Georgia Journal of Science

Volume 67 *No. 1 Program and Abstracts for the Annual Meeting of the Georgia Academy of Science*

Article 1

2009

Program and Abstracts of the Annual Meeting of the Georgia Academy of Science, 2009

Follow this and additional works at: http://digitalcommons.gaacademy.org/gjs

Recommended Citation

(2009) "Program and Abstracts of the Annual Meeting of the Georgia Academy of Science, 2009," *Georgia Journal of Science*, Vol. 67, No. 1, Article 1.
Available at: http://digitalcommons.gaacademy.org/gjs/vol67/iss1/1

This Program for the Annual Meeting is brought to you for free and open access by Digital Commons @ the Georgia Academy of Science. It has been accepted for inclusion in Georgia Journal of Science by an authorized editor of Digital Commons @ the Georgia Academy of Science.

GEORGIA JOURNAL OF SCIENCE

Volume 67 **2009** **Number 1**

CONTENTS

GAS President's Comments and Report from the Academy Council

Dear Georgia Academy of Science members:

I wish you a great experience conferencing at Spelman College. Our annual meeting coincides with Spelman's Research Day; I trust that you would take this advantage to interact with our host's bright young minds. We really appreciate Spelman's hospitality in hosting our meeting; special thanks to Dr. Lisa Hibbard and members of her local committee.

Year 2009 is year for celebration for science despite the world's gloomy economic climate. Barrack Obama has become the first black President of the United States, who happened to sign off the biggest economic stimulus package (the American Recovery and Reinvestment Act) ever. The stimulus for science is no doubt historical: 10.8 Billion for NIH, 3 billion for NSF, $2.5 Billion just for DOE in R/D related to biomass, among others. The renewable energy stimulus is good news for Georgia as Georgia is abundant in biomass. We anticipate a bloom in scientific and technological innovations in Georgia in the next couple of years. This means it is forever urgent for us to attract more young talents into the STEM fields. I am proud to say that as members of the Academy, we are doing just that. I hope you will take full advantage of the stimulus package to do even more, a lot more. We need more science majors, and a whole lot more science teachers who can inspire a future generation of scientists.

We have finally succeeded in amending the constitution to grant the President of the Academy a two-year term, effectively starting this year. The amended constitution will be posted on the GaAcademy.org website soon. The change will give the President more time to lead and improve the service and function of the Academy. Hence, this is a historic year for the Academy too.

Thank you and I wish you all a productive Year of the Ox!

K.C. Chan
President, the Georgia Academy of Science

OFFICE OF THE PRESIDENT
Phone: 404-270-5001
Fax: 404-270-5010

BEVERLY DANIEL TATUM, Ph.D.
President

April 3, 2009

Dear Members of the Georgia Academy of Science:

Welcome to Spelman College! We are very pleased to host the 86th Annual Meeting of the Georgia Academy of Science.

The mission of Spelman College, which was founded in 1881, is to promote academic excellence in the liberal arts and sciences by developing the intellectual, ethical and leadership potential of its students. Our commitment to providing an outstanding learning experience for our students is evidenced by the numbers of students who participate in undergraduate research and go on to pursue advanced degrees. This is true particularly in the STEM disciplines where Spelman has most recently been recognized by the National Science Foundation as being ranked second in the nation in the number of African-Americans who go on to obtain the Ph.D. degree in mathematics and science disciplines. It is, therefore, appropriate that we now have researchers, educators, and students from around the state coming to our campus to attend this specific meeting.

We appreciate the hard work devoted to bringing this conference to Spelman. We would like to acknowledge the hard work of the local arrangements committee, led by Drs. Lisa Hibbard and Paul Camp, and the numerous faculty and staff members who have volunteered their time in making this conference a success.

You will note that the Georgia Academy of Science meeting on Friday April 3rd is being held in conjunction with the College's annual Research Day where students from across all disciplines are presenting their work. We invite you to tour our campus and visit out Research Day talks and posters while you are here so that you can experience why we are so proud of our students and our campus. I hope that you enjoy your time here.

Sincerely,

Beverly Daniel Tatum, Ph.D.
President

Spelman College
To Downtown Atlanta
1. West Campus Parking Deck
Public Safety
2. Sally Sage McAlpin Hall
3. Dorothy Shepard Manley Hall
4. Howard-Harreld Hall
5. Donald and Isabel Stewart
Living & Learning Center I
6a. Johnnetta B. Cole
Living & Learning Center II
6b. LLC II Auditorium
7. Bessie Strong Hall
8. MacVicar Health Services
9. Manley College Center
9a. Bookstore/Post Office
10. Facilities Management & Services
11. Camille Olivia Hanks Cosby,
Ed D. Academic Center
12. Rockefeller Fine Arts Building
RWWL. Robert W. Woodruff Library
13. Not Used
14. Packard Hall
15. Rockefeller Hall
16. Reynolds Cottage
17. Sisters Chapel
18. Read Hall
19a. Academic Computing Center
19b. Tapley Hall
19c. Albro-Falconer-Manley Science Center
20. Laura Spelman Hall
21. Morehouse-James Hall
22. Abby Aldrich Rockefeller Hall
23. Giles Hall
24. Milligan Building
25. The Suites
EXIT 55
LEE STREET
WESTVIEW DRIVE
WEST END AVENUE
GREENSFERRY AVENUE
ENTRANCE
RWWL
Clark Atlanta University
Morehouse College
350 Spelman Lane S.W.
Atlanta, GA 30314-4399
(404) 681-3643
www.spelman.edu
©Sketches, etc. 2008

FRIDAY PAPER PRESENTATIONS
***Denotes student presenter**
****Denotes student research in progress**

Section I: Biological Sciences
Tapley Hall, Room 130
Paul T. Arnold, Presiding

2:00 SILVER-IMPREGNATED ALUMINA AS AN ANTIMICROBIAL AGENT**, Gemeia Cameron*, David Collart, Eric Mintz, Olivier Katembo*, Conrad Ingram and Godwin Ananaba

2:15 THE EFFECT OF SEX RATIO OF CONFUSED FLOUR BEETLE) (*TRIBOLIUM CONFUSIUM*) REPRODUCTION RATE: DO MALES MATTER?, Christina M. Bryan* and Mark A. Schlueter

2:30 THE EFFECT OF TEMPERATURE ON THE REPRODUCTION RATE OF CONFUSED FLOUR BEETLES (*TRIBOLIUM CONFUSIUM*), Daryl L. Knight* and Mark A. Schlueter

2:45 IN VITRO INVESTIGATIONS INTO THE ANTIBACTERIAL CAPACITY OF CRUDE AQUEOUS AND ALCOHOLIC EXTRACTS PREPARED FROM TISSUES OF *PUERARIA LOBATA* (KUDZU VINE), Sam R. d'Entremont* and Thomas J. Campbell

3:00 MORPHOLOGICAL STATUS AND TAXONOMY OF *CHARACODON* (GOODEIDAE) FROM THE HIGH PLATEAU OF CENTRAL MEXICO, Rochelle L. Tiedemann* and S.A. Webb

3:15 **Break**

3:30 A PRELIMINARY ASSESSMENT OF A TECHNIQUE TO EVALUATE VERTICAL HABITAT DISTRIBUTION OF LARVAL DYTISCIDAE (COLEOPTERA), Brandi Dent*, E.H. Barman, B.P. White and T.A. Shepley-James

3:45 SEXUAL DIMORPHISM WITHIN CANINE DIMENSIONS OF THE VIRGINIA OPOSSUM, *DIDELPHIS VIRGINIANA*, FROM BALDWIN COUNTY, GEORGIA, David B. Patterson* and Alfred J. Mead

4:00 ANALYSIS OF *KRYPTOLEBIAS MARMORATUS* FECUNDITY AND EMBRYO STAGE ACROSS SEVERAL CLONAL LINEAGES**, Michael J. Bland*, Melissa E. Ard*, Kelly N. Luke*, Brian C. Ring and David L. Bechler

4:15 BACTERIOCIN ACTIVITY OF *XENORHABDUS NEMATOPHILA***, S.G. Hurst IV*

4:30 **Posters (Posters will be displayed through 5:00)**

Section II: Chemistry
Science Center, Room 233
Glenn Nomura, Presiding

12:00	MECHANISTIC INSIGHT OF FRAGMENTATION CHARACTERISTICS OF MACROLIDE ANTIBIOTICS, Victor Ibeanusi and Yassin Jeilani
12:15	DRUGS BOUND TO THE ENZYME HUMAN GLUTAMINYL CYCLASE**, Breanna Spires and Robert Zurales
12:30	MOLECULAR MODELING OF CARBONIC ANHYDRASE INHIBITORS**, Candice Charles Broome* and Robert W. Zurales
12:45	MECHANISMS FOR KEY NITROGEN FRACTIONATION REACTIONS**, John David Purvis* and Robert W. Zurales
1:00	**Break**
1:15	THE ACTIVE SITE OF HUMAN GLUTAMINYL CYCLASE**, Laurie L. Lane* and Robert W. Zurales
1:30	COMPUTATIONAL STUDIES OF PHARMACOLOGICAL CHAPERONES**, Mary Catherine Huff* and Robert W. Zurales
1:45	COLLISION INDUCED DISSOCIATION OF FENBUTATIN OXIDE USING TRIPLE QUADRUPOLE MASS SPECTROMETRY, Montoya LaFrance,* Yassin Jeilani and Victor Ibeanusi
2:00	FRAGMENTATION PATHWAYS OF FLUROTELMOR ALCOHOLS BY TRIPLE QUADRUPOLE MASS PECTROMETRY, Juandalyn Coffen,* Yassin Jeilani and Victor Ibeanusi
2:15	**Break**
2:30	PHYSICAL PROPERTIES AND PHASE CHANGES IN SCANDIUM FLUORIDE, Karena W. Chapman, Benjamin K. Greve*2, Peter L. Lee, Kenneth L. Martin, Chad J. Ruschman* and Angus P. Wilkinson
2:45	THEORETICAL EVIDENCE FOR THE STRONGER ABILITY OF THYMINE TO DISPERSE SWCNT THAN CYTOSINE AND ADENINE, Yixuan Wang*
3:00	DIELS ALDER REACTION IN WATER**, Morgan Price
3:15	LEWIS ACID AND BRONSTEAD ACID AS CATALYSTS FOR ORGANIC REACTIONS IN WATER**, Shinelle Caldwell* and Nripendra Bose
3:30	**Break**

3:45 HIGH PERFORMANCE LIQUID CHROMATOGRAPHY ANALYSIS OF CAFFEINE IN COMMERCIAL ENERGY DRINKS**, Jaima Dewey* and J. Paul Simon

4:00 A THEORETICAL STUDY OF THE CHEMICAL KINETICS FOR THE DISSOCIATION OF INDIUM NITRIDE SOURCE MATERIALS**, Ashley Jordan

4:15 QUINAZOLINES ARE COMPOUNDS WHICH HAVE A WIDE RANGE OF PHARMACOLOGICAL ACTIVITY**, Kamilah Rashid and Angelica Trumer

4:45 **Posters (Posters will be displayed through 5:00)**

Section IV: Physics, Mathematics, Computer Science, Engineering and Technology
Science Center, Room 232
Solomon Fesseha, presiding

1:00 IMPROVEMENTS AT THE WEST GEORGIA OBSERVATORY, Bob Powell and Robert Moore, Jr.

1:15 PRELIMINARY STUDIES OF PRODUCING HYDROGEN FOR A FUEL CELL, Raymond Hill,* Austin Kerlin,* Benjamin Jenkins,* Robert Moore, Jr. and Bob Powell

1:30 QUALITATIVE ANALYSIS OF THE PACIFIC SCIENCE PHYSICS EQUIPMENT ZEEMAN EFFECT APPARATUS, David Bolding,* David Mertins*, Robert Moore, Jr. and Bob Powell

1:45 SYNTHESIS OF AN ALUMINUM-GALLIUM-INDIUM-TIN ALLOY: AN ALTERNATIVE METHOD OF GENERATING HYDROGEN GAS FOR THE OPERATION OF A FUEL CELL**, B.L. Hammond* and J. Robinson*

2:00 DAM BREAK SCENARIO MODELING IN FRANKLIN COUNTY, GA USING FEMA's HAZUS-MH SOFTWARE.**, Kyle Dalton and Sudhanshu S Panda

2:15 SEMI-CLASSICAL DETERMINATION OF THE ENERGY LEVELS OF AN $X^{4/3}$ POTENTIAL, Kale Oyedeji

2:30 **Break**

2:45 AUTOMATION OF THE FRANCK-HERTZ EXPERIMENT USING LABVIEW**, Nathaniel R. Sonderman* and J.L. Talbot

3:00 A SUITABILITY ANALYSIS MODEL FOR POTENTIAL BLUEBERRY PRODUCTION IN GEORGIA USING GEOSPATIAL TECHNOLOGY, Johnny Reed and Sudhanshu S Panda

3:15 USING GIS TO ANALYZE ENVIRONMENTAL AND SOCIOECONOMIC IMPACTS ON COASTAL RESOURCES IN SOUTHWESTERN MADAGASCAR, Sean R. Uhl and Sudhanshu S Panda

3:30 GENERAL TWO PARAMETER SOLUTIONS FOR THE LINEAR GOURSAT EQUATION, Sandra Rucker and Ronald E. Mickens

3:45 OPTIMAL MASS FOR ACCELERATION WITH A NAKAMURA SPARK TIMER, Benjamin Jenkins*, Robert Moore Jr. and Bob Powell

4:00 TESTING SPATIAL AUTOCORRELATION FOR USE IN DIFFERENTIATING EVAPORATIVE RESIDUES, Scott M. Pierce, K.C. Chan and Yunjie Mi

4:15 INVESTIGATION OF THE QUALITATIVE BEHAVIOR OF THE EQUILIBRIUM POINTS FOR A MODIFIED LOTKA-VOLTERA MODEL, CHRISTOPHER A. STOVER*, Andreas Lazari and Jemal Mohammed-Awel

Section V: Biomedical Sciences
Science Center, Room 145
Francis Eko, presiding

2:00 PHYTOSTEROL SUPPLEMENTATION**, Lucky Nwankwo, Kereen Gordon, Victoria Miles, Godwin Ifere, Qing He, Eno Ekong, Francis Eko, Joseph Igietseme and Godwin Ananaba

2:15 ROLES OF GB3/CD77 IN BURKITT'S LYMPHOMA CELLS**, Brittney Newton*, Mark Maloney, Shanita Bishop, Marisela DeLeon, Guoshen Wang and Leonard Anderson

2:30 THE EFFECT OF ESTROGEN ON *LACTOBACILLUS* VACCINE DELIVERING *CHLAMYDIA* ANTIGEN**, Krystal Farmer, A. Campbell, G. Ifere, L. Nwankwo, V. Miles, E. Ekong, F. Eko, J. Igietseme and G. Ananaba

2:45 THE EFFECT OF PHYTOSTEROLS ON THE FUNCTION OF ANTIGEN PRESENTING CELLS**, Victoria N. Miles*, Lucky Nwankwo and Godwin Ananaba

