *benzothiadiazine* derivatives that have been produced will be sent to our collaborator at the Rega Institute for Medical Research in Leuven, Belgium for testing against HHV-6. This research was funded in part by the HHV-6 Foundation.

10:30 INTRAMOLECULAR N-ARYLATION OF CHLOROPHENYL-SUBSTITUTED 2-AMINOPYRROLES TO YIELD TRICYCLIC COMPOUNDS**, P. X. Moon*, C. E. Stephens, Augusta State University, Augusta, GA 30904. Tricyclic compounds often have unique biological activities. One of the most common examples is the tricyclic antidepressants. Recently, we have become interested in preparing tricyclic compounds from *2-aminopyrroles*. Such pyrroles are readily prepared and afford a great starting point for synthesis of tricyclic systems containing the pyrrole ring. Previously we have showed that *pyrrolo[2,1-b]quinazolines* can be prepared by palladium-catalyzed N-arylation of *2-aminopyrroles* containing a *2-bromobenzyl* substituent at the N-1 position of the pyrrole. Now, to decrease the cost of this reaction we have developed conditions that will allow for the use of a less expensive *2-chlorobenzyl* substituent. We have also now developed a synthesis of *pyrrolo[3,2-b]benzo[1,4]thiazines* by N-arylation of *2-aminopyrroles* containing a *2-chlorophenylsulfonyl* group at the 3-position. In this case, the substituent on the pyrrole N-1 position can be varied to include groups such as alkyl, benzyl, etc. Important for accomplishing these palladium catalyzed reactions using chlorine as the leaving group is the use of a sterically hindered monophosphine ligand, an alcohol as solvent and an extended reaction time of about 24 hr. This presentation will outline the conditions used for these reactions, the yields, and the analytical/spectral data.

POSTERS

ASSESSMENT OF THE DENSITY-FUNCTIONAL TIGHT-BINDING (DFTB) METHOD FOR DESCRIBING THE STRUCTURE AND INTERACTION ENERGIES OF HYDRATED IONS, Mitchell L. Tuttle* and M. Kaledin, Kennesaw State University, Kennesaw, GA 30144. This project concentrates primarily on evaluating the accuracy and computational efficiency of the density functional tight-bonding (DFTB) method in the description of proton transfer in hydrated ions. The structure, dynamics (bond lengths, bond angles, and vibrational frequencies), and energetics (interaction energies) of hydrated ions were calculated using the DFTB and DFT-B3LYP levels of theory. The calculations were com-

pared to the benchmark values at the Møller-Plesset perturbation theory at the second order (MP2) and available experimental observations. Computationally, DFTB is much more efficient than DFT-B3LYP and MP2 and therefore can be used for large molecular systems. Results of this study show that DFTB is a valid theoretical method to be used in larger systems of study.

SPACE GROUP COMPARISON FOR THE CRYSTAL STRUCTURE OF THE CO-CRYSTAL OF 4-BROMOPHENOL AND 2-PYRIDINONE, C. A. Le*[1], S. E. Bettis*[2] and K. L. Martin[1], [1]Berry College, Mt. Berry, GA 30149 and [2]University of North Carolina, Chapel Hill, NC 27599. The crystal structure of *4-bromophenol* and *2-pyridinone* was solved in the triclinic space group *P*-1. The unit cell of the crystal was a = 5.672 Å, b = 11.434 Å, c = 16.8626 Å, α = 90.01º, β = 89.97º, γ = 100.83º, and V = 1074.02 Å^3. The crystal structure was originally solved in the monoclinic space group $P2_1$ with unit cell parameters of a = 5.672 Å, b = 16.863 Å, c = 11.434 Å, β = 100.83º, and V = 1074.02 Å^3. The triclinic space group was favorable over the monoclinic space group because it had a better thermal ellipsoid plot, the refinement of parameters reached convergence, R-factor was better, and the goodness of fit was closer to one.

COMPARISON OF CRYSTAL STRUCTURES OF 3-NITROPHENOLATE IN BODY-CENTERED AND C-CENTERED SPACE GROUPS, S. R. Harris*[1], S. E. Bettis*[2] and K. L. Martin[1], [1]Berry College, Mt. Berry, GA 30149 and [2]University of North Carolina, Chapel Hill, NC 27599. In 2007, the crystal structure of the *tetramethylammonium* salt of *3-nitrophenol* was solved in the *C*2/*c* space group with unit cell parameters: a = 23.543(4) Å, b = 5.636(1) Å, c = 16.387(3) Å, and β = 128.513(3)°. The crystal structure was recently solved in the *I*2/*a* space group with unit cell parameters: a = 16.386(3) Å, b = 5.636(1) Å, c = 18.502(4) Å, and β = 95.357(30)°. The *I*2/*a* space group is a better choice as a space group because of the structure's lower R factor, higher goodness of fit, and reasonable bond lengths between the phenolic oxygen and hydrogen atoms.

NOVEL IMMOBILIZATION AND ENHANCED SENSITIVITY OF SILVER NANOPARTICLE SURFACE PLASMON RESONANCE IN FIBER-OPTIC CAPILLARY WAVEGUIDES**, L. M. Beasley* and B. K. Keller, Kennesaw State University, Kennesaw, GA 30144. In recent years there has been much investment in development of SPR (surface plasmon resonance) biosensors. SPR is a rapid and selective method of label-free detection of biomolecular affinity and kinetics. Commercial SPR instruments utilize a thin layer of gold that exhibits surface plasmon oscillations when light excites surface conduction electrons. When a biomolecular binding event occurs at the gold surface after functionalization with the appropriate ligand, there is a change in the localized refractive index on the nanoparticle surface and corresponding in the plasmon absorbance properties. SPR biosensing is also possible with silver colloids. This project explores methods to increase the loading of silver nanoparticle thin films using PAMAM (*polyamidoamine*) dendrimers immobilized within a micro-tubular fiber-optic capillary (FOCap). Our results should enhance the optical waveguide sensitivity and accordingly reduce the amount of sample needed to perform biosensing measurements. Silver nanoparticles are routinely made in our laboratory via *borohydride* reduction. The nanoparticles are immobilized to the inside of a FOCap with a molecular tether or thin film, which includes PAMAM dendrimers from generation 1 to 5. Increasing the dendrimer generation should increase the number of terminal amine groups on the thin film and correspondingly increase the number of nanoparticles within FOCap sensor. Results obtained from this study also are important to future development of evanescent surface-enhanced Raman spectroscopy (SERS) and evanescent surface-enhanced fluorescence fiber-optic capillary sensors. This

work supported by the College of Science and Mathematics and CETL (Center for Excellence in Teaching and Learning), Kennesaw State University.

METAL NANOPARTICLE SURFACE PLASMON RESONANCE BIOSENSING IN A FIBER-OPTIC CAPILLARY, N. J. Savas*, J. C. Cantrell* and B. K. Keller, Kennesaw State University, Kennesaw, GA 30144. SPR (Surface Plasmon Resonance) is a rapid and selective method of label-free detection to measure protein concentrations, analyze biomolecular affinity, and also measure the kinetics of biochemical reactions. Commercial SPR instruments utilize a thin layer of gold that exhibits surface plasmon oscillations when light excites the metal conduction electrons. A binding event that occurs on the gold surface after it is functionalized with the appropriate ligand, results in a change in the localized refractive index that alters the plasmon absorbance properties. In this work, both gold and silver nanoparticles are used in a colorimetric SPR fiber-optic capillary biosensor. Colorimetric evanescent absorbance measurements are made with an Agilent UV spectromphotometer (HP 8453). Proof-of-concept is illustrated with fibrinogen protein sensing on acid-functionalized nanostructures. The sensitivity of this colorimetric SPR sensor is tested with biotin-streptavidin affinity. Specific protein sensing interactions are also presented. Methods to compare the sensitivity of this colorimetric SPR fiber sensor to propagation-angle-dependent sensing commercial instruments are discussed. This work supported by the College of Science and Mathematics and CETL (Center for Excellence in Teaching and Learning), Kennesaw State University.

A COMPARISON OF GOLD AND SILVER NANOPARTICLE SIZE ANALYSIS USING FOUR TECHNIQUES**, R. A. Godwin*, J. C. Cantrell* and B. K. Keller, Kennesaw State University, Kennesaw, GA 30144. Laser desorption mass spectrometry (LD-MS), scanning electron microscopy (SEM), transmission electron microscopy (TEM), and dynamic light scattering (DLS) were used to analyze the size of gold and silver nanoparticles made by reduction of the metal by either *citrate* or *borohydride* in aqueous solution. The size of nanogold and nanosilver particles in these colloid syntheses is typically ~20 nm (± 5 nm) and ~10 nm (± 2.5 nm), respectively. Some size deviations occur naturally with each individual synthesis. LD-MS yields an average particle mass but also gives a very large mass range. SEM and TEM both give reliable size measurement and also lend to analyzing the space between neighboring nanoparticles when the colloid is deposited or immobilized on a surface but both techniques require sample preparation and image analysis. DLS is a reliable and convenient method to analyze the particle size in solution that readily gives statistical analysis. A brief description of each method is given with results of the colloid particle size (or mass) analysis. DLS is the preferred method when simply determining the particle size but TEM or SEM is also required to analyze the particle placement when the colloid particles are immobilized upon a surface as is the case for most optical biosensors. This work supported by the College of Science and Mathematics, Kennesaw State University.

EVALUATION OF CANCER PREVENTER FOODS/SPICES BY GOLD NANOPARTICLES, Y. A. Beni, G. Pippas and J. M. Love, Columbus State University, Columbus, GA 31907. Some foods have the ability to help stave off cancer and some can even help inhibit cancer cell growth or reduce tumor size. Foods such as avocados, broccoli, cabbage, cauliflower, carrots, chili, peppers, cruciferous, figs, flax, garlic, grapefruits, grapes, kale, licorice root, mushrooms, nuts, oranges and lemons. papayas, raspberries, rosemary, seaweed and other sea vegetables, soy products like tofu, sweet potatoes, green tea and black tea, tapioca, tomatoes, and turmeric are known for their possible anti-cancer property. In this research, Au (III) was used as an oxidizing probe to explore the reduc-

ing capability of antioxidants in natural foods. Some of these natural foods were reacted with HAuCl4 to produce Gold in form of nanoparticles. When a particle of gold metal is similar in size to wavelengths of visible light (400–750 nm), it interacts with light in interesting ways ranking from orange to deep red color. In these experiments, a solution of 0.1 mM Au (III) brought to boiling temperature and then a microfiltered pure and fresh solution of food extract was added to the gold solution along with stirring until it turned to a deep red color. The antioxidant in food reduces the Au(III) ions to nanoparticles of metallic Au which forms red nanoparticle. In conclusion, these experiments suggesting that these foods have antioxidants that can fight against cancers.

SYNTHESIS OF CHLORINATED POLYAZA[5] AND [7]HELICENES, S. A. Jackson* and G. Mandouma, Albany State University, Albany, GA 31705. *Helicenes* are Helically-shaped molecules that consist of *ortho*-fused aromatic compounds composed of benzene rings or other aromatic rings. These molecules tend to have a screw shape due to their steric hindrance causing the molecule to twist out of plane. *Helicenes* play an important role as building blocks of helical conjugated polymers, and other compounds with unique material properties. These molecules are notable for having chirality while lacking both asymmetric carbons and chiral centers and can rotate light almost 10,000 degrees. They have also been found useful as chiral auxiliaries, as inducers of enantioselectivity, and as fluorescence sensors. *[N]helicenes* are structures that exhibit unusual chiro-optical, electro-optical, and fluorescence properties which constitute the cornerstone in many modern devices, from optic fibers to liquid-crystal displays (LCD), or light-emitting diodes (LED). We have designed and synthesized a series of novel helix-shaped molecules having five and seven conjugated rings via an iterative protocol of coupling reactions followed by diazotization reactions. Further elaboration around the chloro substituents can lead to elongation, improved solubility and/or fluorescence, and provide new routes to compounds with tunable material properties.

SYNTHESIS OF POLYAZA[N] HELICENES POTENTIAL INHIBITORS OF TELOMERASE, A. K. Epps and G. Mandouma, Albany State University, Albany, GA 31705. *Telomeres* consist of DNA and bound proteins located at the end of human chromosomes. *Telomeric DNA* are double stranded and contain the sequence (TTAGGG/CCTAAA). *Telomeric DNA* are known to form four-stranded complexes called G-quadruplexes in which four *Guanine* bases are linked to one another. The enzyme telomerase catalyzes the synthesis of *telomeric DNA* repeats and has been associated with cell immortalization. Because telomerase is over expressed in cancer cells, it makes a valuable target in oncology. G-quadruplex stabilization has been shown to directly inhibit telomerase catalytic activity. G-quadruplex formation at the telomeres can be promoted by natural proteins and small molecules and thereby interfere with gene expression. Such Potential inhibitors of telomerase have been found to be either large in size or helical in shape in order to effect binding. Helix-shaped molecules also known as *[N]helicenes* have emerged as potent ligands to G-quadruplex and therefore as telomerase inhibitors. We have synthesized *polyaza[N]helicenes*, compounds **7** and **9** as potential inhibitors to telomerase. Our synthesis was based on an iterative tandem of reactions, Ullmann coupling followed by diazotization first to produce substituted *benzo[c]cinnoline* and then to afford racemic *polyaza[5]-* and *[7]helicenes* **7** and **9**.

BUILDING A CALIBRATION MATRIX FOR QUANTIFYING ACTIVES IN OVER THE COUNTER MEDICINES BY TARGET FACTOR ANALYSIS**, T. T. Ho Lam* and H. Z. Msimanga, Kennesaw State University, Kennesaw, GA 30144. A multivariate calibration matrix was developed and applied to analyze over the counter (OTC) medicines for their

active components. OTC medicines such as Migraine Formula, *Robitussin*, *DimeTap*, and others contain more than one active drug. In addition, they contain excipients like sugars, *saccharin*, *sodium benzoate*, dyes, *citrates*, and others, some of which will respond to the detector used. Some active ingredients are mixed in large concentration ranges, requiring broad range detection instruments. On the other hand, concentrations of the excipients that are possible sources of interference are not known. A calibration matrix for multivariate analysis must address these problems in order to quantify compounds of interest. We obtained absorbance spectra of calibration solutions and sample solutions (unknowns) via a Cary 100 UV Spectrometer. We also used a standard addition method/TFA to minimize spectral interference. We evaluated experimental results by comparing them with the manufacturer's claim and with those obtained from high-performance liquid chromatography using a photodiode array detector (HPLC/PDA). Details of the results and limitations of TFA are discussed in the poster.