3:00 THE EFFECT OF ROUTE OF INFECTION ON THE PATHOGENESIS OF *CHLAMYDIA TRACHOMATIS* INFECTION, L. London, A. Campbell, N. Diala, E. Ekong, G. Ifere, F. Eko, D., Q. He, J. Igietseme and G. Ananaba

3:15 SYNTHESIS OF β-CYCLODEXTRIN-PEG-FOLIC ACID BIOCONJUGATE FOR DELIVERY OF ANTITUMOR PHYTOSTEROLS**, Olatunji Abimbola*, Godwin Ifere, Laurisa London, Lucky Nwankwo, Ishrat Khan, Francis Eko, Joseph Igietseme and Godwin Ananaba

3:30 TRANSCRIPTIONAL ACTIVATION OF VEGF/VEGFR2 GENES BY LEPTIN IN BREAST CANCER CELLS, Yanbo Xu, A. Watters, S.J. Leibovich, D.R. Mann, B.R. Rueda and R.R. Gonzalez

POSTER

PRELIMINARY SOLAR STUDIES DURING A SUNSPOT MINIMUM**, Amanda M. Brock*, Robert R. Moore, Jr. and Bob Powell

SATURDAY PAPER PRESENTATIONS

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

Section I: Biological Sciences
Science Center, Room 145
Paul T. Arnold, Presiding

8:15 MONITORING MOVEMENT PATTERNS AND HABITAT SELECTION OF A FIRST YEAR POPULATION OF JUVENILE GOPHER TORTOISES (*GOPHERUS POLYPHEMUS*) AT REED BINGHAM STATE PARK, GEORGIA**, Christine M. Chessler* and J. Mitchell Lockhart

8:30 SEROSURVEY FOR PATHOGENS IN BOBCATS (*LYNX RUFUS*) IN SOUTH GEORGIA AND NORTH FLORIDA**, Laura Simmons* and J. Mitchell Lockhart

8:45 PHOTOSYNTHETIC RESPONSE OF TERRESTRIAL DESERT ALGAE TO CONTROLLED HUMIDITY, N.L. Charnock* and J.A. Nienow

9:00 THE ATTACHMENT OF DIATOMS TO GREEN COCONUT HUSKS**, J. Trull* and J.A. Nienow

9:15 CONSPECIFIC AND HETEROSPECIFIC ASSOCIATIONS IN NEST-TRAPS OCCUPIED BY THE CRAYFISH, *PROCAMBARUS SPICULIFER*, J. Rousey*, P. Hightower*, M.E. Smith and D.L. Bechler

9:30 MANDIBULAR DAMAGE AND VARIATION IN CRANIAL MORPHOMETRY IN LARVAE OF *AGABUS DISINTEGRATUS* (CROTCH) (COLEOPTERA: DYTISCIDAE), T.A. Shepley-James, E.H. Barman and W.P. Wall

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

10:30 IDENTIFICATION OF THE EPIBIONT, *CHELONIBIA TESTUDINARIA* (CIRRIPEDIA: BALANOMORPHA: CORONULOIDEA) ASSOCIATED WITH ARCHAEOLOGICAL SEA TURTLE REMAINS FROM THE NORTH STORR'S LAKE SITE (SS-4), SAN SALVADOR, BAHAMAS, Jeffrey P. Blick

POSTERS

ARTIFICIAL NEST CAVITIES DESIGNED FOR USE BY SMALL MAMMALS**, Lara Catall*, Terry L. Barrett and Gary W. Barrett

OBSERVATIONS ON MASS METAMORPHOSIS BY RIVER FROGS (*RANA HECKSCHERI*) IN SOUTHWEST GEORGIA, Bob Herrington

LEAFHOPPER VIRAL PATHOGENS, Wayne B. Hunter, M. Marutani-Hert, C.S. Katsar, L.E. Hunnicutt and C.A. Powell

HUANGLONGBING AND PSYLLID CELL CULTURES, Wayne B. Hunter, M. Marutani-Hert and D.G. Hall

ASIAN CITRUS PSYLLID VIRAL PATHOGEN, Wayne B. Hunter, M. Marutani-Hert, D.G. Hall and C.A. Powell

ALIENS IN A NEW LAND: HOW DO ASIAN AMBROSIA BEETLES (*XYLEBORUS GLABRATUS*) FIND THEIR HOST?, Juliette T. Jordan*, L.M. Leege, N. Schmidt and A. Hollebone

THE EFFECTS OF WATER COLUMN NO_3 CONCENTRATION ON TISSUE TOTAL N AND $\delta^{15}N$ OF EURASIAN WATERMILFOIL, *MYRIOPHYLLUM SPICATUM***, Nicole M. Mastriforte* and Risa A. Cohen

CREATION OF PROTEASE MUTANTS IN *XENORHABDUS NEMATOPHILA***, Tialesha A. Myrick* and Holly E. Dekle*

THE CENTRIC DIATOM GENUS *CYCLOTELLA* (STEPHANODISCACEAE, BACILLARIOPHYTA) FROM THE COASTAL WATERS OF GEORGIA, J.A. Nienow and A.K.S.K. Prasad

Section II: Chemistry
Science Center, Room 233
Glenn Nomura, Presiding

8:30 SILVER-IMPREGNATED ALUMINA AS AN ANTIMICROBIAL AGENT**, Gemeia Cameron*, David Collart, Eric Mintz, Olivier Katembo*, Conrad Ingram and Godwin Ananaba

8:45 PHOTOCHEMICAL ANALYSIS OF SUBSTITUTED TETRAPHENYL PORPHYRIN DYES: TETRA AND PENTAFLUOROPHENYL SUBSTITUTION**, Adegboye Adeyemo, Nneamaka Enweani*, Zachary Gardner*, Donovan Tucker* and James LoBue

9:00 **Break**

9:15 PHOTOCHEMICAL ANALYSIS OF SUBSTITUTED TETRAPHENYL PORPHYRIN DYES: DIFLUOROPHENYL SUBSTITUTION**, Adegboye Adeyemo, Nneamaka Enweani*, Zachary Gardner*, Donovan Tucker* and James LoBue

9:30 DIELS ALDER REACTION IN WATER, Morgan Price and Nripendra Bose

9:45 LEWIS ACID AND BRONSTEAD ACID AS CATALYSTS FOR ORGANIC REACTIONS IN WATER, Shinelle Caldwell and Nripendra Bose

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

10:45 SYNTHESIS OF IMINES, ENAMINES AND OXIMES CATALYZED BY SILICA, Jasmine Peterson*, Rajiv Villait, Jana Patton, Rebecca Aszman and John T. Barbas

11:00 PHOTOCHEMICAL ANALYSIS OF SUBSTITUTED TETRAPHENYL PORPHYRIN DYES: DIFLUOROPHENYL SUBSTITUTION**, Adegboye Adeyemo, Nneamaka Enweani*, Zachary Gardner*, Donovan Tucker* and James LoBue

11:15 PHOTOCHEMICAL ANALYSIS OF SUBSTITUTED TETRAPHENYL PORPHYRIN DYES: TETRA AND PENTAFLUOROPHENYL SUBSTITUTION**, Adegboye Adeyemo, Nneamaka Enweani*, Zachary Gardner*[2], Donovan Tucker* and James LoBue

11:30 DIELS GROUP-III NITRIDE SEMICONDUCTORS**, Jayla Subramanian

POSTERS

PROTEIN MODELING STUDIES TO IDENTIFY AND ANALYZE TARGET AMINO ACIDS RESIDUES FOR SITE-DIRECTED MUTAGENESIS STUDIES TO INCREASE THE DECARBOXYLASE ACTIVITY OF OXALATE OXIDASE FROM HORDEUM VULGARE, Crystal Bruce* and Ellen W. Mooma

CATION BINDINGS ON ATP BASE – A NMR STUDY OF 2D ^{1}H-^{15}N-HMBC SPECTRA, Zhiyan Song*, Kari J. Parker and Idorenyin Enoh

VITAMIN C CONCENTRATION, SYNERESIS, AND CONSUMER PERCEPTIONS OF A FERMENTED DAIRY PRODUCT UPON FORTIFICATION WITH CUCUMBER AND RASPBERRY**, Ann C. Onyenwoke*, Joelle E. Romanchik-Cerpovicz, Laura D. Frost,and Helen M. Graf

A STRUCTURAL COMPARISON OF A PUTATIVE ACYL-COA THIOESTERASE FROM *XANTHOMONAS CAMPESTRIS* (XC229) AND A KNOWN THIOESTERASE (4-HYDROXYBENZOYL-COA) FROM PSEUDOMONAS SP(PSHTE)**, Saswat Panda* and Ellen W. Moomaw

HOMOLOGY MODELING OF CERIPORIOPSIS SUBVERMISPORA OXALATE OXIDASE, Nathan Ray* and Ellen W. Moomaw

THERMODYNAMICS AND SEMICONDUCTORS**, Asia S. Jackson

TANDEM MASS SPECTROMETRIC FRAGMENTATION OF ERYTHROMYCIN BY DIRECT INSERTION PROBE: A STUDY OF M/Z 158 PRECURSORS, Sarat Mohammed,* Yassin Jeilani and Victor Ibeanusi

SECTION III: Earth and Atmospheric Sciences
Science Center, Room 134
Donald Thieme, Presiding

8:30 EXPLORING ALGAL MORPHOLOGY DURING EARLY DECOMPOSITION: CONNECTIONS TO ANCIENT ORGANIC REMAINS, Ashley Manning and Julie Bartley

8:45 INVESTIGATION OF METAMORPHIC CONDITIONS ASSOCIATED WITH THE GROWTH OF CENTIMETER-SCALE GARNET PORPHYROBLASTS AT THE GARNET HILL LOCALITY, WEST-CENTRAL GEORGIA, Nelson Spratt IV and Christopher Berg

9:00 PRELIMINARY RESULTS FROM HIGH-RESOLUTION MAGNETIC SURVEY OVER LARAMIDE AND BASIN AND RANGE STRUCTURE, BIG BEND NATIONAL PARK, TEXAS, John Allison, C. Parham and Christian Poppeliers

9:15 MINERALOGY AND CRYSTALLIZATION SEQUENCE OF INCLUSIONS WITHIN TOPAZ CRYSTALS OF THE TOPAZ BEARING RHYOLITE OF TOPAZ MOUTNAIN, JUAB COUNTY, UTAH, Kimberly E. Cook and Curtis L. Hollabaugh

9:30 EVIDENCE FOR DEEP EVAPORATION WITHIN SAND DUNES AND THE INABILITY OF NORMAL PRECIPITATION EVENTS TO RECHARGE GROUNDWATER AT THE GREAT SAND DUNES NATIONAL PARK & PRESERVE IN COLORADO, Dion Stewart and Andrew Valdez

9:45 CREATING A HISTORICAL STORM SURGE DATA WEB SITE, Andrew J. Maloof and Rochelle F. Legaspi

10:00 **Break Section Business Meeting**

10:30 HISTORICAL CHANGES OF GOULDS INLET, GEORGIA, FROM GEOSPATIAL ANALYSIS OF AERIAL PHOTOGRAPHS, Rochelle Petruccelli

10:45 CONTAMINANT TRENDS IN LAKE CORE SEDIMENTS OF LAKE PALMER AND LAKE HARRIET, MINNEAPOLIS, MN, Ellie L. Busse

11:00 CONTAMINATION POTENTIAL FOR CAVES IN THE SUWANNEE RIVER BASIN, FLORIDA, Krystalynn Batts

11:15 SPATIAL AND TEMPORAL CHANGES OF WETLAND AREAS IN THE COASTAL PLAINS REGION, John Ray

11:30 CONSTRUCTED WETLANDS: AN INVESTIGATION OF FILTRATION QUALITY AND EFFICIENCY, Cameron G. Wolfe and Curtis L. Hollabaugh

11:45 EVALUATION OF PROPOSED LONG-TERM SOLUTIONS FOR FUTURE GEORGIA DROUGHTS, Curtis L. Hollabuagh

POSTERS

RIDGE AND SWALE MICROTOPOGRAPHY IN THE ST. JOSEPH'S BAY STATE BUFFER PRESERVE, Antonio Cano and Donald M. Thieme

COMMUNITY DEVELOPMENT ALONG HIGHWAY 41, Stevee Edwards and Michael G. Noll

A NEW OCCURRENCE OF BALD CYPRESS IN A PALEOSOL ON THE SILVER BLUFF FORMATION EXPOSED ON THE BEACH OF JEKYLL ISLAND, GA, Timothy M. Chowns

Section IV: Physics, Mathematics, Computer Science, Engineering and Technology
Science Center, Room 232
Solomon Fesseha, presiding

8:00 MOTION OF A MAGNETOTACTIC BACTERIA**, Timothy Kurtz* and Trinanjan Datta

8:15 AN EXPERIMENTAL STUDY OF THE LENGTHENING PENDULUM, Seth Clark* and J. A. Hauger

8:30 PRELIMINARY RESULTS OF A ROTARY PENDULUM DESIGNED TO MEASURE THE ROLLING RESISTANCE OF PNEUMATIC TIRES**, Rebecca Sawyer* and C. Poppeliers

8:45 SIMPLER FORMULAE FOR GEOMETRIC ALGEBRA, Dennis W. Marks

9:00 DEPOSITION PATTERNS OF NONIONIC SURFACTANT ON A GLASS SUBSTRATE, Neville Brackett, K.C. Chan, Scott M. Pierce and Yunjie Mi

9:15 SIMULATING A WATER DROPLET'S EVAPORATION, J.E. Hasbun, K.C. Chan and Scott Pierce

9:30 HYSTERESIS LOOP AREA OF THE KINETIC ISING MODEL WITH NEXT-NEAREST NEIGHBOR INTERACTION, William D. Baez*, Trinanjan Datta and Christian Poppeliers

9:45 ON THE DERIVATION OF THE DISTRIBUTION OF AN ESTIMATOR FOR THE INVERSE MEAN, Andreas Lazari

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

10:30 A NEW LAW OF COOLING, Ronald E. Mickens

10:45 JUPITER: BRIGHTNESS AND COLOR, Richard W. Schmude, Jr.

11:00 SATURN: BRIGHTER THAN EXPECTED, Richard W. Schmude, Jr.

11:15 THE FEBRUARY 21, 2008 TOTAL LUNAR ECLIPSE, Richard W. Schmude, Jr.