A NEW METHOD FOR EXTRACTING MYRISTICIN IN NUTMEG SPICES**, H. Z. Msimanga, T. Benedict*, J. Mericka* and A. Veney*, Kennesaw State University, Kennesaw, GA 30144. A method for analyzing *myristicin* in nutmeg spices by GC/MS was developed. In addition to *myristicin* which is in relatively small amounts, nutmeg spices contain other essential oils such as *myristic* and *trimyristic acids* as major components. Our goal was to develop a sample preparation method that would reduce the amounts of the acids, but increase the amount of *myristicin* before analysis with GC/MS. We investigated enriching the *myristicin* by using several organic solvents (*methanol, acetone, dichloromethane, chloroform, ethyl acetate, hexane*, and *ether*) of different polarities. We also investigated how extracting *myristicin* at different pH values affected the *myristicin/myristic acid* ratio. Finally, we studied *myristicin* extraction using C18 solid phase extraction (SPE) cartridges. Samples prepared by these procedures were analyzed by GC/MS-QP 2020 using ZB-MS 30 m by 0.25 mm internal diameter column. Preliminary results indicate that hexane or petroleum ether, both nonpolar, extract better than the more polar solvents. Details of the results are presented in the poster.

FLUORESCENT RHODIUM AND IRIDIUM COMPLEXES DERIVED FROM *N*-HETEROCYCLIC CARBENES, C. Ghattas*, M. Chowdhury*, L. Hutchinson* and D. Tapu, Kennesaw State University, Kennesaw, GA 30144. Catalytically active metal complexes derived from *N-heterocyclic carbenes* (NHC) have found increasing interest in the last years, in part due to the unique electronic and steric properties of the ligands. This project was directed toward the synthesis and spectroscopic characterization of a series of rhodium and iridium complexes that incorporate a new class of *N-heterocyclic carbene* ligands. The NHC ligands have been tagged with fluorescent moieties. The synthesis and spectral characterization of these new metal complexes will be presented. Interest in the development of these compounds has arisen due to their potential application in catalysis and in fluorescent devices. Acknowledgment is made to the Donors of the American Chemical Society Petroleum Research Fund for support of this research.

TESTING USED MOTOR OILS FOR FORENSIC RELEVANCE**, C. R. Dockery, V. Langley*, L. Mulqueeny*, K. O'Rourke*, H. Overman* and K. Truong*, Kennesaw State University, Kennesaw, GA 30144. We propose to determine the feasibility of using Laser-Induced Breakdown Spectroscopy (LIBS) to provide investigators with a chemical fingerprint for motor oil stains potentially allowing evidential matching to a suspect automobile. Successful completion of the project will generate a library of wear metal concentrations in different commercial motor oils at different mileage intervals that may be useful in criminal investigations. Nationally, criminal investigators are facing tremen-

dous backlogs created by increased casework in the face of budget cuts, furloughs and reduction in force. There is a critical and recognized need for rapid and potentially field portable forensic methodologies. A commercially available LIBS spectrometer is small and potentially field portable. Because it can be easily mounted onto mobile investigative units criminal investigators may use LIBS to determine the elemental composition of a suspect sample, obtaining results within seconds. Therefore, LIBS could provide necessary presumptive evidence, allowing investigators to obtain a search warrant or make progress in a criminal investigation. This project was supported in part by a Kennesaw State University Incentive Funding Awards for Research & Creative Activity.

ACCIDENTAL POISON: THE ANALYSIS OF 1,4-BUTANEDIOL IN TOYS, C. R. Dockery, H. Z. Msimanga, K. Drupiewski*, L. Mulqueeny* and H. Overman*, Kennesaw State University, Kennesaw, GA 30144. A popular children's arts and craft toy made international headlines recently when it was discovered that *1,4-butanediol* had been substituted into some of its formulations. The chemical *1,4-butanediol* rapidly converts to the date-rape drug *gamma-hydroxybutyric acid* upon ingestion and resulted in the accidental poisoning of several children. In this experiment, students extracted *1,4-butanediol* from the toys (or a prepared simulation) using their knowledge of drug chemistry, solubility, pH, extractions, etc., and quantitative analysis is performed using gas chromatography. Students were able to determine the average percent weight of *1,4-butanediol* in the toy, and based on the percent weight (approximately 7%), calculated the hypothetical therapeutic and fatal doses. Case studies in the existing literature allow students to expand knowledge gained in laboratory to dose-response data in real cases of accidental poisoning. Simulations using commercially available toy craft beads make this experiment accessible to other undergraduate chemistry programs.

A FACILE ONE-POT SYNTHESIS OF CHIRAL AMINES ON SILICA GEL, R. Rozier*, I. Furtado*, A. Tangar* and J. T. Barbas, Valdosta State University, Valdosta, GA 31698. We have continued our investigations for a greener synthesis of chiral amines on silica surfaces. Our current synthesis is facile, economical, and takes place at ambient temperatures on the surface of *activated silica* with the addition of a minimum amount of solvent. Typically, 2 g. of *silica* were introduced into a dry round bottomed flask equipped with a stirring bar and a drying tube. To the flask were added 10-20 mL of dry ether, $1.0x10^{-3}$ mol of an aldehyde and $1.0x10^{-3}$ mol of a chiral primary amine. The suspension was stirred for 30 minutes to form the intermediate imine. To the suspension was then added 0.15 g of *sodium borohydride*. The flask was cooled in an ice bath, and a few drops of water were added periodically to initiate the reduction. The products were filtered, and the silica washed with three aliquots of 5 mL of ether. The ether extracts were combined and dried over anhydrous *sodium sulfate*. After filtration the ether was removed on a rotary evaporator. The products were purified from trace impurities by column chromatography. Yields were near quantitative. They were analyzed by IR, GC-MS, proton and C-13 NMR, and polarimetry.

FORENSIC ANALYSIS OF THE CHEMICAL COMPOSITION OF TRACE EVIDENCE FROM FINGERPRINTS, LIPS AND OTHER SKIN RESIDUES**, J. G. Gober* and W. Zhou, Southern Polytechnic State University, Marietta, GA 30060. New discoveries in chemistry, biology and other scientific disciplines continue to bring innovative methods and technology into the ever-advancing field of forensic science. This project centers around a new approach to forensic analysis: analyzing the chemical composition of latent fingerprints, lip marks and forehead skin residues left at crime scenes. Through modern instrumental analysis, we will determine the chemical composition of these three types

of samples. Gas chromatography mass-spectrometry (GC-MS) is the primary instrument used for qualitative and quantitative analysis. Samples of skin residue from fingerprints, lip marks and foreheads of volunteers were collected on clean glass microscope slides and then extracted with *chloroform*. The extracts were reconstituted with *ethyl acetate* and then silylated with *N,N-bis(trimethylsilyl)- trifluroacetamide* (BSTFA) before being run through GC-MS. Qualitative analysis of more than 30 samples from nine volunteers using GC-MS has identified *squalene, palmitic acid, octadecanoic acid*, and *octadecenoic acid* as common components of these samples. Research thus far has focused on the quantitation of *squalene* in the three types of samples using both selected ion monitoring (SIM) and extracted total ion chromatograms (TIC). Standard solutions of *squalene* with the internal standard *anthracene* were prepared for construction of a calibration curve. Samples from new volunteers will be collected, and the *squalene* content in different samples will be measured. High-performance liquid chromatography (HPLC) and thin layer chromatography (TLC) will also be used for quantitative analysis. Through this research, we hope to gain more insight into the variation in the chemical composition of skin residues that may result from demographic factors such as gender, age and race. In future studies, we will also investigate any potential markers present in samples from vegetarians, smokers and diabetic individuals.

CONFORMATIONS OF RDX ANION: A DENSITY FUNCTIONAL THEORY OF ION STRUCTURE AND ENERGETICS, D. S. Newallo*, N. K. Bose, A. Thompson and Y. Jeilani, Spelman College, Atlanta, GA 30314. RDX (*1,3,5-trinitroperhydro-1,3,5-triazine*), an explosive cyclic nitramine, is used for both military and industrial applications. The widespread use of RDX led to environmental pollution of both surface and ground water. Analytical methods have been developed for detecting RDX using negative chemical ionization (NCI) mass spectrometry. The generation of the negatively charged RDX is the initial ionization step in a mass spectrometer. Correct anion structure of RDX is needed in developing fragmentation mechanisms. Models of RDX and its anion based on both chair and boat conformations were studied using density functional theory (DFT) methods. RDX ring conformations were modeled: AAA, AAE, AEE, and EEE. B3LYP functional with 6-311G(d,p) basis sets were used to optimize all conformers. B3PW91, O3LYP, and X3LYP functionals were used to evaluate the B3LYP results; also, the basis sets effects were studied using 6-311++G(d, p). Hyperconjugation effects on RDX conformation were evaluated because of the lone pair of electrons on the atrazine ring nitrogens. As expected, $n \rightarrow \sigma^* C\text{-}H_{ax}$ interactions were dominant in RDX anion therefore increasing $C\text{-}H_{ax}$ bond length. The goal was to study both the energetic and structural features of the RDX anion. The results showed an anion-molecule complex as the energetically favored structure. Among the selected conformations, AAE and AEE conformers led to anion-molecule complexes. Both AAE and AEE were more stable than other conformers. The use of B3LYP and X3LYP functionals were important in finding the anion-molecule complexes.

A PRELIMINARY REPORT OF CHEMICAL ANALYSIS VIA ATOMIC ABSORPTION SPECTROSCOPY OF A CAMPUS ECOSYSTEM DURING INTENSE CONSTRUCTION ACTIVITY**, N.C. Deans*, S.C. Ryals*, C. Abraham*, N. Jopra* and D.P. Pursell, Georgia Gwinnett College, Lawrenceville, GA 30043. Since opening in 2006, the Georgia Gwinnett College campus has undergone a rapid expansion of its physical plant through construction has increased enrollment from 120 students to 12,000 students by 2014. In addition, the Georgia Department of Transportation will soon begin a major construction project upgrading GA HWY 316 (which bounds the campus ecosystem), a major transportation link between Atlanta and Athens. Our research interest is to monitor

heavy metal contamination in the campus ecosystem before, during, and after this period of rapid growth. Using the Environmental Protection Agency, EPA digestion protocols and flame atomic absorption spectroscopy, we have found detectable levels of cadmium, copper, chromium, and lead in the ecosystem. Samples analyzed to date originate to areas adjacent to GA HWY 316 and include soil, vegetation (*kudzu, Pueraria lobata*), and aquatic life (bullfrog tadpoles, *Rana catesbeiana* and golden shiner minnows, *Notemigonus crysoleucas*). Monitoring is ongoing and will continue over the coming semesters to determine changes in heavy metal levels throughout the period of construction. This research is funded by the Georgia Gwinnett College Vice President for Academic and Student Affairs Seed Grant Program and the Dean of Science and Technology Research Support Program.

REDUCING STRENGTH OF ORGANIC TOMATOES AND A TOMATO JUICE TO REACTIVE OXYGEN FREE RADICALS, B. Garduno* and C. Kim, Georgia Gwinnett College, Lawrenceville, GA 30043. In biological systems, reducing agents, also called antioxidants, play a crucial role by providing electrons to reactive oxygen free radical species which may cause deleterious chain reactions leading to cell death and cell malfunction. Tomatoes are often suggested as a plentiful source of antioxidants; however there are a variety of tomatoes in the market and their antioxidant capacity may vary depending on their characteristics. This research investigated the antioxidant capacity of three different species of tomatoes as well as tomato juices. The solid tomato was blended, followed by centrifugation and filtration to collect juice. Additionally, one-hundred percent concentrated tomato juice was centrifuged and filtrated to be analyzed for its antioxidant capacity. The trolox equivalent antioxidant capacity (TEAC) method was used to evaluate the antioxidant capacity of the three different tomatoes and the tomato juice. The prepared juices were diluted if needed to obtain proper absorbance readings from the UV/Vis spectrophotometer. The results of TEAC values were expressed as µmol of trolox per ml of liquid samples. The experimental results showed that the antioxidant capacities were as high as eight fold different between tomatoes indicating that the size and species of a tomato may relate to its antioxidant capacity. Also the concentrated tomato juice showed a significant difference in antioxidant capacity when compared to those of organic tomatoes.

AVAILABILITY OF WATER-SOLUBLE ANTIOXIDANT IN ASPARAGUS AND BROCCOLI UNDER TWO DIFFERENT PREPARATION METHODS, H. Dinh*, K. Hodge* and C. Kim, Georgia Gwinnett College, Lawrenceville, GA 30043. Free radicals in human body can damage cells, DNA, and proteins, which can lead to various types of diseases including cancers. Antioxidants found in fruits and vegetables help stabilize reactive oxygen species (ROS) free radicals improving beneficial health effects. Asparagus and broccoli are well known vegetables with high antioxidant capacity. This research aims to investigate the availability of extractable antioxidant capacity from these two vegetables which were prepared differently such as fresh under room temperature and boiled at 96°C for 5 minutes. Thirty one grams of fresh and boiled asparagus and broccoli were weighed and blended for a minute with 200 mL of distilled water. The liquid samples were centrifuged for 10 minutes at 1,000 rpm followed by vacuum filtration. The extracted solutions were diluted to determine their antioxidant capacity using Trolox Equivalent Antioxidant Capacity, TEAC assay. The results showed that higher TEAC values were obtained from asparagus than broccoli for both prepared methods. In addition, significantly higher total water-soluble antioxidant capacities were observed from boiled asparagus and broccoli than fresh samples of both.

SYNTHESIS OF A NOVEL DICHLORO HEXAAZA DOUBLE[4]HELICENE, T. M. Horne* and G. R. Mandouma, Albany State University, Albany, GA 31705. *[N]Helicenes* are molecules that are helically-shaped. These molecules consist of *ortho*-fused aromatic compounds composed of benzene rings or other aromatic rings. Because these molecules have a tendency to bend or twist out of shape, they tend to adopt a screw or twisted ladder shape. This geometry is similar to the geometry of DNA. Therefore, *[N]Helicenes* are widely known for having chirality while lacking both asymmetric carbons or chiral centers. Chirality *[N]helicenes* and other twisted compounds such as *hetero[N]helicenes* have been used in polymer films to effect great angles light scattering, a property which is used in the development of large flat screen displays. *[N]Helicenes* have also been found very useful as chiral auxiliaries, inducers, and fluorescence sensors. The modern devices that have been improved include optic fibers, liquid-crystal displays (LCDs), and light-emitting diodes (LEDs). *Double[N]helicenes* are analogs of *[N]helicenes* with a double bend or twist providing a unique saddle-shaped topology. Hetero *double[N]helicenes* especially *polyaza double[N]helicenes* are sought for the added ligand properties because of the nitrogen lone pairs. We have designed and synthesized a novel *2,2'-dichloro 5,6,10,5',6',10'-hexaaza double [4]helicene* by way of an iterative protocol comprised of Ullmann coupling of *2,4-dichloronitrobenzene* **1** followed by Wilcox diazotization of *2,2'-dinitro-5,5'-dichlorobiphenyl* **2** and a selective nitration of *2,7-dichlorobenzo[c] cinnoline* **3**. Ullmann coupling of *2,7-dichloronitrobenzo[c]cinnoline* **4** afforded the *1,1'-dinitro bis 7,7'-dichlorobenzo[c]cinnoline* **5** which was converted to the title compound **6** by a modified Wilcox diazotization.

ATMOSPHERIC CHEMICAL MEASUREMENTS AND TRENDS IN COLUMBUS, GA, S. M. Abegaz and M. Nester, Columbus State University, Columbus, GA 31907. In this study, wet deposition and ambient air samples were collected over a 15 month period at a single site on Columbus State University's main campus in Columbus, Georgia, United States, and analyzed for arsenic, cadmium, chromium and lead. The analytical procedures were validated using standard reference materials of environmental origin. Results of this study were in good agreement with the certified values, with a precision better than 6%. The range of heavy metals concentrations for 6-day wet deposition samples were 0.15-1.0, 0.060-5.0, 0.062-98.0 and 0.10-11.0 micrograms per liter for arsenic, cadmium, chromium and lead, respectively, with a precision better than 7% for more than 95% of the measurements. The ranges of heavy metal concentrations for the 6-day ambient air samples were 0.80-35.0 ng/m^3, 1.50-18.0 ng/m^3, ND-120 ng/m^3, and 2.50-35.0 ng/m_3 for arsenic, cadmium, chromium and lead, respectively, with a precision better than 11%.

RELEASE RATE OF SALICYLIC ACID IN STOMACH RELIEF AIDS**, A. S. Durden* and M. C. Koether, Kennesaw State University, Kennesaw, GA 30144. Stomach relief aids contain *bismuth subsalicylate* as the active pharmaceutical ingredient. Dissolution testing was performed to determine the release rate of the total amount of salicylic acid from these aids. Each test uses 900 mL of deaerated media (deionized water or 0.1 M HCl) at 37°C. Up to six replicates can be performed at once. Some stomach relief aids also contain *salicylic acid* and *sodium salicylate* as non-active ingredients which are also measured in the total amount of *salicylic acid*. While 50 RPM is recommended for suspensions, 100 RPM was also tested. A full suspension sample size (15 mL) is not tested due to the presence of cellulose which interferes with filterability. Only one mL is tested in the 900 mL vessels. However, full caplets are tested. Samples are drawn at 10, and 60 minutes for analysis by UV-Vis. Results indicate that the salicylic acid is considered to be rapidly releasing.

THE SYNTHESSIS AND CHARACTERISATION OF NEW IMIDAZOLIUM SALTS TAGGED WITH FLUORESCENT MOIETIES, M. Chowdhury*, L. Hutchinson*, C. Ghattas* and D. Tapu, Kennesaw State University, Kennesaw, GA, 30144. In 1991, Arduengo reported the first stable crystalline carbene. Since then, *N-heterocyclic carbenes* (NHC) have emerged as a powerful class of carbon-based ligands. Owing to their unique electronic and steric properties, they have been incorporated in a large variety of catalytically active metal complexes. *Imidazolium* salts have been used extensively as precursors for NHC. Using a high yielding, modular synthetic strategy, a series of polycyclic *imidazolium* salts has been prepared and studied as a new class of versatile fluorescent materials and as potential precursors for novel NHC. The synthesis and spectral characterization of these new materials will be presented. Acknowledgment is made to the Donors of the American Chemical Society Petroleum Research Fund for support of this research.

Section III: Earth & Atmospheric Sciences
Social Science Building Room 3019
Alfred J. Mead, Presiding

8:00 GROUND-PENETRATING RADAR INVESTIGATION OF SUBSIDENCE IN COVERED KARST NEAR VALDOSTA**, Benjamin Davis* and Donald M. Thieme, Valdosta State University, Valdosta, GA 31698. During the summer of 2011, cracks developed in the cinder block foundation and walls of a house belonging to Jay Watkins in a rural area west of Valdosta, Georgia. Mr. Watkins contacted faculty at Valdosta State University for geotechnical advice. In two separate field investigations of the Watkins property, we identified subsurface anomalies trending beneath the house using ground-penetrating radar (GPR). Profiles were run at one meter intervals using a MALÅ 100 MHz GPR System on a 29 m x 51 m grid which abutted the house itself (WAT). Two other areas on the Watkins property were also investigated to identify locations which had fewer subsurface anomalies and might be less prone to subsidence than the current house location. "WAT A" was a 17 m x 10 m grid of profiles, and "WAT B" a 17 m x 16 m grid. The WAT A and WAT B grids were on a slightly higher and flatter area of the Watkins property where the land surface appears to be mantled by indurated sand at the top of the Hawthorne Group in the local geology. Maps are being prepared of all three grids using "time slice" analysis in order to assess the likelihood of subsidence occurring in the future.

8:15 3D LASER SCANNING OF QUARRY EXPOSURES IN COASTAL PLAIN STRATA, Chad A. Novack*[1], Donald M. Thieme[1] and Matt Luke[2], [1]Valdosta State University, Valdosta, GA 31698 and [2]Georgia Southern University, Statesboro, GA 30460. Terrestrial laser scanning is a new technology which can be used to make three dimensional interpretations of geologic outcrops. Using currently available LiDAR instruments, more precise evaluations can be completed over larger areas in less time than is currently possible using conventional field methods. In our study of sedimentary strata at the CEMEX limestone quarry near Perry, Georgia, a Leica C-10 HDS scanner was used to identify contacts between stratigraphic units and georeference the contacts with sub-meter accuracy. The CEMEX quarry has been a reference section for Coastal Plain stratigraphic units since 1917. Many tons of rock are removed every week so that new exposures are available for geological and paleontological study every year. In our study, two highwall exposures were scanned. The upper highwall had approximately 25 meters of the Twiggs Clay (Fullers' Earth) overlying limestone from the Tivola tongue of the Ocala formation. In the lower highwall, almost the entire thickness of the Tivola

limestone above the Clinchfield sand was present. Preliminary results from the 3D laser scanning suggest that limestone is particularly well preserved beneath the ridges in the quarry area where there are thick deposits of the Twiggs Clay.

8:30 EARTHQUAKES IN AND NEAR JAPAN, MARCH-AUGUST, 2011, Whitney Rountree* and Donald M. Thieme, Valdosta State University, Valdosta, GA 31698. The great Tohoku earthquake of March 11, 2011 was the most powerful to be recorded by seismographs on Japan, with a 9.0 moment magnitude (Mw). We examine all earthquakes of greater than 4.0 Mw tabulated by the National Earthquake Information Center (NEIC) within the area between 20 and 60 degrees N latitude and between 125 and 150 degrees E longitude with a view to identifying "foreshock" and "aftershock" movements of the Earth's crust related to the March 11 Tohoku earthquake. Of the 4,662 earthquakes studied, 63.4 percent (2,954) occurred during March. Large foreshocks began on March 9th with a 7.3 Mw event followed by another three earthquakes greater than 6.0 Mw on the same day. The average depth of 31.2 km for March was shallower than that for the other months, and over 300 earthquakes during March had foci within the upper 10 km of the crust. Our results indicate that faults along the boundary between the Pacific and North America plates were particularly active at crustal depths shallower than 30 km during March of 2011. Strong earthquakes greater than 4.0 Mw continued to occur along this boundary through August, and crustal movements comparable to that which caused the great Tohoku earthquake, tsunami, and nuclear disaster may recur in the not too distant future.

8:45 SURFACE WEATHERING OF LIMESTONE IN FLORIDA CAVERNS STATE PARK**, Mary Beth Lupo* and Donald M. Thieme, Valdosta State University, Valdosta, GA 31698. Florida Caverns State Park near Marianna is a system of interconnected cave passages developed into a tour cave by federal workers during the 1930's and 1940's. Limestone exposed at the surface and in the uppermost cave passages belongs to the Marianna and Suwannee formations in the local geology. The surface of limestone outcrops throughout the park exhibits features resulting from physical and chemical weathering. Rectangular cracks, rillenkarren, and other features have been identified and are found at several scales. Field mapping and sampling are focused on two areas of the park: 1) China Cave vicinity, and 2) the bluffs between the Tour Cave entrance and the Chipola River. Fractures and features due to both mechanical and chemical weathering are being mapped on rectified photographs and assembled into photomosaics for each area. Samples of limestone are being collected from the exposures representing various stages of weathering beginning with relatively fresh rock. Approximately five (5) thin sections will be made from these samples for petrographic analyses, possibly to be followed up by chemical analyses.

9:00 A GIS METHOD TO ANALYZE SHALLOW ELECTRICAL RESISTIVITY AND GROUNDWATER FLOW IN WETLANDS**, Sarah C. Hazzard*, S. Mutiti, L. E. Berry* and H. Sadowski*, Georgia College and State University, Milledgeville, GA 31061. Shallow electrical resistivity methods provide a relatively easy and cost-effective way of mapping the subsurface in wetland environments. Traditional ways of analyzing these data include curve matching, analytical methods, and pseudosections. Psuedosections and Three Dimensional (3D) results can be obtained from specialized software, such as RES3DINV or EarthImager. In recent years, ArcGIS has become very popular in environmental studies, but not as popular in electrical resistivity data analysis and groundwater flow modeling. The objective of this project was to assess the performance and accuracy of ArcGIS in analyzing 3D resistivity data and groundwater flow in a wetland. The

study area was a wetland system located at the Oconee River Greenway, in Milledgeville. The area of focus was a small basin within the Greenway wetland system. In addition to overland flow, significant subsurface flow through a highly permeable layer was observed to transport water between basins, and possibly from the wetland into nearby Fishing Creek. To further understand how this wetland functions, electrical resistivity profiling was used to map the subsurface and the extent of the high permeability layer. Resistivity results were analyzed in RES3DINV (a commercial resistivity software) and in ArcGIS, using different interpolation techniques. The spline interpolation technique in ArcGIS produced a better match to observed data. Groundwater flow modeling in ArcGIS provides a better understanding of how runoff flows into Fishing Creek. Overall, ArcGIS can be used as a valuable, reliable, and readily available program for analyzing resistivity data and modeling groundwater flow in wetlands.

9:15 HEAT AS A NATURAL TRACER IN WETLAND SLUG TESTS**, L. E. Berry*, S. Mutiti, S. C. Hazzard* and H. D. Sadowski*, Georgia College and State University, Milledgeville, GA 31061. Most wetland environments are composed of low hydraulic conductivity (K) material such as clay, which can make determination of hydrogeologic properties challenging. The objective of this study was to determine the viability of using heat as a natural tracer, coupled with slug tests, to determine conductivity of the subsurface material in wetlands. The use of heat as a natural tracer for determining K is beneficial because it is inexpensive and does not require introduction of chemicals. This study is part of a broader ongoing project to understand the functioning of wetlands in Milledgeville. One of the sites for this study, the Oconee River Greenway, lies along the Oconee River. The second site, Andalusia Farm, is a historical farm formerly belonging to writer, Flannery O'Connor. We investigated the potential of using heat and pressure transport to determine the extent of slug tests. Pressure transducers and HOBO thermisters were used to collect water depth, pressure and temperature data. Borehole logs and two-dimensional electrical resistivity profiling were used to study the subsurface stratigraphy. K values at Andalusia averaged 0.31 m/d and at the Greenway values averaged 0.031 m/d. Both systems were more sensitive to changes in temperature than pressure. To determine which processes (advection, dispersion or conduction) were more dominant in the subsurface heat transfer, coupled heat and flow models will be created in VS2DH software. Our preliminary results indicate that heat as a tracer has potential to show the lateral and vertical extent of slug tests, which is important in studies that are sensitive to heterogeneity in hydraulic properties.