11:30 PRODUCT QUALITY AND ENERGY CHALLENGES IN PULP AND PAPER INDUSTRY, Barry Hojjatie and Chad Handley

11:45 SOURCE LOCALIZATION OF SHOCK-WAVES IN THE GROUND MODEL MEDIA, Hasson M. Tavossi

Section V: Biomedical Sciences
Tapley Hall, Room 119
Francis Eko, presiding

9:00 REPLACEMENT OF MEMBRANE CHOLESTEROL DURING PHYTOSTEROL SUPPLEMENTATION IN PROSTATE CANCER CELLS**, Wambui S. Wandu*, Godwin O. Ifere and Godwin A. Ananaba

9:15 PLASMA INTERLEUKIN-1β CONCENTRATION PREDICTS RISK OF STROKE IN SICKLE CELL DISEASE, Kwaku O. Asare, Beatrice E. Gee, Jonathan K. Stiles, Nana Wilson, Adel Driss, Alexander Quarshie, Robert J. Adams, Abdullah Kutlar and Jacqueline M. Hibbert

9:30 IL-10 AND TGF-β1 EXPRESSION IN IP-10-/- C57BL/6 MICE WITH EXPERIMENTAL CEREBRAL MALARIA: ROLE OF REGULATORY T CELLS**, Bismark Sarfo*, Nana Wilson, Danielle Whittaker, Vincent Bond and Jonathan Stiles

9:45 PCGEM1 MEDIATES CHOLESTEROL ASSUALTS ON PROSTATE CELLS BY INITIATING THE ATTENUATION OF P53 EXPRESSION, Godwin O. Ifere*, Sylvia Wandu, Angela Campbell, Nehemiah Diala, Lucky Nwankwo and Godwin A. Ananaba

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

10:30 EX-VIVO PULSED IL-10 DEFICIENT DENDRITIC CELLS INFLUENCE THE PRODUCTION OF IMMUNE MODULATORS OF PROSTATE CANCER, Godwin Ananaba*, Lucky Nwankwo, Kereen Gordon, Godwin Ifere, Angela Campbell, Francis Eko, Qing He, Eno Ekong and Joseph Igietseme

10:45 THE BACTERIAL GHOST PLATFORM AS A NOVEL STRATEGY FOR VACCINE AND DRUG DELIVERY, Francis O. Eko*, Eno Ekong, Qing He, Godwin Ananaba and Joseph U. Igietseme

Section VI: Philosophy & History of Science
Science Center, Room 238
Vivian Rogers-Price, presiding

8:30 UNRAVELING THE MYSTERY OF THE CHEROKEE ROSE, Charles A. Walker

9:00 PHYSICAL MATHEMATICS: WHAT IS IT?, Ronald E. Mickens

9:30 NOTES ON *EREMAEOZETES ROGERSI*, A NEWLY DESCRIBED SPECIES OF ORIBATID MITE (ACARI: ORIBATIDA, EREMAEOZETIDAE) COLLECTED FROM SANDSTONE OUTCROPS IN COFFEE COUNTY, GEORGIA, USA, F. Michael McAloon

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

10:30 ELIZA FRANCES (FANNY) ANDREWS (1840-1931): WRITER, TEACHER BOTANIST, Charlotte A. Ford

11:00 ERATOSTHENES AND THE CIRCUMFERENCE OF THE EARTH, Jacob Todd Hewell*, Amanda Brock*, Bob Powell and Robert Moore, Jr., University of West Georgia, Carrollton, GA 30118

11:30 PHYSICS, INFORMATION, AND INTELLIGENT DESIGN, E.T. McMullen

Section VII: Science Education
Tapley Hall, Room 130
Bonita Flournoy, presiding

9:00 COMPARISON OF ACTIVE LEARNING AND TRADITIONAL LEARNING IN INTRODUCTORY BIOLOGY, Jonathan M. Locham

9:15 AN ACTION RESEARCH STUDY ON THE EFFECT OF GUIDED INQUIRY TEACHING ON STUDENT UNDERSTANDING AND VIEWS OF SCIENTIFIC INQUIRY, Anil Banerjee, Bonita Flournoy and Susan Sneed

9:30 STUDENTS' PERCEPTIONS OF THE IMPACT OF SYNCHRONOUS AND ASYNCHRONOUS COMMUNICATION IN AN ONLINE COURSE, Ollie I. Manley

9:45 DEVELOPING COGNITION AND EXPERIENCE: THE CASE FOR EARLY CHILDHOOD SCIENCE EDUCATION, David J. Martin

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

10:30 MAKING THE DAPHNIA HEART RATE LAB WORK: OPTIMIZING THE USE OF ETHANOL, NICOTINE, AND CAFFEINE, Darrel Ceballos, Adam Lee, Lindsey Vinson and Frank Corotto

10:45 INTERDISCIPLINARY PROFESSIONAL LEARNING EXPERIENCES FOR MIDDLE AND SECONDARY TEACHERS USING THE PRISM MODEL, Ollie I. Manley, Neva Rose and Donna Whiting

11:00 STUDENTS IN A FRESHMAN EARTH SCIENCE COURSE MODEL ENERGY BALANCE AT THE EARTH'S SURFACE, Randal L.N. Mandock

11:15 ATTITUDES AND PERCEPTIONS OF PRE-SERVICE TEACHERS ABOUT USING A TECHNOLOGICAL INSTRUCTIONAL STRATEGY IN TEACHING SCIENCE CONCEPTS, Bonita Flournoy, Bonita Williams and Paulina Kuforiji

11:30 USING PHOTO STORIES AS A TECHNOLOGICAL INSTRUCTIONAL MECHANISM TO TEACH SCIENCE INQUIRY IN AN ALTERNTIVE FORMAT MIDDLE GRADES SCIENCE CLASSROOM, Katherine Moultrie, Teresa Hedger and Bonita Flournoy

11:45 EARTHQUAKE ANALYSIS IN AN INTEGRATED LECTURE AND LABORATORY PROJECT, Randal L.N. Mandock

POSTERS

EXPLORING NEW METHODS OF TEACHING UNDERGRADUATE COLLEGE SCIENCE, Diandria L. Barber

Section VIII: Anthropology
Science Center, Room 308
Terry G. Powis, presiding

7:45 THE EVOLUTION OF SOCIAL ORGANIZATION: TESTING CULTURAL HYPOTHESES OF SOCIAL EVOLUTION ON A CAPTIVE *LEMUR CATTA* POPULATION, Vicki Ina F. Gloer*

8:00 RECONSTRUCTING THE DIET OF *PARAPAPIO JONESI* FROM TWO PLIO-PLEISTOCENE SITES: STERKFONTEIN AND SWARTKRANS, SOUTH AFRICA, Edgar R. Reyes* and Frank L. Williams

8:15 URBAN AND RURAL DIETS OF COLONIAL CHARLESTON: A COMPARATIVE ANALYSIS OF STONO PLANTATION AND THE CITY OF CHARLESTON, Kevin S. Gibbons*

8:30 TROUP FACTORY: ARCHAEOLOGICAL INVESTIGATIONS OF A 19th CENTURY MILL SITE IN SOUTHWEST GEORGIA, Greg Hansen*, Lindsey Moats* and Patrick Severts

8:45 INDUSTRIAL DENTAL WEAR PATTERNS IN AN ARCHAIC MALE FROM EAST CRETE, GREECE, Katherine Austin*, Jennifer Weber* and Susan Kirkpatrick Smith

9:00 PRELIMINARY ARCHAEOLOGICAL EXCAVATIONS AT THE HOLLAND SITE: A LATE WOODLAND PERIOD OCCUPATION IN PAULDING COUNTY, GEORGIA, Lindsey Moats*, Kong Cheong and Terry G. Powis

9:15 RELATIONSHIPS BETWEEN DENTAL MICROWEAR, ENAMEL THICKNESS AND DIET IN EXTANT PRIMATES, Unnati Patel* and Frank Williams

9:30 MISSISSIPPIAN POLITIES OF THE INTERIOR COASTAL PLAIN, M. Jared Wood*

9:45 AN ANALYSIS OF DENTAL ATTRITION RATES AND CARIES IN A LATE MINOAN POPULATION FROM PALAIKASTRO, CRETE, GREECE, Bridget N. Ebeling*, Vicki Ina F. Gloer* and Susan Kirkpatrick Smith

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

POSTERS

DIET AND HABITAT RECONSTRUCTION AT SWARTKRANS SOUTH AFRICA USING LOW-MAGNIFICATION STEROMICROSCOPY OF DENTAL MICROWEAR, Justin Hosbey*

DIET DIFFERENTATION AND SPECIES ATTRIBUTION AT TAUNG, SOUTH AFRICA INFERRED FROM LOW-MAGNIFICATION OF DENTAL MICROWEAR FEATURES ON FOSSIL PRIMATES, James W. Patterson* and Frank L. Williams

DIET VARIABILITY AMONG AUSTRALOPITHECUS AFRICANUS AND AUSTRALOPITHECUS ROBUSTUS FROM DENTAL MICROWEAR ANALYSIS, Monica Ponce* and Frank Williams

FRIDAY PAPER PRESENTATIONS

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

Section I: Biological Sciences
Tapley Hall, Room 130
Paul T. Arnold, Presiding

2:00 SILVER-IMPREGNATED ALUMINA AS AN ANTIMICROBIAL AGENT**, Gemeia Cameron*[1], David Collart[1], Eric Mintz[2], Olivier Katembo*[2], Conrad Ingram[2] and Godwin Ananaba[1], [1]Department of Biological Sciences, Clark Atlanta University, Atlanta, GA 30134 and [2]Chemistry Department, Clark Atlanta University, Atlanta, GA 30134. The recognition of the anti-microbial activity of oligodynamic metals such as silver has been a basis for the development of many anti-microbial processes and products. Nano-sized silver particles have numerous commercial applications, including disinfection of water, food processing and disinfection of healthcare equipment. In *Escherichia coli* (*E. coli*), which are vulnerable to silver, it has been suggested that the lipopolysaccharides on their surface contain high affinity binding sites for divalent cations. It has been shown that silver interacts with the cell membranes of bacteria, which alters their mesosomal functions, such as their ability to aid DNA replication. The nature of the bactericidal activity of silver and more specifically silver-impregnated alumina is poorly understood. However, we hypothesize that silver in complex with alumina destroys bacteria by oxidation of the plasma membrane and inhibition of its energy metabolism. To study this hypothesis, we exposed E. coli to various concentrations of metallic silver, impregnated on the surface of alumina and determined its effects in compromising cellular integrity and disrupting cellular processes. Our studies reveal that increasing the concentration of silver-impregnated alumina results in a decrease in bacteria viability. This study suggests that silver's ability to kill bacteria is dose dependent. Also, this study suggests silver adsorption upon contact with bacteria. The results of our studies show that silver-impregnated alumina is an effective anti-microbial reagent. Based on this data, we believe that this novel silver anti-microbial reagent is an adequate and cost-effective medium that could be used to improve water quality. (This project was supported by NSF Grant # CTS-0120978, Water CAMPWS, and NIH Grant #GM08247.)

2:15 THE EFFECT OF SEX RATIO OF CONFUSED FLOUR BEETLE (TRIBOLIUM CONFUSIUM) REPRODUCTION RATE: DO MALES MATTER?, Christina M. Bryan* and Mark A. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Confused flour beetles (*Tribolium confusum*), are considered to be big pests due to their damage of stored food products. Confused flour beetle females are capable of laying a large number of eggs, resulting in a quick growing population. At the optimum temperature of 28°C, their life cycle can be completed in about 4 weeks. These beetles are known to be polyandrous, meaning that one female can mate with multiple males. Female confused flour beetles have a special compartment where sperm from multiple males can be stored until needed to reproduce offspring. Females have the ability to regulate whether or not they keep the sperm from males after mating is completed. In our experiment, different initial ratios of virgin males and virgin females were incubated in a flour mixture to measure the effect of sex ratios on population growth. The data of the experiment showed that the number of males does not have an effect on population growth. It did not matter how many males were in the initial colony. When it came to the females, there was a positive effect on population growth. As the initial number of females in the colony

increased, so did the number of new individuals. Although the number of males does not affect population growth, multiple males in the initial colony can be a positive factor by adding to a population's genetic diversity. Populations with high levels of genetic diversity may be better adapted to deal with future stresses.

2:30 THE EFFECT OF TEMPERATURE ON THE REPRODUCTION RATE OF CONFUSED FLOUR BEETLES (*TRIBOLIUM CONFUSIUM*), Daryl L. Knight* and Mark A. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. *Tribolium confusium*, the confused flour beetle, is a pest of stored grain and flour products. These beetles are known to invade our household pantries as well as large storage containers filled with tons of flour or grain. Females are capable of laying hundreds of eggs, resulting in a fast growing population. During optimum conditions, their life cycle can be completed in about 4 weeks. Temperature and humidity are the two most important abiotic factors regulating reproductive rate. In the following experiment, the effect of temperature on population growth was investigated. Adult virgin beetles were placed into different incubators with temperatures ranging from 24-32°C. Significant differences in reproductive rate were observed between the temperatures. At 28°C, the beetles produced the greatest number of new adults and also exhibited the shortest development time (only 4 weeks). At 24°C, the development from egg to adult took 8 weeks, or twice the time. While at 32°C, huge numbers of larvae were produced; however, few survived to the adult stage. Even small temperature changes, a few degrees, clearly played a significant role in the reproductive rate of these beetles. This has significant implications when one considers the effects of global warming. Global warming will raise global temperatures several degrees. Worldwide over 10% of human agriculture is lost to insect pests. Studies like this one have the potential to tell us how small temperature changes will affect pest insect abundance and reproduction.

2:45 *IN VITRO* INVESTIGATIONS INTO THE ANTIBACTERIAL CAPACITY OF CRUDE AQUEOUS AND ALCOHOLIC EXTRACTS PREPARED FROM TISSUES OF *PUERARIA LOBATA* (KUDZU VINE), Sam R. d'Entremont* and Thomas J. Campbell, North Georgia College and State University, Dahlonega, GA 30597. The tissues of the leguminous vine *Pueraria lobata* have long been thought to have beneficial properties and according Chinese medicine, possible antibacterial potential. We investigated the antimicrobial potential of crude aqueous, ethanolic, and methanolic extracts of *P. lobata* root, leaf, and floral tissue extracts. Using standard disc-diffusion techniques, we were able to demonstrate statistically significant growth inhibition of both Gram-negative (*Escherichia coli*) and Gram-positive (*Staphylococcus aureus*) bacterial cultures. Ethanolic extracts from root, leaf, and floral tissues were able to inhibit growth of both bacterial species. Methanolic extracts from floral tissue inhibited *E. coli* and extracts from the root, leaf, and flowers inhibited *S. aureus*. Inhibition was generally more pronounced against the Gram-positive S. aureus bacteria. Our results indicate that particular kudzu tissues do contain antimicrobial agents which can be extracted using crude techniques. The authors wish to acknowledge the biology and chemistry departments of North Georgia College and State University for their support and funding of this investigation.

3:00 MORPHOLOGICAL STATUS AND TAXONOMY OF *CHARACODON* (GOODEIDAE) FROM THE HIGH PLATEAU OF CENTRAL MEXICO, Rochelle L. Tiedemann* & S.A. Webb, North Georgia College & State University, Dahlonega, GA 30597. *Characodon lateralis* and *C. audax* are livebearing goodeine fishes (Goodeidae) from the Mexican plateau. The genus is important phylogenetically and biogeographically, as it occurs in the upper Rio Mezquital, disjunct from remaining members of the

Goodeinae, and according to recent analyses, is the sister group to all other goodeines. A previous phylogenetic analysis of Characodon supported the placement of *C. audax* within a paraphyletic *C. lateralis* comprising northern and southern clades, suggesting the need for reevaluation of the taxonomy of the group. In this study morphological data from preserved specimens and radiographs representing eight localities, including the type material of *C. lateralis* (unknown provenance), were used to determine if variation is consistent with presently-recognized species boundaries, the recent molecular phylogeny of the genus, or neither hypothesis. Nearly all features considered diagnostic of *C. audax*, the more-recently described species, were found distributed among populations of *C. lateralis*, calling into question the validity of *C. audax* as recognized (we did not study coloration). Additionally, no support for the northern and southern clades was found among assessed morphological characters. While it is inconclusive whether a redescription of species is necessary, this work has implications for the biogeography of the genus.

3:15 **Break**

3:30 A PRELIMINARY ASSESSMENT OF A TECHNIQUE TO EVALUATE VERTICAL HABITAT DISTRIBUTION OF LARVAL DYTISCIDAE (COLEOPTERA), Brandi Dent*[1], E.H. Barman[1], B.P. White[2] and T.A. Shepley-James[2], [1]Georgia College & State University, Milledgeville, GA 31061 and [2]Georgia Military College, Warner Robins, GA 31093. The relatively small size of dytiscid larvae, the complexity of shallow breeding habitats of many species, and the crudeness of techniques most often used to collect these larvae make in situ assessments of vertical habitat distribution of larvae problematic. Sediment and plant (living and detrital) materials were arranged in water from a target habitat in glass containers to mimic the vertical distributions of these materials in the site. A small launching platform was suspended just below the water surface of the containers near the center of each. Specimens were placed individually on the platforms and their behavior was monitored for 15 minutes. Twenty-four hours after the initial insertion individual larvae were located (if possible) and observed for an additional 15 minutes. Observations of larvae of small (*Hydrovatus* sp. indet.), medium (*Matus ovatus*), and large (*Cybister fimbriolatus*) species indicate that this approach may provide a relatively simple and more effective method of evaluating vertical distribution of dytiscid larvae in small variable water habitats. Our results also indicate a greater complexity of distribution than indicated by traditional collecting methods. This project was supported in part by a Faculty Research Grant, Office of Research Services, GC & SU, Aquatic Coleoptera Laboratory Contribution No. 75.

3:45 SEXUAL DIMORPHISM WITHIN CANINE DIMENSIONS OF THE VIRGINIA OPOSSUM, *DIDELPHIS VIRGINIANA*, FROM BALDWIN COUNTY, GEORGIA, David B. Patterson* and Alfred J. Mead, Georgia College & State University, Milledgeville, GA 31061. Canine sexual dimorphism was analyzed from a random sample of the Baldwin County, Georgia population of Virginia opossum (*Didelphis virginiana*). During the winter months of 2002 and 2004, 59 road-killed opossums (47 males, 12 females) were collected within Baldwin County from the Georgia Piedmont. The carcasses were skeletonized and, where possible, six linear measurements were obtained from the upper and lower canines. All individuals displayed full tooth eruption indicative of mature adults 10 months or older in age. Basic statistical computations and regression analyses were performed comparing males and females. Although range overlap exists for all measurements, males were found to be significantly larger for upper canine length, upper canine width, upper canine crown height, lower canine length, lower canine width, and lower canine crown height. In many ecological and paleontological instances, the

disarticulated nature of the specimens collected makes it virtually impossible to determine sex. This study provides baseline measurements that should provide ecologists and paleontologists with a method for determining sex in this species.

4:00 ANALYSIS OF *KRYPTOLEBIAS MARMORATUS* FECUNDITY AND EMBRYO STAGE ACROSS SEVERAL CLONAL LINEAGES**, Michael J. Bland*[1], Melissa E. Ard*[1], Kelly N. Luke*[2], Brian C. Ring[1] and David L. Bechler[1], [1]Valdosta State University, Valdosta, GA 31698 and [2]South Georgia College, Douglas, GA 31533. The mangrove killifish, *Kryptolebias marmoratus*, is the only known self-fertilizing vertebrate hermaphrodite. Fertilization occurs internally in a mixed ovotestis resulting in embryo oviposition. A consequence of this unique method of reproduction is the establishment of homozygous clonal lineages. We analyzed 13 clonal lineages maintained at Valdosta State University to determine fecundity and average developmental stage of oviposited embryos (n=795). We also report observed differences in overall fecundity resulting from low- verses high-feeding regimens.

4:15 BACTERIOCIN ACTIVITY OF *XENORHABDUS NEMATOPHILA***, S.G. Hurst IV*, Valdosta State University, Valdosta, GA 31698. Bacteria have evolved to produce various antimicrobial compounds to compete with one another. More specifically, bacteriocins are proteinaceous secondary metabolites that target specific species of bacteria, unlike the broader spectrum antibiotics. A bacterial symbiont of the nematode Steinernema carpocapsae, *Xenorhabdus nematophila* produces bacteriocins in response to the environment. The focus of the following experiment was to determine which related Xenorhabdus and Photorhabdus species *X. nematophila* inhibits. To determine this, an antibiotic overlay assay was used. *X. nematophila* was spotted on tryptic soy agar for approximately three days at 30°C, then were chloroform killed for thirty minutes. Lastly, indicator strains were overlaid on the plates. Bacteriocin activity was evaluated by observing a clearing around the original spotted cultures. Results show that *X. nematophila* ATCC19061 inhibits the growth of *B. subtilis*, *P. luminescens* TT01, *X. szentermaii, X. japonicus, X. beddingii , X. budapestensis, X. ehlersii* and *X. poinarii*. ATCC19061 does not inhibit *X. innexi*. The results also show that *X. nematophila* A24 inhibits growth of B. subtilis, X. japonicus, X. beddingii, X. ehlersii, P. luminescens TT01, *X. budapestensis, X. innexi*, and *X. szentermaii*. Lastly, a rifampicin resistant strain of *X. nematophila* ATCC19061 inhibits growth of *B. subtilis*, *X. japonicus*, *X. beddingii, P. luminescens* TT01, *X. szentermaii, X. budapestensis, X. ehlersii* and *X. poinarii*. It does not inhibit *X. innexi*. This experiment was carried out numerous times with reproducible and consistent results. Now, the focus is to transposon mutagenize *X. nematophila* A24 and *X. nematophila* ATCC19061 to screen for bacteriocin mutants.

Section II: Chemistry
Science Center, Room 233
Glenn Nomura, Presiding

12:00 MECHANISTIC INSIGHT OF FRAGMENTATION CHARACTERISTICS OF MACROLIDE ANTIBIOTICS, Victor Ibeanusi and Yassin Jeilani, Spelman College, Environmental Science and Studies. Macrolide antibiotics are composed of a large ring (14 to 16 carbons) on which several sugars are attached, some of these are amino sugars with diethylamino group. Mass spectrometric characterization of macrolide antibiotics has been a challenge because of low number of characteristic fragments in their collision induced dissociation. Tandem mass spectrometric fragmentation of these antibiotics

show two types of dissociations: a) cleavage of glycosidic linkages attaching the sugars to the macrolide ring and elimination of water, and b) macrolide ring opening cleavages. In this study, erythromycin, tylosin, and oleandomycin were selected to study both types of fragmentations. Using collision induced dissociation data, a multipathway fragmention mechanism was proposed for the selected antibiotics.

12:15 DRUGS BOUND TO THE ENZYME HUMAN GLUTAMINYL CYCLASE**, Breanna Spires and Robert Zurales, Middle Georgia College, Cochran, GA 31014. We started our research by visiting the Protein Data Bank website (www.pdb.org). Here we selected three different recent studies of a drug bound to the enzyme human glutaminyl cyclase, an enzyme implicated in Alzheimer' disease. We attempted to calculate which drug fits the best. We selected key amino acid side chains and deleted all other atoms in the protein. Since the crystal structure does not include hydrogen atoms, we used our chemical intuition to place the hydrogen atoms accordingly. First we allowed the hydrogen atoms to move, freezing the positions of the heavy atoms and optimizing the positions of the hydrogen atoms. Next we froze only the heavy atoms of the protein and then allowed all the hydrogen and drug atoms to move. In each case, the drugs did not really move much. This suggested that we included the most important side chains for binding the drug. These preliminary calculations were performed at the AM1 level using the computational chemistry program Gaussian 03W. Estimated binding constants calculated using a more sophisticated theory will be presented.

12:30 MOLECULAR MODELING OF CARBONIC ANHYDRASE INHIBITORS**, Candice Charles Broome* and Robert W. Zurales, Middle Georgia College, Cochran, GA 31014. While the enzyme carbonic anhydrase (CA) is found throughout the body, the isoform known as CA IX is found almost exclusively in tumors. We are studying drugs that bind more tightly to CA IX than to CA II. The crystal structure of one of these drugs bound to CA II has recently been deposited in the Protein Data Bank. We have downloaded this structure, selected key amino acid side chains, and deleted all other heavy atoms. We added hydrogen atoms, and used the software program Gaussian 03W to optimize the positions of these H atoms. Starting from this structure, we modeled other similar drugs bound to CA II. In these instances, we froze the positions of the heavy atoms of the protein but we allowed all hydrogen atoms and all atoms in the drug to be optimized. Optimizations were performed using B3LYP density functional theory with a 6-31G(d) basis set, while final electronic energies were calculated using the 6-311+G(d) basis set. We compare our calculated binding constants to experimental values and try to explain the general trends of binding in CA II vs. CA IX.

12:45 MECHANISMS FOR KEY NITROGEN FRACTIONATION REACTIONS**, John David Purvis* and Robert W. Zurales, Middle Georgia College, Cochran, GA 31014. The ratio of 15N to 14N has been found to be different in interstellar formations such as interplanetary dust, meteorites, solar wind and comets. Model chemistries that attempt to explain these ratios require the rates of a number of reactions. Due to the low temperature involved, these reactions are all presumed to involve the exothermic reaction of one charged particle and one neutral particle. It is also assumed these reactions have small or no barriers and proceed at or near the Langevin rate. We have tested this hypothesis by searching for transition states, intermediates, or clusters that may be important in the assumed key reactions. Our calculations were performed using the software program Gaussian 03W.

1:00 **Break**

1:15 THE ACTIVE SITE OF HUMAN GLUTAMINYL CYCLASE**, Laurie L. Lane* and Robert W. Zurales, Middle Georgia College, Cochran, GA 31014. This study focuses on the enzyme human glutaminyl cyclase (GC) because it begins the cyclization of N-terminal glutamine residues into pyroglutamic acid in the hypothalamus, adrenal medulla, and other parts of the brain. It is believed that the cores of plaques responsible for Alzheimer's disease have N-terminal pyroglutamic acid so that GC is a potential drug target. Emerging QC inhibitors are likely to chelate a zinc ion, and it is suggested that the most potent inhibitor closely models the substrate. Starting with the crystal structure of a small drug bound to QC that we downloaded from www.pdb.org, we are trying to model the binding of the more complex inhibitor. We hope that our model will help clarify the exact position of the active site of human QC. All calculations were performed using the software program Gaussian 03W. Our preliminary optimizations were performed using AM1 theory.

1:30 COMPUTATIONAL STUDIES OF PHARMACOLOGICAL CHAPERONES**, Mary Catherine Huff* and Robert W. Zurales, Middle Georgia College, Cochran, GA 31014. Mutations in the enzyme glucocerebrosidase (GCase) cause Gaucher disease. It is believed that these mutations lead to an incorrectly folded protein. It has been found that drugs that inhibit the normal enzyme can actually improve the activity of the mutant enzymes. It is believed that these drugs produce correct folding in the mutants before they are displaced by the reactant. In the Protein Data Bank, we found structures of three different drugs bound to GCase. We deleted all atoms except those that are in close proximity to the drugs. Since the structures don't include hydrogen atoms, we added hydrogen atoms using chemical intuition. We were particularly interested in the protonation state of the amine group present in these drugs. We performed a total of six calculations, each drug once with a charged and once with a free amine group. We present our calculated binding energies to test the hypothesis that the drugs bind tightly when neutral, but less tightly when protonated. All calculations were performed using the software program Gaussian 03W.

1:45 COLLISION INDUCED DISSOCIATION OF FENBUTATIN OXIDE USING TRIPLE QUADRUPOLE MASS SPECTROMETRY, Montoya LaFrance,* Yassin Jeilani and Victor Ibeanusi, Spelman College, Environmental Science and Studies. Fenbutatin oxide is a high molecular weight pesticide that is typically analyzed by high pressure liquid chromatography with tandem mass spectrometric detection. The objective of this experiment was to better understand mass spectrometric fragmentation mechanism of Fenbutatin oxide ($R_3Sn\text{-}O\text{-}SnR_3$) by triple quadrupole mass spectrometry. In triple quadrupole mass spectrometry, both first and third quadrupoles are used as mass analyzers and the second quadrupole is used as a collision cell. Data from collision induced dissociation show a sequential loss of R group (m/z 133) from Fenbutatin oxide. Fragments resulting from cleavage of Sn-O bond were further studied by both product and precursor ion scanning. Using these data, a fragmentation pattern of Fenbutatin oxide was proposed.

2:00 FRAGMENTATION PATHWAYS OF FLUROTELMOR ALCOHOLS BY TRIPLE QUADRUPOLE MASS PECTROMETRY, Juandalyn Coffen,* Yassin Jeilani and Victor Ibeanusi, Spelman College, Environmental Science and Studies. Collision Induced Dissociation (CID) of fluorotelomer alcohols (FTOHs) was studied by triple quadrupole mass spectrometry in both Electron Ionization (EI) and Negative Chemical Ionization (NCI). The FTOHs studied included 2-(perfluorohexyl)ethanol, 2-(perfluorooctyl)ethanol, and 2-(perfluorodecyl) ethanol. The NCI spectra showed a far more complex fragmentation pattern than the EI. The NCI spectra of FTOHs showed a number of complexes

of these alcohols with F- and [HF2]-. These complexes were studied by product ion scanning. The CID data showed a unique fragmentation of the selected FTOHs and the fragmentation mechanism of FTOHs was determined.

2:15 **Break**

2:30 PHYSICAL PROPERTIES AND PHASE CHANGES IN SCANDIUM FLUORIDE, Karena W. Chapman[1], Benjamin K. Greve*[2], Peter L. Lee[1], Kenneth L. Martin[3], Chad J. Ruschman*[2] and Angus P. Wilkinson[2], [1]Advanced Photon Source, Argonne National Laboratory, [2]School of Chemistry & Biochemistry, Georgia Institute of Technology, Atlanta, GA 30332 and [3]Department of Chemistry, Berry College, Mt. Berry, GA 30149. Synchrotron X-ray diffraction data sets of samples of ScF3 (99.99%, American Elements) were collected at varying pressure and at varying temperature. FIT2D was used to convert the 2-D MAR345 image plate data to 1-D powder diffraction patterns, and GSAS was used to analyze the powder patterns and model experimental parameters (including unit cell dimensions). A diamond anvil cell was used to achieve hydrostatic pressures up to 8.76 GPa at ambient temperature. ScF3 was observed to undergo two phase changes upon pressurization: between 0.51 GPa and 0.78 GPa, cubic ScF3 becomes rhombohedral ScF3 via octahedral tilting; and pressurizing above 5.65 GPa results in an increase in the coordination of the scandium as the material becomes ScF3-II. Cubic ScF3 was found to have a bulk modulus of 56.9 GPa. Synchrotron data were acquired at ambient pressure while ScF3 was cooled from 280 K to 100 K, heated to 500 K, cooled back to 100 K, and heated once again to 500 K at 180 K/h. Cubic ScF3 was found to exhibit strong negative thermal expansion (αa = -7.5 ppm K-1). APW acknowledges financial support under NSF grant DMR-0605671. The work at the APS is supported by the U.S. Department of Energy under Contract No. W-31-109-Eng-38.