9:30 THE CAPACITY OF A STRUCTURALLY UNIQUE WETLAND TO FILTER URBAN POLLUTANTS IN MILLEDGEVILLE, GEORGIA**, Hannah B. Sadowski*, Samuel Mutiti, Christine Melvin, Sarah C. Hazzard* and Lori E. Berry*, Georgia College and State University, Milledgeville, GA 31061. Wetlands provide the critical biological service of filtering contaminants and wastes from rainfall or runoff. In metropolitan settings, constructed wetlands can be built to treat urban wastewater, which provides additional economic value. The primary objective of this research was to investigate the effectiveness of a structurally-unique urban wetland, along the Oconee River in Milledgeville, at filtering contaminants from urban runoff. The wetland system is made up of a series of basins that are, in some places, separated by covered bricks and provides the only opportunity for runoff to be filtered before entering the creek and river. The basin of study is primarily composed of a top clay layer with a highly conductive sandy layer that lies approximately twelve inches below the surface. A soil core of each soil type was taken and column experiments were used to study the filtration of nitrate, phosphate, and iron. Each column was initially flushed with deionized water to determine the concentration

of chemicals retained in the soil. Then a known standard was added followed by deionized water to determine the filtration capacities. A unique pattern was observed in the clay layer with regards to filtration of nitrate and iron. Reduction in iron and phosphate concentrations, up to 98%, was observed in the sandy layer. It appears that the multi-basin structure and significant subsurface flows of this wetland increase the potential for contaminant removal and should be considered in constructed wetlands. In such a design different soils, plants and microbes can be strategically placed in different basins to progressively increase contaminant removal.

9:45 THE FOSSIL SNAKES OF NORTH AMERICA – HOW OLD IS THAT KINGSNAKE?, Dennis Parmley, Georgia College and State University, Milledgeville, GA 31061. Interestingly, the oldest colubrid snake in North America is known from the late Eocene (ca. 36-34 Ma) of Georgia. This family of snakes exploded during the late Miocene (ca. 12.5-9 Ma) and by the end of the Pliocene (ca. 2 Ma) all modern taxa were likely present in North America, at least at the generic level. Here I will trace the history of North American colubrid snakes across time (late Eocene to Pleistocene) and offer some possible evolutionary explanations for the success of this highly adaptive group of snakes.

POSTER

TOOTH REPLACEMENT PATTERNS AND RATES IN THE LATE CRETACEOUS MOSASAUR *TYLOSAURUS PRORIGER* (SQUAMATA, REPTILIA)**, Zachary T. Ansley*[1], Michael D. D'Emic[1] and Kathlyn M. Smith[1,2], [1]Department of Geology and Geography, Georgia Southern University, Statesboro, GA 30460 and [2]Georgia Southern University Museum, Statesboro, GA 30460. Mosasaurs are extinct marine reptiles from the Cretaceous period. Mosasaurs exhibit polyphyodont dentition, in which teeth are constantly replaced throughout life. Rate of tooth replacement can be related to tooth use and dentition turnover, and may be useful as a character in phylogenetic analyses. Characteristics of tooth replacement in a *Tylosaurus proriger* specimen from South Dakota, USA, will be investigated in this study. Time of individual tooth formation can be determined by counting growth lines in tooth dentin. These lines – incremental lines of von Ebner – are present across all amniotes, and record daily dentin deposition. Thus, differences in the number of daily lines between successive teeth in one tooth family reflect the rate of tooth replacement, as shown in earlier studies. Prior studies have employed CT scans to identify the number of teeth in a single tooth family, and to determine size differences between successive teeth in a family; this difference can be used as a proxy for tooth replacement rate. To minimize damage to this specimen, most data on tooth replacement will be collected from CT scans. Tooth formation time, however, will be obtained – through the use of von Ebner lines – for at least one mosasaur tooth. CT scans will be conducted on teeth in the jaw as well as those in the pterygoid. Differences between pterygoid and jaw tooth replacement have implications for evaluating the function of pterygoid teeth in mosasaurs. Overall, the results from this study are expected to shed light on patterns and rates of tooth replacement in *T. proriger*. These data can ultimately be used to evaluate differences in tooth use and dentition turnover among multiple mosasaur species.

Section IV: Physics, Mathematics, Computer Science, Engineering and Technology
Social Science Building Room 2028
Hasson M. Tavossi, Presiding

8:00 "DYNAMICS OF A PARTICLE ACTED ON BY THE DAMPING FORCE $(1+x^2)\dot{x}$", Ronald E. Mickens, Department of Physics, Clark Atlanta University, Atlanta, GA 30314. We consider a single particle acted on by a dissipative force proportional to its velocity, and a second even factor which is quadratic in its location coordinate. Using the qualitative theory of differential equations, we derive the first-order system, phase-space trajectory equations, the fixed-points (equilibrium states), and calculate the first-integral (which turns out not to be the energy). Our general conclusion is that while the particle travels only a finite distance, it does so in an infinite time. This conclusion is also the same as that for the case of simple linear damping. (This research was supported, in part, by the CAU School of Arts and Sciences, Faculty Development Program)

8:15 "ANALYSIS OF A HARMONIC OSCILLATOR HAVING THE DAMPING FORCE $(1+x^2)\dot{x}$", 'Kale Oyedeji[1] and Ronald E. Mickens[2], [1]Department of Physics, Morehouse College, Atlanta, GA 30314-3773 and [2]Department of Physics, Clark Atlanta University, Atlanta, GA 30314. We investigate the behavior of the solutions to the following nonlinear differential equation:

$$(*)\; x \quad x \quad 2\ (1 \quad x^2)x,$$

Where ε is a small but positive parameter, and the overdots represent time derivatives. Physically, this equation corresponds to a harmonic oscillator acted on by a damping force, which is proportional to the velocity but having a positive-valued space-dependent coefficient. Such a form appears in the study of the vibrations of thin sheets, and tubes of grapheme; see A. Eichler, *et al*., Nature Nanotechnology, DOL: 10.1038/NNANO.02011.71. Using the method of first order averaging, it is found that all nontrivial solutions to Eq. (*) oscillate with an amplitude essentially decreasing exponentially in time. We also use the qualitative theory of differential equations to reach this same conclusion. (This research was supported, in part, by the CAU School of Arts and Sciences, Faculty Development Program)

8:30 WORKING WITH THE LENNARD-JONES POTENTIAL IN SOLID STATE, Javier E. Hasbun, University of West Georgia, Carrollton, GA 30118. The Lennard-Jones potential in solid state physics is very useful because it can model simple systems with only two parameters. The potential was originally proposed in 1924 by Lennard-Jones[1], and the form that is popularly employed in molecular dynamics, for a pair of particles, is $V(r) = 4\varepsilon\left[\sigma/r_{ij}^{12} - \sigma/r_{ij}^{6}\right]$, where ε and σ are the parameters, r_{ij} is the distance between particles i and j. This form is known as the Lennard-Jones 12-6 potential. The potential is best suited for noble gases, due to their close shell properties (most closely like billiard balls). In this presentation, we employ this potential in order to simulate the equilibrium distance achieved by particles interacting through it. In particular we consider a pair of particles in one dimension; three particles in two and three dimensions; and finally four particles in three-dimensions. It will be shown that, in addition to obtaining the particles' equilibrium distance, that minimizes the potential, one also finds that they organize in a fashion that gives their optimal structure. We, for example, find that three particles arrange in an equilateral triangle, in two or three dimensions, and that the optimal structure for four particles in three dimensions is for each of them to occupy the corners of a tetrahedron. [1]"On the Determination of Molecular Fields. II. From

the Equation of State of a Gas," J. E. Jones, Roy. Soc. Proc. A106, No.738, p463-477(1924).

8:45 TEMPERATURE AND HEAT TRANSFER ANALYSES OF BIOMATERIAL CERAMICS DURING VARIOUS COOLING CONDITIONS, Barry Hojjatie and Mathew Vining, Valdosta State University, Valdosta, GA 31698. Thermal stresses induced in dental ceramics and other biomaterials ceramics during firing, thermal treatment, or cooling may result in premature failure of these materials. In order to quantify the residual and transient thermal stresses within the materials, we need to first determine the temperature distributions and the cooling profiles subjected to various cooling conditions. In this study we discuss the development of analytical and computation models that we have developed to predict thermal behavior of ceramic disks during rapid or slow cooling and present our recent findings. A computer program in MATLAB was developed, based on the analytical solutions of the differential equations, governing the heat transfer problem, the mechanical and thermal properties of various biomaterial ceramics were used in the analysis. The results were obtained for various cooling parameters, and geometric conditions. Comparison of the results from the analytical model, with those from the models based on finite element analysis, showed a good agreement which supports the validity of our analytical solutions and computational models. This study was supported by a seed grant from Valdosta State University.

9:00 LESSONS LEARNED IN THE FIRST YEAR OF THE NSF S-STEM PROGRAM AT AUGUSTA STATE UNIVERSITY, J. A. Hauger, C. J. Poppeliers, S. J. Reinke, M. E. Robbins and S. L. Robinson, Augusta State University, Augusta, GA 30904. The Savannah River Scholars Program (SRSP) at Augusta State University is funded through the National Science Foundation's Scholarship for STEM (S-STEM) program. Now in its first year, the SRSP supports students majoring in chemistry, computer science, mathematics and physics. In addition to funding scholarships, SRSP supports faculty and peer mentoring as well as undergraduate research. The presentation will outline the steps we took in writing a successful grant as well as highlight the features of the SRSP which are intended to improve student success. In addition, we will present preliminary data collected with the intent of evaluating, and improving the program.

9:15 RED AND INFRARED COLOR INDEX VALUES OF THE MOON**, R. W. Schmude, Jr., Gordon College, Barnesville, GA 30204. The writer has carried out brightness measurements of our Moon in filters, transformed to the Johnson R and I system. An SSP-3 solid state photometer along with a small telescope, and calibrated aperture masks of 0.002 and 0.0007 meters, were used in this study. Based on the measurements collected as of November 8, 2011, it is concluded that our Moon has opposition surge values of 0.11 and 0.07 magnitudes in the R and I filters, at a solar phase angle near 1.5°. The selected equation for the V-R color index is 0.77 – 0.0009 × alpha and the selected equation for the R-I color index is 0.46 + 0.0005 × alpha. In both equations, alpha is the solar phase angle of our Moon.

9:30 BINARY-ENCODED RECURSIVE GENERATION OF SPACE-TIMES, D.W. Marks, Valdosta State University, Valdosta, GA 31698. Products of orthonormal basis vectors generate the elements of a geometric algebra, labeled by a binary index indicating whether or not a given basis vector is in the product. For an even number of bases, the volume element anti-commutes with each basis vector. Direct products generate larger geometric algebras from smaller ones. Given two sets of basis vectors, with an even number of bases in the first set, construct a compound set of basis vectors

consisting of (a) the direct products of basis vectors of the first set and the identity matrix of the second geometric algebra and (b) the direct products of the volume element of the first geometric algebra and basis vectors of the second set. The number of dimensions of the compound set equals the sum of the number of dimensions of the two original sets. If the volume element of the first set is space-like (time-like), then the signature of the compound set equals the signature of the first set *plus* (*minus*) the signature of the second set. Sets of basis vectors, also labeled by a binary index, with signature 0 and any (necessarily even) number of dimensions can thus be built up recursively from the basis vectors (one space-like and one time-like) of the Minkowskian plane. Sets of basis vectors with any signature and number of dimensions can then be found as subsets of larger sets with signature 0. Direct product construction also generates complex numbers, quaternions, Pauli spin matrices, and Dirac gamma matrices. Recursive generation of geometric elements suggests that the universe generates itself recursively from two base elements, one space-like and one time-like.

9:45 CHARACTERIZATION OF DAMAGED ZONE IN BIOLOGICAL TISSUE BY ULTRASOUND, Hasson M. Tavossi, Dept. of Physics, Astronomy and Geosciences, Valdosta State University, Valdosta, GA 31698. Biological tissues are characterized by ultrasonic technique as a noninvasive method, similar to the ultrasonic imaging. This method is safer than x-ray or radiation tomography, can be done in real-time, and is less costly than Magnetic Resonance Imaging (MRI). In this experiment ultrasonic wave transmitted in the tissue sample is investigated by three different signal analysis techniques. These are; i) spectral content, ii) wave attenuation, and iii) wave speed measurements of the ultrasonic waves transmitted through the tissue sample. The tissue as a poroelastic material has a large attenuation, and acts as a frequency pass-band filter, for ultrasonic waves. Data collected for attenuation, wave speed, and frequency filtering are processed by a high performance 500 MHz digital oscilloscope, to detect damaged zones in the biological tissue. The goal is to use this safe, real time and low cost method to detect damaged in the biological tissues.

10:00 **Section Business Meeting**

10:45 COLLEGE ALGEBRA – LARGE SECTION VERSUS TRADITIONAL SIZE, Andreas Lazari and Denise Reid, Valdosta State University, Valdosta, GA 31698. The economic crisis facing our nation forced many companies, and universities to downsize and learn to operate with smaller budgets. Valdosta State University (VSU) did not remain immune to this economic crisis. To deal with this crisis VSU started offering large sections of core area courses, including College Algebra (MATH 1111). It is clear from a financial point of view that large sections will benefit the university during this financial crisis. What was not clear was the impact to student's learning and success in College Algebra. Fall 2010, and 2011 VSU offered the first large sections of Math 1111 with 170 students. The course retention rate and the students' performance on the departmental final exam for the treatment group, Large Section (LS), versus the control group Traditional Size (TS) of 35 students, were compared. The LS had a statistically significant higher retention rate, and departmental final exam average.

11:00 LEARNING TO TEACH MATHEMATICS: PRESERVICE TEACHERS' DESIGN AND IMPLEMENTATION OF STUDENT-LED, DEMOCRATIC, MIDDLE GRADES MATHEMATICS CLUBS, Stephanie Behm-Cross, N. Bayazit and C. C. Jett, Georgia State University, Atlanta, GA 30302. This STEM project partnered middle grades pre-service teachers, and mathematics methods faculty members, at Georgia State

University (GSU), with teachers and students at Atlanta Neighborhood Charter School (ANCS). The purpose was to create innovative year-long after-school mathematics clubs for middle level students at ANCS. Further, the project allowed pre-service teachers the opportunity to design and implement student-led, democratic, project-based curriculum, as well as to engage in alternate forms of reflection and learning among; pre-service teachers, in-service teachers, university faculty, and middle grades students. We projected that, by allowing middle school students the opportunity to engage in democratically-designed and relevant mathematics lessons, activities, and tasks; it would enhance their understanding and appreciation for mathematics, in the real world. In addition, we projected that, pre-service constituents would be able to make connections between what they learn in methods courses pertaining to mathematics teaching and learning theories, and the pedagogical practices, that are actually enacted in middle grades mathematics spaces. Preliminary findings from our work with the mathematics clubs will be shared at this meeting.

11:15 STUDENTS DOING THE UNTHINKABLE… COMING TO CLASS ONE HOUR EARLY! (INCREASING STUDENT SUCCESS IN CALCLUS I), Q. Harris, Georgia Perimeter College, Decatur, GA 30034. Ever wish that your students would perform better in your class? I've tried a NEW technique and it is working! Using this technique during the spring, 2011 Semester, 60% of my students passed Calculus I! We will see a video of the Students from last semester and discuss my technique. This study was made possible by a STEM grant from Georgia Perimeter College.

POSTER

ELECTRICAL RESISTANCE OF MULTI-WALLED CARBON NANOTUBES AS A FUNCTION OF TEMPERATURE, Adriane M. Melnyczuk* and Ben de Mayo, University of West Georgia, Carrollton, GA 30118. Carbon nanotubes are at the forefront of materials science research; these versatile materials can be commercially produced and used in a variety of science disciplines. We studied carbon nanotubes in order to characterize the electrical resistivity of commercially supplied multi-walled carbon nanotubes, outer diameter <8nm, length ~50μm, and purity >95wt% (given by supplier) as a function of temperature. The sample was configured into a cylindrical shape with a length of 8.6 mm between copper electrodes and a diameter of around 0.8 mm. A LabView virtual instrument system measured the temperature of the sample, using a resistance thermal detector (RTD) from Omega, over the temperature range of liquid nitrogen (LN2) to a maximum of 306K. The virtual instrument also recorded the time and the resistance of the sample (4 point probe configuration). The resistance ranged from 23.33 Ω at room temperature (296.82K), to a minimum of 18.11Ω at LN2, and a maximum of 24.88 Ω at 306K, with a minimum of 17.80 Ω at 180.6 K. After the temperature reached a maximum, the sample was cooled to 297.3 K; the resistance was 23.35 Ω, compared to 24.09 Ω, for the same temperature upon heating. The error in resistance measurement was close to ± 0.03 Ω, and in temperature ± 0.02 K. Our research on the electrical properties of carbon nanotubes as a function of temperature will help facilitate their use in future applications. Work supported by the Georgia Space Grant Consortium-NASA.

DETERMINING THE LOCATIONS AND KINEMATICS OF MASS OUTFLOWS IN AGN, Jay P. Dunn[1], D. Michael Crenshaw[2] and Steven B. Kraemer[3], [1]Georgia Perimeter College, Dunwoody, GA 30338, [2]Georgia State University, Atlanta, GA 30303 and [3]The Catholic University of America, Washington, DC 20064. Mass outflows of ionized gas in AGN are important feedback mechanisms for the enrichment of the IGM, self-

regulation of black-hole growth, and formation of structure in the early Universe. To understand the origin, dynamics, and impact of the outflowing gas on its surroundings, we need to know their locations (radial positions and polar angles with respect to the AGN rotation axes) and kinematics (radial and transverse velocities). We present here the first steps toward these goals. We have newly processed FUSE spectra of 2 Seyfert 1 galaxies and we have derived velocity-dependent covering factors and ionic column densities, which are essential in determining number densities (via metastable lines or variability) and ionization parameters (via photoionization models) of the UV absorbers (in conjunction with the ongoing COS data analysis).

Section V: Biomedical Sciences
Social Science Building Room 3010
Seyed H. Hosseini, Presiding

POSTERS

A RECOMMENDATION FOR ACCURATE EXTRACTION OF EFFECTIVE ERMITTIVITY OF CANCER CELLS AT MICROWAVE FREQUENCIES, S. J. Timmons and A. K. Saha, Albany State University, Albany, GA 31705. To kill cancer cells by microwave radiation, it is important to determine accurately the effective permittivity of cancer cells at microwave frequencies. Cancer cells are generally characterized by mixing cells homogeneously into isotonic agarose gel at a low volume fraction and then exposing at microwave signal placing the composite in a metallic waveguide. In this simulation work, cancer cells are modeled as tiny dielectric particles of spherical shapes in 3D electromagnetic simulation software HFSS (High Frequency Structure Simulation). The host medium (agarose gel) is also modeled as another dielectric material of cubic shape. Cancer cells are mixed with fixed volume of host medium at different volume fractions and placing the composite or sample in a parallel plate wave guide (PPWG), microwave signal is applied. Some part of the signal power is reflected back and some are transmitted through the sample. Effective permittivity (which is a measure of electrical property of a material) is calculated from reflected and transmitted signal power data by a rigorous mathematical manipulation. Effective permittivity is calculated for different volume fraction of cancer cells and a linear relationship is obtained between volume fractions of cancer cells and extracted effective permittivity of the composite. Finally, effective permittivity of cancer cells is extracted by extrapolation from the linear relationship. The analysis of the result shows that extracted parameter of the cancer cell is slightly less than the assumed value in the simulation. The investigation to find out this discrepancy results in a conclusion or recommendation that effective permittivity of the gel should be as close to that of the cancer cells for accurate determination of cancer cells' effective permittivity. This work is supported by MBRS-RISE and DoD Grant.

ASSESSMENT OF THE QUANTITY AND FUNCTION OF MITOCHONDRIA FROM THE LIVER OF SHELL-LESS CHICK EMBRYOS, Cleonecia Forbes**, Feiruz Atta and Army Lester, Department of Biology and Physics, Kennesaw State University, Kennesaw, GA 30144. Environmental conditions that prevent the normal growth and development of shell-less chick embryos have plagued scientists for decades. Shell-less embryos appear to grow at a relatively normal rate during the first 10 days of development but significantly decline during days 14-21 of incubation. This study investigates liver mitochondrial quantity and activity as a possible explanation for this problem. Fertile chicken eggs were incubated for three days and the embryo removed and cultured in a shell-less cup-type

culture vessel. After 14 days of total incubation, the embryos were removed from the culture vessel, the liver dissected and used as a source of mitochondria. A succinate dehydrogenase assay was used to assess mitochondrial activity. Preliminary results indicate that liver of a single embryo is sufficient to provide enough mitochondria for assessment. Also, mitochondrial activity appears to be normal or even high when compared to *in ovo* controls and responds to variables such as changes in substrate. Further assessments of difference in mitochondrial activity between in ovo and shell-less embryos is likely to shed light on the hypothesis that dehydration is the major problem of shell-less embryos.

BUGS AND MUCK! AN INVESTIGATION OF MACROINVERTEBRATE DIVERSITY AND WATER QUALITY AT RAES CREEK** Christina W. Tran*, M. Y. Nakama*, L. C. Coursey*, C. Best*, A. L. Joyce* and M. Ayer*. Recent literature has indicated that freshwater ecosystems have been increasingly impacted by human influences, with southeastern states showing no immunity to this trend. Raes Creek is an important tributary of the Savannah River. The purpose of the study was to monitor benthic macroinvertebrate (insect and shellfish) diversity and water quality among three varying human impacted sites within Raes Creek. Two sampling methods were used to survey macroinvertebrates within each impacted site: a Surber net sampler (active sampling) and Hester-Dendy plate sampler (passive sampling). Water quality was measured and recorded at each site; the concentrations of the following parameters were measured: nitrate ($NO3^-$), phosphate ($PO4^-$), dissolved oxygen (DO), pH, depth and velocity of the surveyed area. Results to the present date have shown that water quality shows consistency across eight months of data collected. Macroinvertebrate diversity shows seasonal variation, but no consistent trend to indicate poor water quality in the impacted sites. Some species, such as water striders were found to be unique to certain sites, which may help to provide further insight to the quality of water. Further studies into Raes Creek are necessary to come to a more definitive conclusion in order to observe a correlation between macroinvertebrate diversity and water quality. In addition, other tributaries should be investigated in a similar manner to determine whether there is significant human impact on the Savannah River.

POTENTIAL ROLES OF Gb3 IN APOPTOSIS PATHWAYS IN BURKITT"S LYMPHOMA CELLS**, Kinnari L. Matheson*[1], Nicole Ezeude*[1], Shanita S. Bishop[1], Leonard Anderson[2], Marisela DeLeon Mancia[1] and Mark Maloney[1], [1]Spelman College Atlanta, GA 30314 and [2]Morehouse School of Medicine Atlanta, GA 30310. Globotriaosylceramide (Gb3/CD77) is a glycolipid that associates with Shiga toxin to induce apoptosis in Burkitt's lymphoma cells and B-lymphocytes in the germinal centers of lymphoid tissue. Gb3/CD77 also plays a role in other immunological pathways that include type I interferon (IFN-α) signaling and cell adhesion involving the B lymphocyte antigen CD19. Using microarray analysis, gene expression in Daudi cells, Burkitt's lymphoma cells with high levels of Gb3/CD77, has been compared to gene expression in VT500 cells, Daudi subclones with very low levels of Gb3/CD77 and an increased resistance to apoptosis inducers. Assays utilizing polymerase chain reaction (PCR) arrays purchased from Qiagen, Inc. (RT^2 Profiler PCR Array, PAHS-012F-2) will be performed according to the manufacturer's specifications. Analysis of PCR array data comparing apoptosis-related gene expression in these two cell lines will be compared to microarray results in order to better understand the roles that the glycosphingolipid Gb3/CD77 plays in susceptibility to apoptosis inducers. Funding for this study has been provided by the following grants: NIH/MBRS/SCORE GM 08241, NIH/RIMI MD00215, MBRS/RISE 2R25GM060500-09A1 and HHMI 52006134.

RECOGNITION OF GB3-BINDING SITES IN NON-HUMAN PROTEINS**, Nicole O. Ezeude*[1], Kinnari Matheson*[1], Shanita S. Bishop[1], Leonard Anderson[2], Marisela De-Leon Mancia[1] and Mark Maloney[1], [1]Spelman College, Atlanta, GA 30314 and [2]Morehouse School of Medicine, Atlanta, GA 30310. Extensive research has identified the glycosphingolipid globotriaosyl ceramide (Gb3 or CD77) as the receptor for Shiga toxin (verotoxin) and the bacterial pilin papG protein. Studies also have identified Gb3 as a marker for germinal center (GC) B cells, and roles for Gb3 in CD19-mediated adhesion, interferon type I signaling, apoptosis and antigen presentation in these cells have been reported. The B cell protein CD19 appears to contain a Shiga toxin-like Gb3 binding site. Blastp searches from the NCBI database were previously utilized to identify additional human proteins with sequence similarities to the Gb3-binding region of the Shiga toxin B-subunit and the papG protein. We will expand upon this research to attempt to identify similar Gb3-binding sites on non-human proteins in the databases using Shiga toxin sequences and the Shiga toxin-like sequence of CD19 as query sequences for Blastp searches. SDSC Biology Workbench 3.2 tools (ALIGN and LALIGN) will be used to align these protein sequences with toxin B-subunit and CD19 sequences. Further analyses will be performed using Cn3D modeling software in order to identify possible Gb3-binding sites on available structural models of proteins identified in the BLAST p searches. Research funding was provided by the following grants: NIH/ MBRS/SCORE GM 08241, NIH/RIMI MD00215, MBRS/RISE 2R25GM060500-09A1, and HHMI 52006134.

Section VI: Philosophy and History of Science
Social Science Building Room 2035
E.T. McMullen, Presiding

9:00 SERENDIPITY IN DISCOVERIES: CASE STUDIES OF TWO ALEXANDERS, BELL AND FLEMING, Tom McMullen, Georgia Southern University, Statesboro, GA 30460. A great many past discoveries, in one way or another, have lead to scientific or technical advances. Many of these physical discoveries were serendipitous or incidental. These types of discoveries neither lend themselves to in-depth analysis nor much philosophical discussion. Nevertheless, this paper will examine two case studies of serendipitous discovery. Alexander Graham Bell was a famous US citizen who was born in Scotland but found a home in Canada. He is best known for the invention of the telephone, which led to riches and honors. There were several factors involved in the telephone's invention, but the first, and most important factor for Bell, was serendipity. This occurred several times leading up to the invention. Serendipity is nothing new in the area of discoveries. Alexander Fleming, who was also born in Scotland, is famous for the discovery of penicillin. Fleming's discovery was also serendipitous. He made it because he was prepared, primed you might say, for the discovery. When the opportunity came his way, he was ready for it and recognized what had happened. It was similar with Bell. Both men were working in their respective fields of endeavor and were primed and alert for the serendipity that came their respective ways.

9:30 WHY NEW SCIENTIFIC JOURNALS ARE CREATED, Ronald E. Mickens, Department of Physics, Clark Atlanta University, Atlanta, GA 30314. Why was the "Astrophysical Journal" created when "Physical Review" was already in existence? Why journals of "Physical Chemistry" and "Chemical Physics"? And, what were the original reasons for starting the Journal of Physical Chemistry? We discuss these questions and several related topics as fundamental issues involved in the professional development and recognition of new scientific areas when their methodologies do not fit readily into the

"normal" practices of the standard sciences. Our general conclusion is that new journals come into being when some subgroup of scientists, working within the framework of a "non-standard" scientific methodology, lack effective means to discuss, present, and publish their work in existing scientific journals. This research was supported, in part, by the CAU School of Arts and Sciences, Faculty Development Program.

10:00 **Section Business Meeting**

10:30 FACTORS WALK RETAINING WALL – A FEW NOTES ON THE HISTORY OF THE STONE WALL WITH THE RESULTS OF AN UPDATED ANALYSIS OF THE WALLS EROSION AND PROJECTED REPAIRS TO BE MADE, Elliott O. Edwards, Jr., Savannah-Chatham County Public School System, Savannah, GA 31406. Factors Walk Retaining Wall is an attractive series of stone gravity retaining walls that reach heights of 19 feet. The walls begin at the East Broad Street ramp to the east and continue westerly for ¾ of a mile along the Savannah River bluff to their termination at the foot of Montgomery Street to the west. The walls were built between 1855-1869 into the river bluff as a measure to protect Factors Walk. The retaining walls that protect Factors Walk are constructed primarily of stone ballast that was brought over on cargo ships throughout the nineteenth century. The historic stone retaining wall continues to erode and presents problems dealing with its stability. The wall is an important piece of infrastructure along Savannah's waterfront and erosion is playing a significant role in its stability as a retaining wall that protects the Savannah Bluff. There are two reasons why the wall is eroding: acid rain and salt water intrusion. A recent, updated analysis of the stone erosion will be presented and reasons why it is important to protect this important piece of Savannah History. Appropriating funds to make repairs on the wall have been challenging and an update on the financial status will also be presented.