2:45 THEORETICAL EVIDENCE FOR THE STRONGER ABILITY OF THYMINE TO DISPERSE SWCNT THAN CYTOSINE AND ADENINE, Yixuan Wang*, Department of Natural Science, Albany State University, Albany, GA 31705. Self-stacking of four DNA bases, adenine (A), cytosine (C), guanine (G) and thymine (T), and their cross-stacking with (5,5) as well as (10,0) single walled carbon nanotubes (SWCNTs) were extensively investigated with a novel hybrid DFT method, MPWB1K/cc-pVDZ. The binding energies were further corrected with MP2/6-311++G(d,p) method in both gas phase and aqueous solution, where the solvent effects were included with conductor-like polarized continuum model (CPCM) model and UAHF radii. The strongest self-stacking of G and A takes displaced anti-parallel configuration, but un-displaced or "eclipsed" anti-parallel configuration is the most stable for C and T. In gas phase the self-stacking of nucleobases decreases in the sequence G>A>C>T, while because of quite different solvent effects their self-stacking in aqueous solution exhibit a distinct sequence A>G>T>C. For a given base, cross-stacking is stronger than self-stacking in both gas phase and aqueous solution. Binding energies for cross-stacking in gas phase varies as G>A>T>C for both (10,0) and (5,5) SWCNTs, and the binding of four nucleobases to (10,0) is slightly stronger than to (5,5) SWCNT by a range of 0.1-0.5 kcal/mol. The cross-stacking in aqueous solution also varies differently from that gas phase: A>G>T>C for (10,0) SWCNT and G>A>T>C for (5,5) SWCNT. It is suggested that the ability of nucleobases to disperse SWCNT depends on relative strength (ΔE_{bin}^{sol}) of self-stacking and cross-stacking with SWCNT in aqueous solution. By comparing the binding energies in aqueous solution (ΔE_{bin}^{sol}) of self-stacking

with those of cross-stacking, of the four investigated nucleobases thymine (T) exhibit the highest difference, which can well explain the experimental finding that T more efficiently functionalize SWCNT than C and A.

3:00 DIELS ALDER REACTION IN WATER**, Morgan Price, Spelman College, GA 30314. Organic compounds are not favored to react in water due to their low solubility. However, there have been recent developments and findings that water can be a viable solvent used in organic synthesis. We want to explore the option of using water as a solvent because of its eco-friendly behavior. Exclusively, our interest is exploring a Diels-Alder reaction of furan and maleic anhydride in water. The optimum conditions and further details of the reaction will be explained.

3:15 LEWIS ACID AND BRONSTEAD ACID AS CATALYSTS FOR ORGANIC REACTIONS IN WATER**, Shinelle Caldwell* and Nripendra Bose, Spelman College, Atlanta, GA 30314. The low solubility of organic compounds in water has hindered the use of water in organic synthesis. However, the advantages of using water as a solvent in organic synthesis are significant because water is environmentally friendly. We are exploring the possibilities of using water as a solvent for green organic synthesis. Lewis acid and Bronstead acid surfactants will be used to check the efficiency of water as a solvent for organic synthesis. The use of water as an organic solvent will be discussed in detail.

3:30 **Break**

3:45 HIGH PERFORMANCE LIQUID CHROMATOGRAPHY ANALYSIS OF CAFFEINE IN COMMERCIAL ENERGY DRINKS**, Jaima Dewey* and J. Paul Simon, Columbus State University, Columbus, GA 31907. Caffeine is a widely consumed psychoactive substance, and affects the psychological state of those who consume it. The increase in the popularity of energy drinks, especially in the 13-35 age group, prompted us to investigatethe caffeine content of these commercial supplements. Many of these drinksdo not state the caffeine content on the bottle label. Using High Performance Liquid Chromatography, a variety of locally available, commercial energy drinks were analyzed for caffeine content. Some of the analyzed energy drinks provide high doses of caffeine in small volumes. Consumption of two or more of these beverages in a single day can lead to the adverse effects of excessive caffeine intake.

4:00 A THEORETICAL STUDY OF THE CHEMICAL KINETICS FOR THE DISSOCIATION OF INDIUM NITRIDE SOURCE MATERIALS**, Ashley Jordan, Spelman College, Atlanta GA 30314. Indium nitride (InN) belongs to the group III-nitride semi-conductors, such as gallium nitride and aluminum nitride. Recent studies have been focused specifically on InN because its films have been found to meet requirements for use in many practical devices in which bright blue, violet, and blue-green light-emitting diodes are needed. Also, indium nitride semiconductors have a role in optical storage and power transistor devices. Properties intrinsic to InN include superior electron transport characteristics, high mobility, and a high saturation velocity. One popular method used to synthesize InN is chemical vapor deposition (CVD) which is a process by which a substrate is exposed to source materials in the reaction chamber, in order to produce the semiconductor film. This research group works in collaboration with an experimental laboratory at Georgia State University (GSU), which produces InN films in a high-pressure chemical-vapor-deposition reactor. The theoretical calculations were performed to provide valuable information to the GSU's laboratory. In this particular study, the chemical kinetics for the dissociation of source materials to produce indium nitride (InN) has been

studied theoretically using a finite-difference approach. The source materials considered were trimethylindium [$In(CH_3)_3$] and ammonia (NH_3). The reaction rate constants were obtained following a semiclassical method and transition-state theory. The calculations were performed at varying temperatures between 500 K and 1200K, and pressures between 1 atm and 50 atm. Finite-difference equations were used to track the speed with which $In(CH_3)_3$ dissociates. Anticipated results are that the main species present at the substrate are highly affected by temperature and pressure.

4:15 QUINAZOLINES ARE COMPOUNDS WHICH HAVE A WIDE RANGE OF PHARMACOLOGICAL ACTIVITY**, Kamilah Rashid and Angelica Trumer, Spelman College, Atlanta, GA 30314. In our lab we have developed a convenient one pot domestic microwave assisted synthesis of substituted Quinazolines. This method presents the advantages of being environmentally friendly and economical. It employs shorter reaction time in solvent-less conditions.

Section IV: Physics, Mathematics, Computer Science, Engineering and Technology
Science Center, Room 232
Solomon Fesseha, presiding

1:00 IMPROVEMENTS AT THE WEST GEORGIA OBSERVATORY, Bob Powell and Robert Moore, Jr., University of West Georgia, Carrollton, GA 30118. An on-campus observatory was opened at the University of West Georgia in October, 1979. The five-meter dome housed a 14-inch Cassegrain telescope, purchased with a National Science Foundation Grant for Instructional Scientific Equipment. During the last 29 years, the observatory has been used for astronomy class and laboratory observations and student projects. Regularly scheduled public observations have brought thousands of people to the facility. School classes and clubs as well as civic clubs and church groups have arranged visits to the West Georgia Observatory. Even though the sky now has severe light pollution, a campus observatory is needed for the convenience of students. In October 2008, a 16-inch Meade LX200 Schmidt-Cassegrain telescope was installed in the facility. This computer-driven scope enables the operator to locate dim celestial object more easily. In addition, an Orion StarShoot Pro Deep Space Color CCD Camera was acquired. This camera has a 1.8-inch format CCD with a 3032x2016 pixel array with thermoelectric cooling in the camera to reduce thermal noise in the images taken. Exposure times can be varied from 0.002-second to 9.5-hours. Despite the light pollution, good photographs are being taken of celestial objects, such as the Ring Nebula (M27), the globular cluster in Hercules (M13), and the Orion nebular (M42). The new telescope and camera will allow more students to complete projects.

1:15 PRELIMINARY STUDIES OF PRODUCING HYDROGEN FOR A FUEL CELL, Raymond Hill,* Austin Kerlin,* Benjamin Jenkins,* Robert Moore, Jr. and Bob Powell, University of West Georgia, Carrollton, GA 30118. Students are interested in alternative energy projects. This research group selected a project to generate hydrogen to operate a fuel cell. Work has been completed on two aspects of the project. A device has been constructed from stainless steel to electrolyze water. Studies have been completed to optimize the efficiency of this apparatus and to reduce contamination of the hydrogen produced due to unwanted reactions between the electrolyte solution, conductor plates, and wiring of the apparatus. Studies have also been conducted on the production rate of hydrogen gas as a function of electrolyte concentration and the number of electrode

plates The second part of the study involves the usage of a solar panel to produce electricity for the electrolysis. Studies have been completed on its output in regard to the orientation with the Sun. Usage of lenses or mirrors to concentrate the radiant energy is being conducted. Electricity from the solar panel will be used to generate hydrogen via the electrolysis of water in the next phase of the project.

1:30 QUALITATIVE ANALYSIS OF THE PACIFIC SCIENCE PHYSICS EQUIPMENT ZEEMAN EFFECT APPARATUS, David Bolding*, David Mertins*, Robert Moore, Jr. and Bob Powell, University of West Georgia, Carrollton, GA 30118. An attempt was made last spring to find information from similar departments about a Zeeman effect apparatus as a possible new experiment for an upper level laboratory course for physics majors. Such information was unavailable. The Pacific Science Physics Equipment Zeeman Effect Apparatus was purchased for evaluation. This project involved the testing of this apparatus to determine its usefulness to the physics education community. We have determined the magnetic field strength as a function of current, optimized the optical alignment, and tested the CCD camera settings. The splitting of the green line (545.1 nm) of the element mercury into rings though a circular aperture can be shown. Several issues have been found. The apparatus does not come with an optical bench. The manufacturer's instructions are not clear and do not provide good information about quantitative analysis. When a student spectroscope and spectrometer are used with the apparatus, a broadening of spectral lines is seen when the magnetic field is turned on, but the instruments do not have sufficient resolution to measure the amount of splitting of the spectral lines.

1:45 SYNTHESIS OF AN ALUMINUM-GALLIUM-INDIUM-TIN ALLOY: AN ALTERNATIVE METHOD OF GENERATING HYDROGEN GAS FOR THE OPERATION OF A FUEL CELL**, B.L. Hammond* and J. Robinson*, Augusta State University, Augusta, GA 30904. An economically viable process for producing hydrogen on demand has yet to be fully discovered due to the problem of safely storing hydrogen gas. We have conducted experiments using an aluminum-gallium-indium-tin alloy, which when immersed in water, splits water into hydrogen and oxygen. The hydrogen gas generated, after being compressed and stored, was then directed into a hydrogen fuel cell where it was used to operate various electrical applications. The alumina side product of the reaction can then be recycled back into aluminum at almost 100% efficiency. Testing at Purdue University by Professor Jerry Woodall has revealed that this alloy is exceptionally efficient for both hydrogen production and storage. Our research initially consisted of synthesizing this alloy using various ratios of aluminum, gallium, indium, and tin to determine which proportion is most economically and environmentally efficient in regards to the production and storage of hydrogen. Other metals, including antimony and thallium, are also being integrated into the alloy and each mixture has produced a variety of results. After sufficient testing of the various alloys.

2:00 DAM BREAK SCENARIO MODELING IN FRANKLIN COUNTY, GA USING FEMA'S HAZUS-MH SOFTWARE**, Kyle Dalton and Sudhanshu S Panda, Institute of Environmental Spatial Analysis, Gainesville State College, Gainesville, GA. The use of the HAZUS software package to model dam break scenarios is a new function. The HAZUS software takes inputs from the user and calculates damage to the study area. In this project the study area is limited to the northwest portion of Franklin County, GA. The HAZUS package comes with census blocks and tracts stored in a geodatabase. From these shapefiles the coordinates are obtained of the study area and the HAZUS package directs the user to the USGS Seamless server to download a digital elevation model. With

the built in models of HAZUS a stream network is delineated. After delineation and user inputs of flow the floodplain and depths are calculated by the HAZUS package. After the complete analysis package has ran summary reports are generated that contain information about losses to the area in the form of building, road, agriculture, and vehicle damage. It gives the estimated losses in dollar amounts. These amounts are based on population information taken by the CENSUS Bureau. The resultant maps show the spatial extent of flood damage after the breaks in the study area including the summary reports as mentioned.

2:15 SEMI-CLASSICAL DETERMINATION OF THE ENERGY LEVELS OF AN $X^{4/3}$ POTENTIAL, Kale Oyedeji, Physics Department, Morehouse College, Atlanta, GA 30314-3773. Given a classical solution to a 1-dim in space system, for which all the solutions are periodic, the application of the modified Bohr-Sommerfeld quantization condition [1] allows a determination of semi-classical estimates for the energy levels of the associated quantum system. We consider an $x^{4/3}$ potential and use the methods of harmonic balance and iteration to calculate accurate approximations to the classical periodic solutions [2]. With these results, a general semi-classical energy spectrum can be determined. To judge the accuracy/validity of these calculations, we use a simple calculation of the associated energy and compare this value with our semi-classical result. [1] A.B. Migdal and V.P. Krainov, "Approximation Methods in Quantum Mechanics" (W.A. Benjamin, New York, 1969). [2] R.E. Mickens, Journal of Sound and Vibration 292 (2006), 964-968.

2:30 **Break**

2:45 AUTOMATION OF THE FRANCK-HERTZ EXPERIMENT USING LABVIEW**, Nathaniel R. Sonderman* and J.L. Talbot, University of West Georgia, Carrollton, GA 30118. The Franck-Hertz Experiment is a classic experiment in the Modern Physics canon. Traditionally, the accelerating voltage and the resulting current through the mercury vapor tube are measured using digital multimeters. This method is tedious, time-consuming, and ripe for error. To allow for more thorough data-taking, the experiment can be run using an Agilent power supply connected, via a serial cable, to a computer running LabVIEW. A LabVIEW VI controls the power supply voltage, and measures the resulting current using a built-in multimeter function. A curve resembling the expected result has been obtained.

3:00 A SUITABILITY ANALYSIS MODEL FOR POTENTIAL BLUEBERRY PRODUCTION IN GEORGIA USING GEOSPATIAL TECHNOLOGY, Johnny Reed and Sudhanshu S Panda, Institute of Environmental Spatial Analysis, Gainesville State College, Gainesville, GA. Blueberry production is a rapidly growing industry in Georgia and other southeastern states. It currently ranks second in fruit/nut production value in Georgia. The industry is currently concentrated in the southeastern part of the state. However, there is greater scope to extend the area of cultivation to other parts of Georgia and so as in other southeastern states. Successful blueberry cultivation has specific requirements in terms of weather suitability, such as chilling hours, soil characteristics like, pH level, drainage, and permeability, and land-use and land cover (LULC) types. The objective of this study is to develop a geospatial map which identifies spatial locations of Georgia that have the potential for successful blueberry production. The potential blueberry production area map is produced through an automated geospatial model developed in ArcGIS 9.2 ModelBuilder. Data concerning to this project were collected from various sources. STATSGO soil data was collected from Georgia GIS Data Clearinghouse. The weather

data to provide chilling hours was collected from the Georgia Automated Environmental Monitoring Network. National Land Cover Dataset (NLCD) 2005 Georgia LULC classified map was another data used for analyzing the land potential for potential blueberry production. Models were created to determine counties in Georgia with highest blueberry production for studying the suitable conditions; to create chill hour raster for Georgia and top producing counties; to create LULC raster for Georgia and top producing counties; to produce soil characteristics raster, such as suitable/potential Counties pH raster, permeability raster, and drainage raster. Each raster was reclassified with Boolean method to show suitable raster cells as 1 and unsuitable as 0. All these reclassified models were multiplied using Map Algebra to provide a suitable range map for blueberry production in Georgia counties. Finally, all these models were combined into a single automated geospatial model to produce the map showing suitable blueberry production spatial locations in Georgia.