11:00 WHEN THE MOON IS IN THE SEVENTH HOUSE: ASTROLOGY AND ASTRONOMY IN THE SCIENTIFIC REVOLUTION, Tom McMullen, Georgia Southern University, Statesboro, GA 30460. "When the moon is in the Seventh House, and Jupiter aligns with Mars." So begins *The Age of Aquarius* from the 1960s rock opera *Hair*. But exactly when does this alignment occur? More importantly, how could we figure out celestial positions at the moment of your birth? Giovanni Pico della Mirandola raised these questions in his challenge of astrology, *Disputationes adversus astrologiam divinatricem*, 1496. Claudius Ptolemy's *Tetrabiblos* and *Almagest* (Second Century, AD) were the standards of the day, but his planetary positions not accurate. This changed during the Scientific Revolution. Astronomers especially, but also astrologers, mathematicians, and medics all desired more accuracy in this age of uncertainty. These included Regiomontanus, Copernicus, Brahe, Kepler, and Galileo - all of whom were taught astrology and/or practiced its principles. Catholic authorities accepted astrology for medical reasons, weather predictions, etc., but allowed nothing to override the free will of God. Thus, in 1605, Galileo Galilei was accused of casting horoscopes of a deterministic nature. Martin Luther was totally against Astrology. Tycho Brahe argued for it, but allowed for both the free will of God and man. Johannes Kepler was famous for the relative accuracy of his calendar predictions, especially the one for 1595. He wrote *On the more certain foundations of astrology* (1601). The upshot of all this concern for more accurate alignments of the moon, Jupiter, Mars, et. al. was the emergence of astronomy as an independent science.

Section VII: Science Education
Social Science Building Room 2025
Ollie Irons Manley, Presiding

8:00 ENGAGING GIFTED STUDENTS IN GENERAL EDUCATION CLASSROOMS USING DIFFERENTIATION, Joan B. Imand* and R. A. Cooper, Brenau University, Gainesville, GA 30501. The purpose of this study was to determine if differentiation helps to engage gifted students in general education classrooms. Gifted students are often placed in general education classrooms and as a result, can become unengaged in learning. Gifted students bring gifted personalities and abilities into general education classrooms and teachers frequently lack the necessary skills to engage them. This research involved forty students and two units of sixth grade Earth Science instruction. For the first unit, one group of twenty students received differentiation while the other group of twenty students received teacher led instruction. For the second unit, the groups were switched so that each set of twenty students received each type of instruction. The teacher led instruction consisted of students sitting and taking notes. Students would raise their hands to ask questions or to give answers to teacher questions. The differentiation involved student choice. Students could choose to learn through inquiry cooperative learning groups, working individually, or choosing a different type of learning environment such as working quietly or listening to music. The results of this research indicate that differentiation engaged gifted students in general education classrooms better than teacher led instruction. Both groups of students performed better on the unit assessments and were more interested and eager to learn when the teacher used differentiation. It can be concluded that it is beneficial for teachers to include differentiation as an instructional method when teaching gifted students in general education classrooms. The student benefits outweigh the time that it takes for teachers to prepare for differentiation.

8:45 SYNTHESIS OF 2-AMINOFLUORENE DERIVATIVES AS AN ORGANIC CHEMISTRY LABORATORY PROJECT, Joy T. Jenkins*, Harry J. Reed* and Chad E. Stephens, Augusta State University, Augusta, GA 30904. A multi-step laboratory project has been developed for the organic chemistry laboratory involving the synthesis and subsequent reactions of 2-aminofluorene. This project demonstrates multi-step synthesis to students and affords students the opportunity to perform a number of reactions that are typically covered in a second semester sophomore level organic chemistry course. The project also allows ample opportunity for student use of spectral analysis to characterize reaction products. The first step of the project involves nitration of fluorene, a commercially available and relatively inexpensive starting material, using nitric acid in acetic acid. Next, the nitro group is reduced by refluxing with either tin (II) chloride in EtOAc, or with Zinc and ammonium chloride in EtOH, to give 2-aminofluorene. The 2-aminofluorene is then converted to a number of derivatives, including an acetamide, a benzamide, and an imine. To illustrate "green" chemistry, the imine synthesis can be conducted by simply grinding the 2-aminofluorene and a substituted benzaldehyde together without solvent. The imine is then reduced with NaBH4 to give an alkylamine, which illustrates a reductive amination sequence. Finally, the 2-aminofluorene can be converted to 2-iodofluorene via a diazonium reaction. Students characterize each product by mp, TLC, IR, ^{1}H NMR and ^{13}C NMR. If at least one product contains fluorine, students can also utilize ^{19}F NMR to characterize a product.

9:00 LEARNING TO TEACH MATHEMATICS: PRESERVICE TEACHERS' DESIGN AND IMPLEMENTATION OF STUDENT-LED, DEMOCRATIC, MIDDLE GRADES MATHEMATICS CLUBS, Shannon Hart,* Stephanie Behm-Cross, N. Bayazit and C. C. Jett, Georgia State University, Atlanta, GA 30302. This STEM project partnered middle grades pre-service teachers and mathematics methods faculty members at Georgia State University (GSU) with teachers and students at Atlanta Neighborhood Charter School (ANCS). The purpose was to create innovative year-long after-school mathematics clubs for middle level students at ANCS. Further, the project allowed preservice teachers the opportunity to design and implement student-led, democratic, project-based curriculum as well as to engage in alternate forms of reflection and learning among pre-service teachers, in-service teachers, university faculty, and middle grades students. We projected that by allowing middle school students the opportunity to engage in democratically-designed and relevant mathematics lessons, activities, and tasks, it would enhance their understanding of and appreciation for mathematics in the real world. In addition, we projected that pre-service constituents would be able to make connections between what they learn in methods courses pertaining to mathematics teaching and learning theories and the pedagogical practices that are actually enacted in middle grades mathematics spaces. Preliminary findings from our work with the mathematics clubs will be shared at this meeting.

9:15 EFFECT OF PEDAGOGICAL STRATEGIES ON STUDENTS' INDIVIDUAL AND GROUP PERFORMANCE WHEN LEARNING COMPARABLE MATHEMATICAL CONCEPTS**, Kristen Young and Sandra Rucker, Clark Atlanta University, Atlanta, GA 30314. The effectiveness of two different instructional strategies on students' performance while learning comparable mathematical concepts will be discussed. The intent was to gain insight into the usefulness of cooperative learning groups versus individual efforts when studying comparable concepts in the mathematics classroom. Instructional sessions with students enrolled in an applied algebra course were used for the study. A mixed-methods design was employed. Qualitative data consisted of attitude surveys and quantitative data included student quizzes. The results of the evaluation of the study will be presented at the meeting.

9:30 COMBINING TAXONOMY AND DNA BARCODING TO MEASURE INSECT BIODIVERSITY ON CAMPUS, A. D'Costa, J. Russell, R. Haining, C. Runck, A. Barrera, M. Schlueter and D.Barnes, Georgia Gwinnett College, Lawrenceville, GA 30043. As part of a four-year undergraduate research experience initiative, faculty have been charged to integrate research into the curriculum of required courses in all four years of a student's matriculation. To expose students to the nature of science and show them continuity in research, a lab module has been piloted that has multiple sections of introductory and upper level biology students collaborating on a research project aimed at measuring insect biodiversity on a college campus. Students in introductory biology determine the best collection techniques to obtain these insects at various sites on campus. In lab, they sort and classify them using traditional taxonomic techniques. Each student picks a specimen and researches its distinguishing morphological features, life cycle, and other important characteristics. The insects are then handed over to students in an upper level biology course to DNA barcode using PCR. Information from each specimen will be catalogued in an online biodiversity database that will be updated and maintained by students and faculty. This project integrates the organismal and genetic bases of biodiversity, and will provide students a unique research experience in taxonomy, phylogenetics, and molecular evolution. Assessments will determine students' attitudes towards science and

whether they gained a deeper understanding of biodiversity through field collection and classification, and theory application of PCR.

9:45 USING WIMBA AS A TOOL FOR VIRTUAL OFFICE HOURS IN AN ONLINE ASTRONOMY LAB, Ulrike G. Lahaise, Georgia Perimeter College, Online Campus, Clarkston, GA 30021. Wimba Classroom is an online, live conferencing tool that is integrated into iCollege, Georgia Perimeter College's version of Blackboard Vista. Wimba Classroom was used in an online astronomy lab to hold virtual, live office hours for two consecutive semesters. In the first semester it was merely announced as an optional tool available to students by appointment. Student response was very limited for making appointments; however, the archived sessions were used more widely. The second semester is currently in progress. Wimba Classroom sessions were scheduled as a regular component with the instructor present in the room at pre-scheduled times in addition to the option for students to make individual appointments. Participation was still student driven due to the typically high variability of work schedules among online students. Attendance of the pre-scheduled sessions will be compared to the usage of the archived sessions as well as the usage as an individual appointment tool. The preliminary results of the second semester will be compared to those of the first semester. An evaluation will be presented regarding which method of integrating the use of Wimba Classroom yields a higher usage rate and whether or not the offering of regularly scheduled Wimba Sessions leads to a change in the number of individual appointments.

10:00 **Section Business Meeting**

10:30 FACULTY'S PERCEPTIONS OF DISTANCE LEARNING IN AN ONLINE SCIENCE PROGRAM ACCORDING TO GENDER AND YEARS OF TEACHING, Gladys Yarbrough and Ollie Manley, Georgia State University, Atlanta, GA 30303. American educators are facing a grave dilemma: As the technology clock is ticking faster and faster, successfully keeping pace with the ravenous learning appetite of 21st century students, traditional college teaching professionals are falling short of this challenge. However, for the most part, traditional colleges and universities faculty have been reluctant to embrace distance learning without uncertainty. Therefore, this research focused on examining faculty perceptions of an on-line graduate degree program in science education. The independent variables for this study are gender and years of teaching and the dependent variable is faculty's perceptions. In this study, e-mails were sent to the faculty in the College of Education at a university requesting their participation. The first part of the study was designed to obtain demographic data, and the second part was designed to determine faculty's perception of teaching in an online environment. The results confirmed that both gender and years of experience were significant, although our sample size was low. A more in-depth qualitative study is planned to examine follow-up data from personal interviews.

10:45 OVERCOMING FEELINGS OF ISOLATION IN AN ONLINE SCIENCE COURSE, Ollie Irons Manley, Georgia State University, Atlanta, GA 30303. In the traditional face-to-face courses students are able to interact with each other and observe the actions of their peers as well as their instructors. Online courses minimize the interactions between students and students as well as instructor and students. The lack of interactions causes feelings of isolation due to an absence of a means for social interfacing. This study focused on strategies that support student interactions as well as software systems that provide for both synchronous and asynchronous interactions. Data were collected

by interview to determine the students' perceptions of feelings of isolation in both synchronous and asynchronous courses. It is concluded that the use of synchronous and asynchronous communication tools supported interactions among students; however, the students felt that the synchronous environment provided for more social interactions in that they could react immediately to the comments and questions of their peers without a lapse in time.

11:00 DETERMINATION OF FAT IN FRENCH FRIES: AN ENGAGING CHEMISTRY LAB FOR NON-CHEMISTRY MAJORS, Michael Sakuta[1], T. Lampe[2], V. Mativo[2], J. Poteat[3] and M. Schoene[2], [1]Georgia Perimeter College–Newton Campus, Covington, GA 30014, [2]Georgia Perimeter College–Clarkston Campus, Clarkston, GA 30021 and [3]Georgia Perimeter College–Dunwoody Campus, Dunwoody, GA 30338. At Georgia Perimeter College (GPC), students (mainly pre-nursing and pre-dental hygiene) participate in introductory organic chemistry lab classes geared to non-majors. One experiment involves lipids. There are many types of lipids and, as a result, there are a wide variety of experiments that can be performed. However, the lipid experiment previously performed is, as the lab supervisor said, "a dud." Students don't learn much from this experiment and they are bored when they perform it. Here we present our new improved lipid lab that is easy to set up and engages students. Specifically, students determine the relative *iodine value* (the degree of unsaturation) of several edible fats and oils. In the second half of the experiment, the students extract the fat from a fast food restaurant's French fries and determine the total percent of fat in the fries. Then they determine the *iodine value* for the fries and compare it to the results from the first part of the experiment. The students can judge whether the restaurant's claims, that they cooked the fries in a polyunsaturated oil, are true. A majority of students said that this lab was interesting and that they learned a lot, making them want to learn more about fats and oils; thus, they were more engaged. This work was funded by a Georgia Perimeter College, University System of Georgia STEM mini-grant.

11:15 EFFECTS OF RESEARCH EXPERIENCES ON RETENTION OF UNDERGRADUATE STEM MAJORS, M. L. Lowder and B. O. Mitchell, Atlanta Metropolitan College, Atlanta, GA 30310. The retention of students in science, technology, engineering, and mathematics (STEM) disciplines is important for the United States' economic growth and competiveness. This study examines the effectiveness of the "NASA Creating Research Excellence in STEM" Program on improving the retention of STEM majors at Atlanta Metropolitan College (AMC). The program seeks to increase the number of underrepresented students successfully pursing and completing STEM and NASA-related programs of study. Ten undergraduate STEM majors, selected via an application process, participated in the program. All participants conducted research on the AMC campus and six were involved in summer internships involving research. The study measures retention of AMC STEM majors based on the first full cohort through one academic year to the next. Retention of program participants is compared to that of non-program participants. Students involved in the program are less likely to change to a non-STEM major or drop out. Furthermore, students participating in the program, as well as internships, are even less likely to leave STEM disciplines. "Student End of Experience" surveys suggest interest in STEM fields increased as a result of program involvement. Long term retention rates of program participants will be monitored. Funding for the "NASA Creating Research Excellence in STEM" Program was provided by NASA's Curriculum Improvements Partnership Award for the Integration of Research (CIPAIR).