3:15 USING GIS TO ANALYZE ENVIRONMENTAL AND SOCIOECONOMIC IMPACTS ON COASTAL RESOURCES IN SOUTHWESTERN MADAGASCAR, Sean R. Uhl and Sudhanshu S Panda, Institute of Environmental Spatial Analysis, Gainesville State College, Gainesville, GA. More than half of the world's population lives within 60 kilometers of a coast. Of these people, some 200 million make a livelihood directly from harvesting fish and other marine resources (World Bank 2008). As such, studies of coastal marine resources have been, and continue to be, an important aspect of biological conservation worldwide. Studies in poor, remote regions of the world often focus solely on fishing villages and the fishers living there. This project aims to utilize existing geographical information systems (GIS) and census data to take a more regional approach to analyzing and visually displaying socio-economic impacts on coastal marine resources in such an area: the southwestern coastal region of Madagascar. The resulting map document is intended to show general patterns and causes of impact on the coastal region and to aid researchers and local stakeholders in viewing these issues at a regional scale. Every effort has been made to identify potential problems associated with the data used, methodology, and assumptions made so that the project can benefit from input by researchers and locals with more intimate knowledge of the region and issues.

3:30 GENERAL TWO PARAMETER SOLUTIONS FOR THE LINEAR GOURSAT EQUATION, Sandra Rucker and Ronald E. Mickens, Clark Atlanta University, Atlanta, GA 30314. The linear Goursat partial differential equation can be derived from the linear, damped wave equation by means of a linear transformation of the independent variables. Our goal is to construct explicitly, for the Goursat equation, a two parameter family of exponential-type solutions. We also demonstrate that for special ranges of the parameters, oscillatory, periodic, and exponential solutions exist. An extended version of this work, along with certain issues related to the discretization of the equation, appear in G. S. Laddle *et. al* (editors) Proceedings of Dynamic Systems and Applications, vol. 5(2008), pps. 322-324.

3:45 OPTIMAL MASS FOR ACCELERATION WITH A NAKAMURA SPARK TIMER, Benjamin Jenkins*, Robert Moore Jr. and Bob Powell, University of West Georgia, Carrollton, GA 30118. The Behr apparatus, the digital freefall timer, and the simple pendulum are often used to determine the acceleration due to gravity on the surface of the Earth. The Nakamura Spark Timer is advertized by the Sargent-Welch Company for the measurement of this acceleration. Since the initial measurements did not yield good results, this project was devised to ascertain if there was an optimum mass and/or orientation for the simple spark timer. The accelerations of masses, starting at 10g and

increasing in increments of 10g to 200g, were determined using the spark timer at 60 Hz in a horizontal orientation. Three measurements were done for each mass. The best result in this orientation was 9.4 m/s^2 for a mass of 200g. The system was set in a vertical position, and masses ranging from 100g to 300g, increasing in increments of 50g, were used. The average acceleration continued to increase with increasing mass to an average result of 9.6 m/s^2 at 300g. Larger masses caused the tape to break.

4:00 TESTING SPATIAL AUTOCORRELATION FOR USE IN DIFFERENTIATING EVAPORATIVE RESIDUES, Scott M. Pierce, K.C. Chan and Yunjie Mi, Albany State University, Albany GA 31705. Evaporation driven self-organized patterns of surfactant mixed with organic adjuvant poses an analytical challenge: How to differentiate between the distributions of various mixtures' residues? Standard univariate analyses are not adequate. A novel spatial autocorrelation method is developed to tackle this problem. By applying the recognized Moan I and Geary C statistics, and by optimizing lag distance, spatial relationships between deposit subsets are illuminated. This approach has the potential to assess the degree of randomness and to reveal common patterns in evaporation driven residues. Once validated on simulated data, the method is applied to analyze evaporative patterns of X-77, a common agricultural surfactant. Funding acknowledgement: Funding was made possible (in part) by 5P20MD0001085-04 from the National Ctr on Minority Health and Health Disparities. Views expressed are the presenter(s)', and do not constitute endorsement by DHHS.

4:15 INVESTIGATION OF THE QUALITATIVE BEHAVIOR OF THE EQUILIBRIUM POINTS FOR A MODIFIED LOTKA-VOLTERA MODEL, Christopher A. Stover*, Andreas Lazari and Jemal Mohammed-Awel, Valdosta State University, Valdosta, GA 31698. We are interested in a modified Lotka-Voltera model, which incorporates a non-linear relationship representing the interaction between the species. We study the stability of the equilibrium points of the system; compare the qualitative behavior of the equilibrium points in our model with the qualitative behavior of the classical Lotka-Voltera equations and with the qualitative behavior of other modified Lotka-Voltera equations.

POSTER

PRELIMINARY SOLAR STUDIES DURING A SUNSPOT MINIMUM**, Amanda M. Brock*, Robert R. Moore, Jr. and Bob Powell, University of West Georgia, Carrollton, Georgia 30118. Solar activity varies on average every eleven years. Recently, sunspot activity has been minimal. This project of monitoring the Sun started in October, 2008. Its objectives are to obtain baseline images of the Sun in various wavelengths during the minimum and to continue this imaging in the initial part of the new sunspot cycle. We have been making photographs through telescopes equipped with three different filters. We have used an optical telescope equipped with a neutral density filter; all wavelengths in the visible spectrum are attenuated by the same factor. In these images, we can see the visual appearance of the sun, including sunspots. The number of sunspots and size of sunspots can be determined. We have used a solar telescope equipped with an H-Alpha filter. Images made through this instrument show prominences, sunspots, flares, and plages. We also have used a second solar telescope equipped with a Calcium-K filter. These images show sunspots and the granulation of the photosphere very clearly. Initial photographs also suggest these blue images reveal places where sunspots may later form. The camera used in these initial studies was an Orion StarShoot Solar System Color Imager with a 1/3" sensor. Exposure times ranged from 0.001 to 0.5 second.

Section V: Biomedical Sciences
Science Center, Room 145
Francis Eko, presiding

2:00 PHYTOSTEROL SUPPLEMENTATION**, Lucky Nwankwo[1], Kereen Gordon[2], Victoria Miles[2], Godwin Ifere[2], Qing He[3], Eno Ekong[3], Francis Eko[3], Joseph Igietseme[4] and Godwin Ananaba[1/2], [1]Center for Cancer Research & Therapeutic Development, [2]Clark Atlanta University, [3]Morehouse School of Medicine and [4]Centers for Disease Control and Prevention, Atlanta, GA. Interleukin-10 (IL-10) cytokine has pleiotropic effects in immunoregulation and inflammation. It down-regulates the expression of Th1 cytokines, MHC class II antigens, and co-stimulatory molecules on macrophages. IL-10 is an anti-inflammatory cytokine that depends on the JAK-STAT signaling pathway. Cancerous cells increase their production of TGF-β and IL-10, which also act on surrounding cells to suppress immune response. We examined the mechanisms by which plant sterols such as β-cyclodextrin (β-CD) induce production of factors that can suppress or enhance immune response against prostate cancer. We hypothesize that phytosterol treatment enhances immunostimulatory effects of promonocytic THP1 cells on prostate cancer cells. In this study THP1 cells were used to determine the effects of IL-10 on JAK-STAT and TGF-βsignaling pathways. A combination of techniques such as ELISA, PCR, and Western blotting were used to determine the effects of β-CD delivered phytosterols on THP1 maturity and activation of immunity against prostate cancer. We found that prostate cancer cells continuously produce IL-10, a Th2 cytokine, and TARC, an angiogenic Th2 chemokine. Moreover phytosterols activate macrophages and enhance immune response. Our results suggest that phytosterols can be used as immunotherapeutic agents against prostate cancer.

2:15 ROLES OF GB3/CD77 IN BURKITT'S LYMPHOMA CELLS**, Brittney Newton*[1], Mark Maloney[1], Shanita Bishop[1], Marisela DeLeon[1], Guoshen Wang[2] and Leonard Anderson[2], [1]Spelman College, Atlanta, GA 30314 and [2]Morehouse School of Medicine, Atlanta, GA 30310. The glycosphingolipid Gb3 (CD77) found in germinal center stage B cells and Burkitt's lymphoma cells has roles in apoptosis, cell adhesion, and interferon type I signaling. Direct ligation of Gb3 with anti-Gb3 antibodies or the Gb3-binding Shiga toxin B-subunit induces apoptosis in Daudi cells and other Gb3-positive Burkitt's lymphoma cell lines. We have investigated the role of Gb3 in more general apoptotic pathways induced by camptothecin, staurosporine or serum deprivation. Results indicate that caspase and mitochondrion-associated pathways are involved in the apoptosis induction in Gb3-positive Daudi cells. In contrast, VT500 cells, Gb3-deficient Daudi mutants, are highly resistant to apoptosis induced by camptothecin, staurosporine and serum deprivation. When Gb3 was incorporated into VT500 cells through reconstitution with fusogenic liposomes, the reconstituted cells became sensitive to the apoptosis inducer camptothecin as determined by JC-1 staining for mitochondrial membrane depolarization. This result was not observed following reconstitution with other glycolipids. Microarray analysis performed using Agilent technology and human genome arrays indicates that a number of genes are differentially expressed in Gb3-positive versus Gb3-deficient Burkitt's lymphoma cells including the apoptosis-related genes JNK1, Caspase 3, PARP and ICAD. Funding was provided by grants from NIH MBRS/SCORE GM08241, NIH R1M1 MD00215.

2:30 THE EFFECT OF ESTROGEN ON *LACTOBACILLUS* VACCINE DELIVERING *CHLAMYDIA* ANTIGEN**, Krystal Farmer[1], A. Campbell[1], G. Ifere[1], L. Nwankwo[1], V. Miles[1], E. Ekong[2], F. Eko[2], J. Igietseme[3] and G. Ananaba[1], Clark Atlanta

University, Atlanta, GA, [2]Morehouse School of Medicine, Atlanta GA amd [3]Bluefield State College, Bluefield, WV. *Lactobacillus* species are safe microorganisms used as vaccine delivery agents that have adjuvant quality and are present in the normal floral of the human gut and genitourinary tract. The estrous cycle or treatment with sex hormones like estradiol is known to influence genital mucosal immune elicitation and function. Determining the effect of estrogen on *Lactobacillus* viability will demonstrate the potential capabilities of *Lactobacillus* as a vaccine delivery vehicle on the mucosal surface of the genital tract. The goal of this study is to explore the use of *Lactobacillus* species as a delivery vehicle for *Chlamydia* antigen(s) in an estrogen environment. We hypothesize that *Lactobacillus* species can be used as a live carrier of a genetic system consisting of *Chlamydia* antigens in an estrogen environment. In this study, *Lactobacillus acidophilus*, *L. gasseri* and *L. vaginalis* were cultures in *Lactobacillus MRS* broth and *Lactobacillus MRS* agar plates containing 10-7, 10-8, 10-9 estradiol concentrations. Colony forming units were enumerated and used to determine the effect of estradiol on *Lactobacillus* viability. The result show that *L. vaginalis* viability was not affected by the estradiol; however, estradiol inhibited the growth of *L. gasseri* and *L. acidophilus*. These results suggest that *L. vaginalis*, as a preferred strain of *Lactobacillus* can be used as an effective vehicle to deliver *Chlamydia* or antigens of other human and animal pathogens to the genital mucosa.

2:45 THE EFFECT OF PHYTOSTEROLS ON THE FUNCTION OF ANTIGEN PRESENTING CELLS**, Victoria N. Miles*, Lucky Nwankwo and Godwin Ananaba, Department of Biological Science, Clark Atlanta University. Antigen Presenting Cells/Macrophages are part of a network of cells that process and present antigens to the immune cells. The immune cells protect the body from foreign invaders and cancers. Several proteins and genes such as; ICAM-1, B7.1, B7.2, Jak II, Stat III, MHC class II, CD40 Ligand, Nitric Oxide, γ- interferon, IL-10, CXCL 12, and SDF-1 are produced by APCs and act as co-stimulators in the body's immune response. However, these co-stimulators can be influenced by phytosterols; which are a group of steroid alcohols naturally occurring in plants. They seem to have cholesterol lowering properties, reducing cholesterol absorption in intestines and may act in cancer prevention. We hypothesize that phytosterols alter NO production and immunity against prostate cancer. The hypothesis was investigated by growing ThP1 and PC-3 cells, and supplemented with cholesterol and phytosterol, facilitated by β–cyclodextrin (as vehicle). The supernatants were collected and the level of NO was determined by ELISA. The results show increased production of NO by cholesterol supplementation and reduction by phytosterol treatment. Based on these studies, we have demonstrated that phytosterols inhibit the production of NO and the activation of APCs. Supported by NIH grants GM0824, A141231 and 5P20MD0022854-02.

3:00 THE EFFECT OF ROUTE OF INFECTION ON THE PATHOGENESIS OF *CHLAMYDIA TRACHOMATIS* INFECTION, L. London[1], A. Campbell[1], N. Diala[1], E. Ekong[2], G. Ifere[1], F. Eko[2], D.Q. He[2], J. Igietseme[2,3] and G. Ananaba[1], [1]Clark Atlanta University, [2]Morehouse School of Medicine and [3]Centers for Disease Control & Prevention, Atlanta, GA. *Chlamydia trachomatis* is a major cause of sexually transmitted diseases (STD) that can lead to chronic pelvic inflammation, ectopic pregnancy, and infertility in women. The public health objectives to develop prevention and control strategies for *Chlamydia* require a better understanding of the pathogenesis of chlamydial disease. Since members of the *Chlamydia* family can cause ocular, respiratory and reproductive tract diseases, the effect of prior exposure by one route on the incidence of complications developed after an infection through another route is unknown. The purpose of this study was to determine the effect of prior nasal or genital infection on infertility that follows

a genital infection. We hypothesized that infertility associated with genital tract infection by *C. trachomatis* can be aggravated by prior intransal infection. Female mice were pre-infected intranasally or intravaginally with *C. trachomatis* and were reinfected intravaginally, then mated to assess fertility. Mice were weighed daily to check the progression of pregnancy, and just before delivery the unborn murine pups were enumerated. Our results show that prior infection by either the nasal or vaginal tract reduced the fertility either by reducing the pregnancy rate or number of pups produced. Furthermore, the nasally and vaginally pre- infected groups carried smaller litters. Results from this study may lead to a better understanding of the pathogenesis of the complications of genital chlamydial disease, which can lead to better prevention measures.

3:15 SYNTHESIS OF β-CYCLODEXTRIN-PEG-FOLIC ACID BIOCONJUGATE FOR DELIVERY OF ANTITUMOR PHYTOSTEROLS**, [1]Olatunji Abimbola*, [2]Godwin Ifere, [2]Laurisa London, [2]Lucky Nwankwo, [1]Ishrat Khan, [3]Francis Eko, [3/4]Joseph Igietseme and [1/2]Godwin Ananaba, [1]Center for Functional Nanoscale Materials, [2]Center for Cancer Research & Therapeutic Development, Clark Atlanta University, [3]Morehouse School of Medicine and [4]Centers for Disease Control and Prevention, Atlanta. GA. An inclusion complex of β-cyclodextrin with hydrophobic compounds can be used in drug delivery. In this study, we synthesized and characterized β-cyclodextrin -PEG-Folic Acid (β-CD-PEG-FA) bio-conjugate for antitumor delivery of phytosterols. known to reduce tumor cell growth and migration. We hypothesize that the bio-conjugate of β-CD-PEG-FA will facilitate phytosterol absorption and increase β-cyclodextrin solubility and targeted delivery to a tumor site. Thus, phytosterols supplemented with β-cyclodextrin were characterized by IR and NMR analysis. The IR studies revealed diminished absorption spectra of phytosterol inclusion complex compared to the β-cyclodextrin spectra. H1NMR studies also revealed a resonance shift upfield. Solid state IR of synthesized activated β-cyclodextrin peaked at 1375cm-1,characteristic of methyl group incorporation. The IR studies suggest that most of the phytosterol moieties were encapsulated in the β-CD cavity, and capable of delivering phytosterols and other therapeutic drugs in an inclusion complex.

3:30 TRANSCRIPTIONAL ACTIVATION OF VEGF/VEGFR2 GENES BY LEPTIN IN BREAST CANCER CELLS, Yanbo Xu, A. Watters, S. J. Leibovich, D.R. Mann, B.R. Rueda and R.R. Gonzalez, Morehouse School of Medicine, Atlanta, GA. We have previously reported that in vitro and in vivo leptin signaling mediates proliferation of mouse 4T1 mammary tumor (MT) cells and regulates levels of VEGF and VEGFR2. Therefore, we hypothesize that leptin signaling can regulate VEGF/VEGFR2 expression by transactivating VEGF/VEGFR2 genes in the MT cells. Mouse MT cells were treated with leptin to investigate its dose-response effects on VEGF/VEGFR2 levels. MT cells were transiently transfected with molecular engineered luciferase-reporters for mouse VEGF promoter and transcription factor-binding deletions for hypoxia responsive element (HRE), AP1, AP2, SP1 and NFκB. Dual-luciferase assay was used to measure the VEGF promoter activity in the transfected cells. To further determine how leptin regulates VEGF expression in MT cells the effects of hypoxia alone and combined with leptin on VEGF levels and VEGF promoter activities were investigated. The results indicated that leptin regulates VEGF promoter activity through several binding sites for transcriptional factors including HIF-1, AP1, SP1 and NFκB. Our data suggest that leptin can induce VEGF/VEGFR2 at both protein and mRNA levels in 4T1 and MMT cell lines. The results provide novel information on the molecular mechanisms for leptin-induced angiogenic effects in breast cancer.

SATURDAY PAPER PRESENTATIONS

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

Section I: Biological Sciences
Science Center, Room 145
Paul T. Arnold, Presiding

8:15 MONITORING MOVEMENT PATTERNS AND HABITAT SELECTION OF A FIRST YEAR POPULATION OF JUVENILE GOPHER TORTOISES (*GOPHERUS POLYPHEMUS*) AT REED BINGHAM STATE PARK, GEORGIA**, Christine M. Chessler* and J. Mitchell Lockhart, Valdosta State University, Valdosta, GA 31601. The gopher tortoise (*Gopherus polyphemus*) is a medium-sized tortoise found in the southeastern United States. Legal protection of the gopher tortoise varies depending on their range, but it is listed as threatened in the state of Georgia. A mortality rate of greater than 94% of both gopher tortoise eggs and hatchlings has been shown to occur due mostly to predators such as raccoons, armadillos, and fire ants. Since mortality rates are extremely high in juvenile gopher tortoises, research into this early life stage could allow for increased knowledge into developmental issues facing this long-lived species. Surgically implanted 134.2 KHz, 8.5 x 2.12 mm PIT (Passive Integrated Transponder) tags were placed into 91 juveniles artificially brooded by Reed Bingham State Park. Through recapture observation, PIT tags will ultimately allow data collection on home range, movement patterns, theoretical sex structure, survivability, and habitat selection by the juveniles. Information gained through this project could allow for better practices and conservation of the species at Reed Bingham State Park, Georgia, as well as throughout its range.

8:30 SEROSURVEY FOR PATHOGENS IN BOBCATS (*LYNX RUFUS*) IN SOUTH GEORGIA AND NORTH FLORIDA**, Laura Simmons* and J. Mitchell Lockhart, Valdosta State University, Valdosta, GA 31601. Bobcats (*Lynx rufus*) are a significant mesopredator of bobwhite quail (*Colinus virginianus*) in the southeastern United States. As part of a 6 year study to evaluate the effects of mesopredator removal on bobwhite quail production, more than 120 bobcats were lethally removed from four plantation sites in south Georgia and north Florida. The principal objective of this study was to evaluate bobcats for the presence of various infectious pathogens. Secondary objectives were to determine if sex, season and year of collection, and host removal had any effect on pathogen presence. Serum from bobcats was tested for the presence of *feline calicivirus* (FCV), *feline infectious peritonitis* (FIP), *Bartonella henselae*, *feline herpesvirus* (FHV), and *Toxoplasma gondii* using fluorescent antibody methods. Preliminary results indicate that 36.3% (29/80) of bobcats are seropositive for FCV, 0% (0/76) for FIP, 0% (0/38) for FHV, and 94.8% (110/116) for *T. gondii*. These results suggest that pathogens that are potentially transmissible to companion animals are present in wild animals in south Georgia and north Florida.

8:45 PHOTOSYNTHETIC RESPONSE OF TERRESTRIAL DESERT ALGAE TO CONTROLLED HUMIDITY, N. L. Charnock* and J. A. Nienow, Valdosta State University, Valdosta, GA 31698. As part of our ongoing studies of the ecophysiology of terrestrial and subaerial microalgae, we examined the photosynthetic response of selected strains isolated from desert habitats to controlled humidity. BBM-agar cultures were washed onto polycarbonate filters, which were then dried over phosphorus pentoxide, suspended over aqueous glycerol solutions corresponding to known relative humidities,

and incubated for at least one week under continuous dim light and constant temperature. The photosynthetic yield parameter of the filtered algae was determined at each stage using pulse-amplitude-modulated fluorometry. For all strains of the genus *Stichococcus Nägeli* (Chlorophyta) tested, the value of the yield parameter was significantly higher after incubation at constant humidity above 60% than in the desiccated state (paired t-tests with $\alpha = 0.05$). The photosynthetic yield did not, however, return to pre-desiccation levels. In addition, there was no significant difference in the response to relative humidities between 60% and 90%, suggesting the presence of a humidity threshold. The increase in the photosynthetic yield parameter in response to increased relative humidity was not observed in tested strains belonging to other genera of green algae.

9:00 THE ATTACHMENT OF DIATOMS TO GREEN COCONUT HUSKS**, J. Trull* and J. A. Nienow, Valdosta State University, Valdosta, GA 31698. In this study we were testing the hypothesis that coconut husks inhibit the attachment and growth of marine diatoms. Pieces of fresh coconut husk were attached to microscope slides and floated in St. George Sound, on the northern Gulf coast of Florida, in early February, 2008. Slides, selected randomly, were recovered at two to three week intervals, fixed in ethanol/formalin and returned to Valdosta State. 2-liter whole water samples were collected at the same time and fixed in Lugol's iodine solution. At Valdosta State, slides were separated from the coconut husks and processed separately. A portion of each husk and each slide was critical-point dried, sputter-coated with gold/palladium and examined with scanning electron microscopy. The remaining portions of the husks and the slides were scraped using fresh razor blades. The scraped material was acid-washed, then rinsed with de-ionized water. Portions of the cleaned material were mounted in Naphrax for light microscopy, or dried onto aluminum stubs and sputter-coated for scanning electron microscopy. Our preliminary results indicate that 1) both slides and husks were colonized by diverse assemblages of microorganisms within the first three weeks of exposure, and that 2) the diatom assemblages on the husks, on the slides, and in the water column are different. We are currently verifying the latter point by determining the relative composition of the diatom associations by identifying and counting 300 valves from each sample.

9:15 CONSPECIFIC AND HETEROSPECIFIC ASSOCIATIONS IN NEST-TRAPS OCCUPIED BY THE CRAYFISH, *PROCAMBARUS SPICULIFER*, J. Rousey*[1], P. Hightower*[2], M.E. Smith[1] and D.L. Bechler[1], [1]Valdosta State University, Valdosta, GA 31602 and [2]Abraham Baldwin Agricultural College, Tifton GA 31793. From 8 March to 21 September 2006, 35 and 15 cm nest-traps made of PVC irrigation pipe and partially packed with leaves were placed in the Alapahoochee River to determine coexistence of conspecific and heterospecific invertebrate associations. From 29 March until 24 August, traps were opened and the number, gender and size of all crayfish species were recorded. After data acquisition, crayfish were returned to the nest-trap, which was then replaced in the river. On 21 September, the entire contents of the trap were removed, placed in 95% ethanol with rose Bengal dye, and returned to the laboratory for heterospecific invertebrate analysis. Overall occupation rate of traps by crayfish was 43%. Occupation by two or more crayfish occurred 10% of the time. If two crayfish occupied a trap, then the size of the larger crayfish was significantly different from the smaller crayfish. If three crayfish occupied a trap, there was no significant size difference between the two smaller crayfish, but both were significantly smaller than the largest crayfish. Significantly more females were found in traps than males. An examination of all possible gender combinations for traps occupied by two or more crayfish showed significant differences such that the most common gender combination was a larger male with smaller female. Other invertebrate

groups found in traps with crayfish included Diptera, Ephemeroptera, Coleoptera, Mollusca, amphipods, copepods, and shrimp. *Chironomini* (Diptera:Chironomidae) and *Stenacron* (Ephemeroptera:Heptageniidae) comprised over 50% and 20% of individuals, respectively. The dominant invertebrate functional feeding group was collector-gatherers (>90% of all specimens captured).

9:30 MANDIBULAR DAMAGE AND VARIATION IN CRANIAL MORPHOMETRY IN LARVAE OF *AGABUS DISINTEGRATUS* (CROTCH) (COLEOPTERA: DYTISCIDAE), T. A. Shepley-James[1], E. H. Barman[2] and W. P. Wall[2], [1]Georgia Military College, Warner Robins, GA 31093 and [2]Georgia College & State University, Milledgeville, GA 31061. Data for mature larvae of *Agabus disintegratus* (Crotch) collected from a small roadside habitat in Baldwin County, Georgia indicated that head lengths exhibited a bimodal frequency distribution. In contrast, head lengths of *A. punctatus* Melsheimer, also a faunal component of this site, exhibited a pattern approaching a normal distribution with a single mode. Mature larvae of *A. disintegratus* were subjected to forced eclosure with the resulting adults preserved individually in 70% glycerated ethyl alcohol along with their corresponding larval sclerites. Cranial parameters examined included total head length, gape, coronal suture length, and frons width and length. The analysis of these parameters confirmed the bimodality in this population of *A. disintegratus* although there was no evidence of sexual dimorphism. Eighty per cent of larvae examined (n = 10) had the apices of one or both mandibles damaged. In contrast, larvae of *A. disintegratus* collected from a different (larger) habitat and cultured into the adult stage using identical methods exhibited no mandibular damage. The damaged mandibles indicate that larvae in the roadside habitat may have been exploiting a suboptimal prey regime and that this may be an explanation for the distribution frequencies observed.

10:00 **Section business meeting**

10:30 IDENTIFICATION OF THE EPIBIONT, *CHELONIBIA TESTUDINARIA* (CIRRIPEDIA: BALANOMORPHA: CORONULOIDEA) ASSOCIATED WITH ARCHAEOLOGICAL SEA TURTLE REMAINS FROM THE NORTH STORR'S LAKE SITE (SS-4), SAN SALVADOR, BAHAMAS, Jeffrey P. Blick, Georgia College & State University, Milledgeville, GA 31061. Excavations at North Storr's Lake (SS-4) on San Salvador, Bahamas have yielded turtle barnacle wall plates (shell compartments) in association with skeletal remains of sea turtles dated to ca. A.D. 1000-1500. The turtle barnacle has been identified as *Chelonibia testudinaria* (Linnaeus, 1758), a widespread, commensal species found on all genera of Cheloniidae in the world's oceans. *C. testudinaria* is the most often reported sea turtle barnacle and is commonly found on *Caretta caretta* (loggerhead) and *Chelonia mydas* (green turtle) dating as far back as the Miocene epoch. Wall plates of *Chelonibia testudinaria* occur in stratigraphic association with both loggerhead and green sea turtle remains at North Storr's Lake, peaking in frequency in the same archaeological stratum as the sea turtle remains, therefore the association is clear. Sea turtle species were identified using DNA and stable isotope analysis on bone, thus species identifications are confirmed. Accelerator Mass Spectrometer (AMS) dates from carbonized wood in site stratigraphy span the period ca. A.D. 1311-1442, indicating sea turtle exploitation by the indigenous Lucayans ca. 180 years or less prior to the arrival of Columbus on San Salvador. AMS dates and stratigraphy suggest that green turtle may have been harvested earlier and over a longer time span (ca. A.D. 1000-1500) than loggerhead (ca. A.D. 1311-1442). Based on these results, this locality at the North Storr's Lake site is interpreted as a traditional sea turtle butchery site where multiple species and individuals were repeatedly butchered over a relatively lengthy time period.

POSTERS

ARTIFICAL NEST CAVITIES DESIGNED FOR USE BY SMALL MAMMALS**, Lara Catall*, Terry L. Barrett and Gary W. Barrett, Eugene P. Odum School of Ecology, University of Georgia, Athens, GA 30602. We designed a replicated study investigating the use of artificial small-mammal nest cavities that provided potential nest sites for such species as white-footed mice (*Peromyscus leucopus*), golden mice (*Ochrotomys nuttalli*), and the southern flying squirrel (*Glaucomys volans*). This study was conducted at the Horseshoe Bend Ecology Experimental Site (33°57′N, 83°23′W) located in Clarke County, Georgia. Ten (10) large (mean [137.1 cm ± 25.6 SD] diameter breast-height) water oak (*Quercus nigra*) trees were selected within a one-hectare forest habitat. Tubes measuring three inches (7.6 cm) or six inches (15.2 cm) in diameter and 12 inches (30.5 cm) in length were capped on one end and placed in the field to determine preference of nesting cavity size of small mammals. Artificial nesting material (nonabsorbent cotton) occupied one-half of each tube. The paired cavities were mounted on wooden platforms attached to each tree trunk approximately 5 feet (1.5 m) above ground level. Previous studies demonstrated this height was effective in small mammal capture. Preliminary findings suggest that *P. leucopus* prefer three-inch (7.6-cm) tubular nesting cavities.