POSTER

GPC'S STEM GRANT NAVIGATION GUIDE, Pamela Gore, Kouok Law, Pamela Leggett-Robinson, Margie Lewkowicz, Margaret Major, Bonnie Martin, Brooke Skelton and Jarrett Terry, Georgia Perimeter College, Decatur, GA 30034. This session will provide information on the grants that GPC has recently received, which are designed to increase the number of students majoring in STEM (Science, Technology, Engineering and Mathematics). (1) The University System of Georgia STEM II Initiative Grant funds a faculty mini-grant program to increase student success in STEM fields, professional development workshops and seminars, and supports Project MESA (Mathematics, Engineering and Science Achievement), which prepares educationally disadvantaged students (including female, low-income, minority, and first-generation college students) for transfer to a four-year institution with a math-based degree by providing academic tutoring, advising, career counseling, and college transfer information. (2) The NSF-funded Peach State Louis Stokes Alliance for Minority Participation (Peach State LSAMP) Grant supports special programs and initiatives to increase the number of underrepresented minority (URM) students who graduate from college with STEM degrees. (3) The NSF-funded ENLISTEM Project (Educate and Nurture Leadership in Science, Technology, Engineering and Math) recruits and awards scholarships ranging from $2000 to $5000 each year to 32 financially needy and academically talented STEM students who have unmet need after Federal Financial Aid has been awarded. (4) The NSF-funded Science, Technology, Engineering and Mathematics Talent Expansion Program (STEP) Grant provides support for students from their initial enrollment at GPC through their transfer/graduation to four-year institutions to complete their STEM Baccalaureate degrees. (5) GPC in collaboration with the Center for Assistive Technology and Environmental Access (CATEA) at Georgia Tech and the University of Georgia College of Education have teamed to create a STEM Accessibility Alliance, funded by the NSF called BreakThru. BreakThru is recruiting students having difficulties with STEM classes, due to learning challenges or disabilities to participate in an online, 3-D virtual mentoring program.

Section VIII: Anthropology
Social Science Building Room 2030
Susan Kirkpatrick Smith, Presiding

8:15 EARLY MAYA SHELL BEAD PRODUCTION AT PACBITUN, BELIZE**, Stephanie L. Henry*, Kennesaw State University, Kennesaw, GA 30144. Archaeological investigations at the ancient Maya center of Pacbitun, located in western Belize, have revealed the presence of thousands of shell beads embedded in the floors of early Maya houses dating to the Middle Preclassic (900-300 BC) period. The majority of the shell used in the manufacture of these beads was obtained from the Caribbean Sea, a distance of more than 100 kilometers. While most of the beads were marine in origin, a minority of them were produced using local snails (*jute*) and clams (*Nephronaias*). On the house floors, the beads were found in direct association with shell detritus and chert microdrills, which were used in their manufacture. A recent attribute analysis of more than 240 shell beads from one of the houses found at Pacbitun has provided some interesting insights into early Maya household organization, social structure, and craft specialization. This paper will focus on the nature and extent of craft production at the site during this early time period, and how bead manufacture changed through time (over a six hundred year period). The change observed in size and shape of the beads over time may have been in

response to a number of societal factors. These factors will be discussed as they impacted other sites in the region.

8:30 A PRELIMINARY ANALYSIS OF THE WHITES MOUND (9RI4) SITE**, Matthew T. Lyons*, University of Georgia, Athens GA 30602. The Whites Mound site (9Ri4) is located in eastern Richmond County, Georgia. The site was excavated in 1963 by David S. Phelps, then of Tulane University. No formal analysis of the artifacts recovered from the site was completed, and no report was ever written detailing the excavation and results. In 2011, the author began a study under the direction of Dr. Mark Williams of UGA to gather all known records on the site and to conduct a preliminary analysis of the sizable collection of artifacts recovered by Phelps. These ongoing efforts reveal the site to be multi-component, with primary occupations in the Archaic and Historic periods. Ultimately, the findings of this study will be used to characterize Whites Mound both chronologically and culturally. This research is supported by the University of Georgia Laboratory of Archaeology.

8:45 LAMAR ARCHITECTURE AT THE SWEETGUM SITE, 9MG245**, K.C. Graham*, University of Georgia, Athens, GA 30602. The Sweetgum site, 9MG245, was discovered in southeastern Morgan County, Georgia during the fall of 1989. Extensive excavations conducted in the summer of 1990 as part of a Pennsylvania State University archaeological field school revealed many details of a Lamar period farmstead dating sometime between A.D. 1520 and 1580. A large circular house and one small rectangular structure were identified during these excavations. This farmstead was one of a series of such farmsteads located in this part of the Oconee River valley. The spatial patterning of domestic structures and features is important for our understanding of regional household dynamics in the rarely-documented dispersed settlement system of the late prehistoric Southeast. A final report of this site was never published and as a result, much of the digital mapping of the site has remained unfinished. In this paper, I will present detailed digital maps of the Sweetgum site through each phase of the 1990 excavation. This research will hopefully shed light on the existence of other structures that may have been missed during the initial mapping of the site. This study is supported by the University of Georgia Laboratory of Archaeology.

9:00 EAT, DRINK AND… WALK?: DIET AND ACTIVITY AMONG BARBADIAN MIGRANTS IN ATLANTA, Jennifer Sweeney Tookes*, Emory University, Atlanta GA 30322. Diet or exercise? Debate over the most critical contributor to health is rampant. This paper addresses the issue among Caribbean migrants and their counterparts in the sending country, assessing differences and similarities in food choice and activity in Barbadian migrants in Atlanta as well as Barbadians in their home country. The existing literature argues that changes in diet cause migrants to become less healthy in the U.S. However, my analysis of dietary habits and levels of activity indicates that the significant difference in health between these two groups is the quantity and type of physical activity. Preliminary analysis indicates incidental exercise integrated into regular daily habits in Barbados increases activity levels to a point that seems to protect health, with little influence from dietary choices. Barbadian migrant women are adhering to a diet considered healthy by American dietary guidelines; yet, Barbadian women in Atlanta are less healthy than their counterparts on the island, who consume more traditional Caribbean diets heavy in starchy foods, meats and fats, but lighter in vegetables and fruits. This research indicates that physical activity may be a more important factor in long-term health than has been previously recognized. Funding provided by the Wenner Gren Foundation for Anthropological Research.

9:15 THE RACIAL "QUADRANGULATION" OF THE MIGRANT WORKER IN AMERICA'S SERVICE INDUSTRY, Isabella H. Alexander*, Emory University, Atlanta, GA 30322. The migration trends continuing to diversify the U.S. necessitate a move beyond the dichotomy of black and white in explorations of racial identity. Yet, how to best move beyond historically dualistic interpretations of race in the U.S. continues to be debated. Political scientist Claire Jean Kim proposed a "field of racial positions," mapping the racialization of Asians in relation to blacks and whites along the axes of "superior-inferior" and "foreigner-insider." Given the growth of migration from Latin America, my research introduces a mapping of the U.S.'s Latino population. I draw on my year of ethnographic engagement with restaurant workers and managers in the service industry, the nation's largest employer of migrant and Latino workers, to examine the positionality of Latinos through Kim's argument of racial triangulation. First, I establish a space for Latinos in the field of racial positions, below Asians on the axis of "inferiority" and below blacks on the axis of "foreignness." Second, I argue that an individual's context is responsible for shaping the emergent racial classification. I conclude that "migrant worker" is a point synonymous with Latino in the field of racial positions. In the context of restaurant work, the predominance of Latino migrants is influencing the racialization of the "other" as Mexican. The restaurant industry serves as a locus for the organization of new, politically charged forms of racial categorization and provides an ideal context for further exploring the implications of race and immigration in the American workplace.

9:30 PROS AND CONS OF LEAVING SKELETAL REMAINS ENCASED IN SOIL AFTER EXCAVATION**, Courtney Hamilton* and Susan Kirkpatrick Smith, Kennesaw State University, Kennesaw, GA 30144. Archaeological excavations in Greece are often conducted by professional archaeologists employed by the Greek Archaeological Service. This governmental agency does not have physical anthropologists on their staff, so human remains are boxed and stored for later analysis. Sometimes the remains, particularly the skulls, are left encased in soil and put in plastic bags. This practice creates some benefits for physical anthropologists, but also causes some problems. We will use an example from Crete, Greece to show how different kinds of data are lost and others are retained when bone remains unexcavated for a long period of time.

9:45 REALISTIC VERSUS IDEALIZED PERCEPTIONS OF WOMEN AND CHILDREN IN RECONSTRUCTION ERA BLACK DALLAS, TEXAS, Megan Teague Tucker, M.A., Kennesaw State University, Kennesaw, GA 30144 and University of Florida, Gainesville, FL 32611. The categories of male, female, and child are fluid concepts in Western society. Historically, in anthropological studies women and children are ignored or considered only peripherally in studies of adult interactions. The anthropological treatment of these groups as voiceless, static beings has since been challenged by sociologists, psychologists, social historians, and a myriad of others who began to explore their roles in the creation and maintenance of cultural norms. This paper examines the concepts of "childhood" and femininity in pre- and post-Emancipation urban Dallas, Texas. The new financial and social freedoms of African-Americans allowed them to express their ideals with material goods providing an avenue of both power and resistance to the dominant Victorian patriarchal society.

10:00 **Section Business Meeting**

10:30 CAVE ARCHAEOLOGY OF NORTH GEORGIA: PAST, PRESENT, AND FUTURE INVESTIGATIONS, J. G. Burnette* and T. G. Powis, Kennesaw State University, Kennesaw, GA 30144. Over the past 50 years, there has been consider-

able archaeological investigation of surface sites across north Georgia. However, little is known in comparison about cave sites in this same region. This lack of focus (or direction) into these karst features has skewed our understanding of the importance of how they were used, when they were used, and why they were used. To help remedy this, we began our research into cave archaeology by conducting a thorough review of the literature. Given the hundreds of caves that have been identified in the region, we decided to focus on a few of them which have been archaeologically investigated. The Corra Harris Cave in Bartow County and the Kingston Saltpeter Cave in Gordon County proved to be good candidates for review and exploration. Both of these cave sites have produced evidence of prehistoric Native American occupation. This paper will discuss what we know about cave use by early peoples of the region, and how their use has impacted the archaeology of north Georgia. Preliminary results indicate that caves were a highly functional aspect of prehistoric Native American culture and that little connection has been made by archaeologists between surface sites and cave sites.

10:45 THE GEOLOGY AT THE CORRA HARRIS 'IN THE VALLEY' HISTORIC HOMESTEAD AND ITS RELATIONSHIP TO CULTURAL LANDSCAPE USE, Kathy Wiggins* and Wayne Van Horne, Kennesaw State University, Kennesaw, GA 30144. The Corra Harris historic homestead was donated to Kennesaw State University and is currently being assessed for its potential for educational, research, and conservation usage. As part of a cultural ecological assessment of the site, a geological survey was performed to assess the influence of the local geology on the ecological community, available natural resources, and prehistoric and historic cultural use of the In the Valley site. Research methods included the use of USGS maps, field samples, observations of geological formations, and historical records. Based on this research, the geology of In the Valley would have provided a basis for a landscape rich in forest wildlife and vegetation suitable for hunter-gatherer societies. The thin soils covering dolomitic limestone and shale formations were unsuitable for Native American or historic agriculture over much of the historic homestead acreage.

11:00 PEDOLOGY AND CULTURAL LANDSCAPE AT THE CORRA HARRIS 'IN THE VALLEY' HISTORIC HOMESTEAD, Cecilia M. Mattei* and Wayne Van Horne, Kennesaw State University, Kennesaw, GA 30144. The Corra Harris historic homestead was donated to Kennesaw State University and is currently being assessed for its potential for educational, research, and conservation usage. As part of a cultural-ecological assessment of the site a pedological (soil) survey was conducted to determine the type of natural community that the soil would have supported both prehistorically and in the historic period. This provided a basis for evaluating the natural resources that would have been available at the site for cultural usage by both Native Americans and historic settlers. Methods used included soil analysis, use of state soil records to classify the soils, and observation of the ecological communities on the property. This analysis indicated that a variety of plant and animal resources would have been available for hunting and gathering; however, the thin acidic soils would not have been suitable for either prehistoric or historic agriculture.

11:15 THE ECOLOGY OF THE CORRA HARRIS 'IN THE VALLEY' HISTORIC HOMESTEAD AND ITS RELATIONSHIP TO CULTURAL LANDSCAPE USE, Wayne Van Horne, Kennesaw State University, Kennesaw, GA 30144. The Corra Harris historic homestead was donated to Kennesaw State University and is currently being assessed for its potential for educational, research, and conservation usage. As part of a cultural-ecological assessment of the site an ecological survey was conducted to identify

the present ecological community. Witness tree records from a property survey in 1832 were used to compare the current ecological community with the historic community. Aerial photographs of the site from the nineteen-thirties were also used to help determine the age of the current forest on the property. Based on this data the current community is representative of the historic nineteenth-century environment as reflected by witness tree data. The trees on the property appear to have been cut in the middle to late eighteenth century, but the current forest appears to be more than a century old. Based on this assessment, the historic ecological community would have provided resources for Native Americans in the form of various nut mast crops and game animals such as deer. The community is also indicative of dry, thin, acidic soils and the site is located on a ridge, so it was not conducive to agriculture for either Native Americans or American farmers in the area. Since the current forest represents the original flora of the site and is of significant age, and since original forest habitats of this type in this area of the Appalachian Valley are extremely rare due to historic agricultural impact, the conservation value of the property is considered to be high.

11:30 A PRELIMINARY CHECKLIST OF THE VASCULAR FLORA OF THE CORRA HARRIS 'IN THE VALLEY' HISTORIC HOMESTEAD, BARTOW COUNTY, GEORGIA, AND IT'S RELATIONSHIP TO CULTURAL LANDSCAPE USE, James Van Horne* and Wayne Van Horne, Kennesaw State University, Kennesaw, GA 30144. The Corra Harris historic homestead was donated to Kennesaw State University and is currently being assessed for its potential for educational, research, and conservation value. As part of a cultural ecological assessment of the site a checklist of the vascular flora was made to record the species that are present on the property, as well as their general distribution and abundance. This information was used to identify the existing ecological communities at the site. Visits were made to the property every two weeks for the duration of the growing season in 2011 in order to make identifications. All records were sight records only, and no voucher specimens were taken. A checklist of a few hundred species was recorded and nativity of species was also noted. The research demonstrated that for its relatively small size, and relative lack of geologic and topographic variety, this property has a large and diverse flora which includes a state protected species, *Sabatia capitata*. This diversity highlights the property's conservation value and also indicates the property's historic utility and value to people living off of the land.

11:45 HISTORIC CULTURAL LAND USE AT THE CORRA HARRIS 'IN THE VALLEY' HISTORIC HOMESTEAD, Heather E Irvin* and Wayne Van Horne, Kennesaw State University, Kennesaw, GA 30144. The Corra Harris historic homestead was donated to Kennesaw State University and is currently being assessed for its potential for educational, research, and conservation usage. The goal of this research is to identify the historical use of the property in order to assess its conservation value. Historical and archival sources, as well as USGS maps, were used to study the property and to reconstruct the cultural land use. The information indicates that the well-known author Corra Harris gardened and raised mules on the property for commercial sale. Her house, barn, library, and chapel remain in good condition and heirloom roses still bloom in the ruins of her formal garden. Since the structures built while Harris owned the property are still intact, the heirloom roses have survived despite years of neglect, and the historic cultural use of the site is known, the assessment provides strong evidence that the 'In the Valley' historic homestead has both historic and conservation value.

POSTERS

ASSESSMENT OF A NOVEL METHOD FOR STATURE ESTIMATION, Tony Fitzpatrick* and Leslie Brown*, Georgia State University, Atlanta, GA 30303. Forensic stature estimation from fragmented skeletal remains requires the use of non-standard formulae. The 'proximal femoral breadth', measured along the axis of the femoral neck, has been tested on skeletal populations of known stature, and has been shown to have a high correlation with the length of the femur. Length of the femur is in turn highly correlated with living stature. A measurement that is slightly modified, but simpler to collect has been tested on a skeletal Indigenous South African population. Living stature used in the South African analysis was not known and was therefore estimated with the Fully method. The modified measurement, or 'upper breadth of femur', is taken from the most superior point on the fovea capitis to the inferior aspect of the greater trochanter. In this study, data from a modern American population were collected from individuals housed in the Bass Donated Skeletal Collection at the University of Tennessee. The modern samples were of known age and living stature. In a sample of 63 females, the correlation between upper breadth of femur and length of femur is 0.640, similar to previous studies. In the male population of 146 individuals, the correlation is slightly lower at 0.609. Funding for data collection was supported by a Sigma Xi Grant-in-Aid of Research.

AN ANALYSIS OF CHERT ARTIFACTS AND THEIR ORIGINS AT TWO LATE WOOODLAND SITES IN NORTH GEORGIA, Lindy Crapps*, Kennesaw State University, Kennesaw, GA 30144. Lithic studies in the archaeology of north Georgia have not received as much attention in the past few decades despite recent advances in lithic method and theory across the Southeast. As a result, our understanding about how prehistoric Native Americans utilized chert sources and resources is not well understood. A recent comparative analysis of chert artifacts from two sites, the Holland Site located in Paulding County and the George Smith Site in Bartow County was conducted using the Sullivan and Rozen typology method. Both the Holland and George Smith sites are considered to be small hunting camps occupied during the Late Woodland (AD 200-800) period. Although separated by about 100 kilometers, these two campsites provide significant information about local procurement strategies, tool production, etc. The results of this analysis indicate that during the Late Woodland period, a wide variety of chert material was available and utilized, particularly from local and nonlocal sources. Implications for the utilization of nonlocal chert in the production of both tools and weapons will also be discussed. The Sullivan and Rozen debitage typology method was particularly useful for learning and comparing the lithic assemblages from the two sites. This method is simple and reliable in replicating debitage collections of similar sites for comparison of data. Through this comparative analysis and search for origins of non-local chert, a better representation of trade and resources among prehistoric Native Americans can be reached

ARCHAEOLOGICAL EDUCATION OUTREACH: HOW TO BETTER REACH THE LOCAL PUBLIC**, Andrew Post* and Susan Fishman-Armstrong M.A., University of West Georgia, Carrollton, GA 30118. Education Outreach Programs are important in informing the public about different areas of study. The Antonio J. Waring, Jr. Archaeological Laboratory (Waring Laboratory) is part of the Anthropology Department at the University of West Georgia (UWG). The Waring Laboratory established a formal education program in 2003, to teach the community about the importance of archaeology. This Education Outreach Program has three components including two teaching trunks that correlate with Georgia Performance Standards for 3rd-8thgrades, a Guided Tour of the Waring Laboratory, and a unique opportunity for students to engage in an on-site

Mock Excavation Pit. Changes in the economy and in school standards have created challenges for local schools to participate in the Education Outreach Program. Since 2003, the Education Outreach Program has had 4,509 participants. Of those participants 2,462 students were in grades k-12th with only 171 students from local schools. The purpose of this paper is to explain methods used to connect with the local school systems. Research was conducted through interviews with local principals and teachers, and with professors in the College of Education at UWG. As a result of these efforts and inquiries, better advertising methods are being developed and large scale inquiries are now being received from local schools.

THE GEORGIA ACADEMY OF SCIENCE

Affiliated with the American Association for the Advancement of Science

The Georgia Academy of Science is composed of "Residents and non-residents of Georgia who are engaged in scientific work, or who are interested in the development of science." The purpose of the Academy of "the promotion of interests of science, particularly in Georgia."

The Georgia Academy of Science was organized in 1922 and incorporated as a non-profit organization in 1953. Originally, eligibility for membership in the Academy was "definite achievement in some branch of scientific activity," and the number of members was set at fifty. This number gradually increased to ninety-five by 1934, and in 1937 the numerical limitation was removed. For several years the Academy affairs were administered by Fellows, but today this class of membership is honorary only, and all members who are residents of Georgia are equally eligible for Academy offices. Currently the membership of the Georgia Academy of Science is approximately 450, composed of men and women from all scientific disciplines and interest, located throughout the state of Georgia. In addition to direct membership in the Academy, affiliation of scientific societies with the Academy is also possible. At present the Georgia Junior Academy of Science and the Georgia Genetics Society are affiliated with the Academy, and have representatives on the Council, which is the governing body of the Academy.

The primary activities of the Academy are centered around the Journal, the Annual Meeting and the Georgia Junior Academy of Science. The Georgia Journal of Science is a recognized scientific publication, and is to be found in libraries throughout the United States and in many foreign countries. The Journal is published four times each year, the April issue being devoted to the abstracts of papers presented at the Annual Meeting.

The Annual Meeting of the Academy presents an opportunity for scientists and others interested in the development of science to meet, visit, and deliver scientific papers. Members of the Academy belong to Sections representing various fields of scientific endeavor the Annual Meeting is primarily oriented towards the programs of these Sections. In order to fulfill the growing requirement for interdisciplinary conferences one session of the Annual Meeting is devoted to a joint program in which the entire Academy participates.

The Georgia Junior Academy is composed of high school and middle school students organized into science clubs under the guidance of a Director and his (or her) staff, appointed by the President of the Georgia Academy of Science. The Georgia Junior Academy of Science supports a number of activities designed to promote scientific inquiry on the part of students. These activities include: (1) a state-wide Scientific Problem-Solving Bowl, (2) regional and state Science Bowl competitions, (3) regional and state Science Olympiad competitions, and (4) original research projects presented at the American Junior Academy annual meeting. In addition, the Georgia Junior Academy of Science sponsors a Fall Leadership Conference and a Spring Conference to give all members opportunities to explore areas of scientific inquiry in regional settings, and is heavily involved with regional and state science fairs. Active participation by businesses, industrial organizations, and colleges and universities in Georgia contribute significantly to the work of the Junior Academy.

Membership in the Georgia Academy of Science supports the activities described above: the publication of the Journal, the Annual Meeting and the Junior Academy with it State District Science Fairs. Members of the Academy benefit from the opportunities to associate with their colleagues, to present scientific papers and introduce their students at the Annual Meeting, the receipt of and opportunity to publish in the Journal, and participation in the one state-wide interdisciplinary organization in Georgia devoted solely to the promotion of the interests of science.

GEORGIA ACADEMY OF SCIENCE MEMBERSHIP RECORD

For our records and for mailing purposes, please print the following information:

Name _____

Position_____

School or Organization _____

E-mail Address_____

Mailing Address (no more than three lines) _____

_____

_____ Zip _____

Degrees with dates and institutions: _____

_____

Special Scientific interests:_____

_____

_____

_____

_____

Memberships in other scientific organizations: _____

_____

_____

_____

Section of Academy preferred (only one): I. Biological Sciences; II. Chemistry; III. Earth and Atmospheric Sciences; IV. Physics, Mathematics, Engineering, and Computer Sciences; V. Biomedical Sciences; VI. Philosophy and History of Science; VII. Science Education; VIII. Anthropology.

Ways you would be willing to serve the Academy:

_____

_____

_____

Printed Name Date Signature

Current dues are $35.00 U.S. ($50 International) for individuals and $50.00 U.S. ($65 International) for institutions per calendar year, payable at the time of submission of this form. Make check payable to Georgia Academy of Science.

Return to: Dr. Mitch Lockhart, Treasurer
Biology Department, Valdosta State University
1500 N. Patterson Street, BC 2035
Valdosta, Georgia 31698

NOTES

NOTES

NOTES

Georgia Academy of Science **Information for Authors**

Editor-in-Chief
Dr. John V. Aliff
Editor, Georgia Journal of Science
Georgia Perimeter College Online
P.O. Box 506, Auburn, Georgia 30011-0506
678-438-2901/john.aliff@gpc.edu

Associate Editor:
Dr. Don Thieme
Dept. of Physics, Astronomy & Geosciences
Valdosta SU, Valdosta, Georgia 31698
dmthieme@valdosta.edu

The Georgia Journal of Science will accept original contributions pertaining to the eight different sections of the Academy. The Editorial Board consists of one representative from each section. The manuscripts are reviewed by at least two reviewers; the editors then make the decision on acceptability. The Editor in Chief reserves the right to reject any manuscript that is not in proper form or written in acceptable English when first received at the editorial office. The editors reserve the right to make minor changes in the text of a manuscript to improve its composition provided the author's meaning has not been changed.

Senior authors are required to be members of the Academy or a charge of $35.00 per published page will be incurred. Proof of membership or the payment of page charges is due before publication of the article. The membership application is included in this publication.

Manuscripts should be concise and consistent in style and use of abbreviations. The original plus three copies of the manuscript should be sent to the Editor-in-Chief at the above address. The original manuscript must be typewritten and double-spaced on one side of good quality white paper, 8 1/2" x 11", with one-inch wide margins. Please provide a disk copy in Microsoft Word, Microsoft Works or WordPerfect (IBM Clone or Macintosh).

Scientific papers should be organized according to the following sections:

(1) Title Page (2) Abstract & keywords (3) Introduction (4) Materials & Methods
(5) Results (6) Discussion (7) Acknowledgments (8) References

Title page. This page should contain the complete title of the manuscript, names and affiliations of all authors, institution at which the work was done and name and address for correspondence. The e-mail address of the designated author to whom correspondence is addressed should be designated by an asterisk and their e-mail address included when appropriate.

Abstract. This page consists of 100-150 words summarizing the major finding and conclusions in the paper.

Tables. Tables must be numbered in order of appearance with Roman numerals. Each must have a title and be keyed into the text.

Legends. A legend must accompany each illustration and must define all abbreviations used therein.

Illustrations. All illustrations must be numbered in order of appearance with Arabic numbers. Photographs should be submitted on glossy prints (5" x 7" or 8" x 10"). All graphs should be printed with a laser printer on white paper. All lettering must meet professional standards: typewritten or hand lettering is unacceptable.

References. In the text, references should be cited consecutively with numerals in parentheses. In the final list they should be in numerical order including the complete title of the article cited and names of all authors.

Journal abbreviations should follow Index Medicus style. In the following examples notice the punctuation, do not use all capitals, do not underline.

Journal articles:

1. Singleton ER, Herbert WD, Zepatka FA and Handy MK: A modified medium for recovery of *Salmonella* from cocoa powder. Ga J Sci 42: 67-73, 1984.

Books:

2. Zachar J: "Electrogenesis and Contraditing in Skeletal Muscle Cells." Baltimore: University Park Press, p103, 1971.

Articles in Books:

3. Lipton JM and Nathan DG: The role of T lymphocytes in human erythropoiesis. In The Lymphocyte (Self and Miller, Eds) New York: Alan R. Liss, p57, 1981.

The editors recognize that History of Science articles need a different format and therefore footnotes are acceptable when typed consecutively on a separate sheet of paper in order of their appearance in the text. In all instances, Arabic numbers should be used as superscripts for footnotes appearing in the text. Footnotes should be brief and should not include material that can be inserted in the running text.

Research Notes are accepted provided they relate new and important findings. ***Letters to the Editor*** may be included if written concisely in GaJSci style with appropriate references. Letters will be limited to: 1) Issues of scientific integrity or 2) Expansion of theses presented in a previous paper published by GaJSci. The editorial board of GaJSci may accept or reject a letter based on its scientific relevance and accuracy.

Back issues of the Georgia Journal of Science are $10 each; $5 each for students.

GEORGIA JOURNAL OF SCIENCE
Dr. John V. Aliff, Editor
Georgia Perimeter College
P.O. Box 506
Auburn, GA 30011-0506