OBSERVATIONS ON MASS METAMORPHOSIS BY RIVER FROGS (*RANA HECKSCHERI*) IN SOUTHWEST GEORGIA, Bob Herrington, Georgia Southwestern State University, Americus, GA 31709. Many aspects of the life history of the River frog, *Rana heckscheri*, remain poorly described. River frog tadpoles are among the largest found in North America and typically spend slightly more than a year as larvae before initiating metamorphosis. During May 2008, I was fortunate to observe and quantify the size and weight of transforming froglets from a small permanent pond in Sumter County, Georgia. Emerging froglets were 56.5 + 2.8 mm in SVL and weighed 24.1 + 3.8 grams when collected (N=70). At emergence only 20% had any measurable amount of tail left. Literally thousands of froglets transformed over a five day period and these were most frequently observed and collected from either emerging aquatic vegetation or small areas of bare ground between emerging vegetation. River frog tadpoles have been reported to be distasteful to predators, and based on my observation of lack of increase in vertebrate predation during this mass metamorphosis strongly suggests that at least transforming froglets are also distasteful or noxious to predators.

LEAFHOPPER VIRAL PATHOGENS, Wayne B. Hunter[1], M. Marutani-Hert[1], C.S. Katsar[2], L.E. Hunnicutt[3] and C.A. Powell[4], [1]USDA, ARS, U.S. Horticultural Research Lab, Ft. Pierce, FL 34945, USA, [2]USDA-APHIS-PPQ, 1800 Eller Drive, Suite 414, Fort Lauderdale, FL 33316, [3]North Carolina State University, Raleigh, NC, 27695 and [4]University of Florida, IFAS, Indian River Research and Education Center, Ft. Pierce, FL, 34945. Four newly discovered viral pathogens in leafhoppers have been shown to replicate in sharpshooter leafhoppers; the glassy-winged sharpshooter (GWSS), *Homalodisca vitripennis*, and *Oncometopia nigricans* (Hemiptera: Cicadellidae). The viruses were classified as members of the Reoviridae, Phytoreoviridae, Rhabdoviridae, and Dicistroviridae. Leafhoppers appear to be permissive to RNA viruses (both dsRNA and ssRNA). Of these the viral genome of Homalodisca virus-1 was sequenced, and the path of infection into the leafhopper was determined to be through the midgut tissues. The virus occurs naturally in the wild and has potential as a biological control agent for the management of leafhoppers. Currently viral biological control agents of leafhoppers are lacking. The GWSS is considered the main vector of plant diseases such as Pierce's disease of grapes. But all leafhoppers tested so far have shown the ability to spread the bacterium *Xylella*

fastidiosa, which causes these 'Scorch'-like diseases. These leafhopper-infecting viruses were shown to be infecting field populations of GWSS across several different states from Florida to California. Infected adult GWSS were dissected and examined. Comparative in silico analysis of sequences isolated directly from the salivary glands and midguts showed high levels of the virus in the midgut tissues. Examination by electron microscopy supports the hypothesis that the midgut tissues act as the entry and replication sites for some of the single-stranded RNA viruses. Viruses serve as naturally-occurring biological control agents. Cost/benefit analyses are being conducted on virus mass production and application of leafhopper viruses as a means to reduce the presence and transmission of disease causing pathogens like the bacterium *Xylella fastidiosa*.

HUANGLONGBING AND PSYLLID CELL CULTURES, Wayne B. Hunter, M. Marutani-Hert and D.G. Hall, USDA, ARS, U.S. Horticultural Res. Lab, Ft. Pierce, FL 34945, USA. We successfully established cell cultures of the Asian citrus psyllid *Diaphorina citri* (Psyllidae: Hemiptera), DcHH-1. Studies of the bacterial pathogens associated with Huanglongbing, known as citrus greening disease, have long been impeded by the fact that the bacterium "*Candidatus Liberibacter*" has not yet been successfully cultured under artificial conditions. Reports that "Ca. *Liberibacter asiaticus*" is retained within the psyllid for 12 weeks, suggested a new approach using psyllid cell cultures as the 'living' medium to isolate and culture this bacterium. Several commercially available insect cell culture media were screened for suitability to culture cells from *D. citri* embryos. Successful psyllid cell cultures were obtained using a defined medium referred to as Hert-Hunter-70. Comparison of the successful media to others: [Ex-cell 405 (Sigma), Sf900 III SFM (GIBCO), Schneider's Insect Medium (Sigma), TNM-FH Insect Medium (Sigma), TC100 Insect Medium (Sigma), Shields and Sang M3 Insect Medium (Sigma), IPL-41 Insect Medium (Sigma)] demonstrated that media lacking or insufficient in: KCl, NaHCO3, NaH2PO4, Alanine, L-Cystine, p-Aminobenzioc acid, D-Biotin, D-Calcium pantothenate, Folic Acid, i-Inositol, Nicotic Acid, Pyridoxine, Riboflavin, Thiamine, Fumaric acid, α-Ketoglutaric acid, L-Malic acid and Succinic acid did not support psyllid cell growth. The DcHH-1 cells attached to the substrate, with suspended cells surviving for several months. The doubling time of cells is approximately four days, with passage once every 8-10 days at a temperature of 25°C. The *Diaphorina citri* cell line, DcHH-1, provides a greatly needed research tool which will now be applied to studies of "Ca. Liberibacter"-psyllid cell interactions. These cell cultures also provide a highly controlled system for the study and propagation of psyllid viruses.

ASIAN CITRUS PSYLLID VIRAL PATHOGEN, Wayne B. Hunter[1], M. Marutani-Hert[1], D.G. Hall[1] and C.A. Powell[2], [1]USDA,ARS, U.S. Horticultural Research Lab, Ft. Pierce, FL 34945 and [2]Univ. Florida, IRREC, Ft. Pierce, FL 34945. A newly discovered viral pathogen of Asian citrus psyllid (AsCP), *Diaphorina citri* Kuwayama (Hemiptera: Psyllidae), was classified as a reovirus. The AsCP is an efficient vector of the plant-infecting bacterium ("Candidatus *Liberibacter asiaticus*") associated with the disease Huanglongbing, which has caused extensive economic losses to citrus industries world-wide. We produced an expression library prepared from adult psyllids in search of new pathogens that can be used as biological control agents. We identified viral sequences of 616 bp and 792 bp, each with significant similarity to insect reoviruses. Multiple sequence alignments of predicted Diaphorina citri-Reo1 amino acid sequences resulted in 48% shared identity to RNA polymerase of Nilaparvata lugens reovirus. Multiple sequence alignments of predicted Dc-Reo2 amino acid sequences resulted in a 30% shared identity to segment S2 of the NLRV, and 25% identity to a 'B' spike structural protein- segment 3 of Fiji Disease Virus, 24% identity to segment S2 the Mal de Rio Cuarto virus, 25% identity to P4 protein

of Rice black streaked dwarf virus segment 4 and 20% identity to an unnamed protein product of *Diadromus pulchellus* idnoreovirus 1. To confirm the incidence of psyllids infected by this reovirus, psyllids were collected in the field and assayed for the virus by RT-PCR with Reo2 primers. Psyllids collected from the field (May 2008) were ~55% virus positive. No immediate pathogenic effects were observed in psyllids. Virus acquisition and transmission may be occurring due to a combination of the *D. citiri* feeding behavior and wide host range which overlaps with Reovirus host plants. The virus was also determined to consist of subgenomic strands similar to members of Fijivirus. Phylogenetic and homology comparisons using PAUP 4.0 and NCBI software indicated that the viral sequences were most closely related to Nilaparvata lugens reovirus (Reoviridae: Fijivirus).

ALIENS IN A NEW LAND: HOW DO ASIAN AMBROSIA BEETLES (*XYLEBORUS GLABRATUS*) FIND THEIR HOST?, Juliette T. Jordan*, L.M. Leege, N. Schmidt and A. Hollebone, Georgia Southern University, Statesboro, GA 30460. *Xyleborus glabratus* is an invasive Asian ambrosia beetle native to Japan, India, Taiwan and Myanmar. This beetle vectors the fungus, *Raffaela lauricola*, which causes laurel wilt and consequent mortality of *Perseae borbonia* (redbay) and other trees in Lauraceae. The objectives of this study were to: 1) determine if volatile monoterpenes, produced by redbay and other trees in Lauraceae attract *Xyleborus glabratus* and 2) determine the seasonal activity of *Xyleborus glabratus*. The study was carried out from November 2007 to July 2008 in an Evans County site (Georgia, USA), where nearly all of the redbay trees >3 cm DBH suffer from laurel wilt. Thirty-five, 1.5 m PVC trap posts were set up at 50 meter intervals in a 250 m x 350 m grid and equipped with 22 x 28 cm sticky traps, baited with vials of the experimental monoterpene (eucalyptol, camphor, limonene, linalool, beta pinene and manuka oil; which contains copaene and calamenene). We found that *Xyleborus glabratus* responded positively to 100% eucalyptol with 7.8 times more beetles per trap day than in the ethanol control (F=5.25, P=0.0021). *Xyleborus glabratus* responded negatively to camphor with 2.3 times more beetles per trap day found in the ethanol control than in 30% camphor (F= 2.62, P=0.044). The other monoterpenes tested showed no response from *X. glabratus*. *Xyleborus glabratus* was most active from April to June (F=10.81, P=0.026). Camphor is known to kill termites, mice, fungi and bacteria; this might explain why the beetles responded negatively to camphor.

THE EFFECTS OF WATER COLUMN NO_3 CONCENTRATION ON TISSUE TOTAL N AND δ15N OF EURASIAN WATERMILFOIL, *MYRIOPHYLLUM SPICATUM***, Nicole M. Mastriforte* and Risa A. Cohen, Georgia Southern University, Statesboro, GA 30458. Nitrogen (N) enters aquatic systems from human and natural sources. Stable N isotopes may be used to differentiate among sources that have known isotopic ratios (δ15N). *Myriophyllum spicatum*, an aquatic macrophyte, is known to take up N from the water, and does not discriminate between N isotopes. By exposing *M. spicatum* to different N concentrations with the same δ15N signature, we aimed to assess whether ratios from a source can be detected in the field, and whether concentration affects source determination. In May, 2008, 12 cylinders (mesocosms) were anchored in a pond in Bulloch Co., GA (10 cm deep into sediment, extending 10 cm above water surface), each enclosing 116 L of water. Six plants, (138.0 + 39.6 cm height), were planted in each mesocosm. In July, mesocosms were assigned to one of three treatments: 1) ambient control, 2) 25 µM and 3) 250 µM NO_3. The δ15N of nutrient addition treatments was 30‰. Mesocosms were sampled weekly throughout July; water was analyzed for NO_3 and plant tissue was analyzed for % total N and δ15N. Plants grew 1 cm week-1. Tissue % total N did not reflect water NO_3 concentration. Delta 15N in tissue from the 250 µM treatment was significantly greater than δ15N in control tissue through week 3, but was

not different from tissue in the 25 µM concentration until week 3. These findings suggest a minimum concentration below which δ15N from a source cannot be identified. However, elevated δ15N in the 250 µM treatment relative to controls for three weeks indicates that *M. spicatum* may be useful in detecting N sources to aquatic systems. Funding was provided through a Chandler Scholar Fellowship from Georgia Southern University.

CREATION OF PROTEASE MUTANTS IN *XENORHABDUS NEMATOPHILA***, Tialesha A. Myrick* and Holly E. Dekle* Valdosta State University, Valdosta, GA 31698. Previous published work identified two genes, prt A and prt X, required for protease activity in *X. nematophila*. These genes were identified through transposon mutagenesis. PrtA encodes a metalloprotease which binds zinc and prtX encodes a magnesium binding protein. We are continuing to work on these genes by making prtA and prtX knockout mutants by homologus recombination. A clone consisting of a prtA upstream region, kanamycin (kan), and a prtA downstream region will be made and and verified through sequencing. This plasmid will be delivered into *X. nematophila* where homologous recombination between the plasmid and the chromosome will occur resulting in prtA being replaced by kan. Selection of the *X. nematophila* protease A mutant will occur by plating on kanamycin. The same procedure will be followed for prt X. Both prtA and prtX mutants will be tested for loss of protease activity. These protease mutants will also be tested for insect virulence.

THE CENTRIC DIATOM GENUS *CYCLOTELLA* (STEPHANODISCACEAE, BACILLARIOPHYTA) FROM THE COASTAL WATERS OF GEORGIA, J. A. Nienow[1] and A.K.S.K. Prasad[2], [1]Valdosta State University, Valdosta GA 31698 and [2]Florida State University, Tallahassee FL 32306. Our long-term investigations of the diatom flora of coastal Georgia have revealed a diverse assemblage of species from the centric diatom genus *Cyclotella* (Kützing) Brébisson. This distinctive genus is characterized by a marginal alveolate-striated area, a central area devoid of striae, and a ring of fultoportulae interrupted by a single rimoportula on the valve mantle. It has long been considered a predominately freshwater genus, but recent studies have greatly increased the number of recognized marine forms. Here we report on our observations of the marine species *Cyclotella baltica* Håkansson, *C. choctawhatcheeana* Prasad, *C. litoralis* Lange & Syvertsen, *C. striata* (Kützing) Grunow, *C. stylorum Brightwell*, and a taxon not previously described. In light microscopy, the new taxon is similar in size and structure to *C. stylorum*, with a colliculate and tangentially undulate central region and with marginal fultaportulae located on recessed costae within marginal chambers. However, the orientation of the marginal fultaportulae differs--internally, the tubes form an alternating up/down pattern, while externally, the openings of the fultaportulae form an irregular zigzag pattern of openings on the valve mantle. In addition, there are numerous, 8 - 80, valve face fultoportulae, scattered on both parts of the undulation, visible in light microscopy as bright punctae.

Section II: Chemistry
Science Center, Room 233
Glenn Nomura, Presiding

8:30 SILVER-IMPREGNATED ALUMINA AS AN ANTIMICROBIAL AGENT**, Gemeia Cameron*[1], David Collart[1], Eric Mintz[2], Olivier Katembo*[2], Conrad Ingram[2] and Godwin Ananaba[1], [1]Department of Biological Sciences, Clark Atlanta University, Atlanta, GA 30134 and [2]Chemistry Department, Clark Atlanta University, Atlanta, GA

30134. The recognition of the anti-microbial activity of oligodynamic metals such as silver has been a basis for the development of many anti-microbial processes and products. More specifically, silver and silver salts have been widely employed, particularly in water disinfection. Nano-sized silver particles have numerous commercial applications, including disinfection of water, food processing and disinfection of healthcare equipment. In *Escherichia coli* (*E. coli*), which are vulnerable to silver, it has been suggested that the lipopolysaccharides on their surface contain high affinity binding sites for divalent cations. It has been shown that silver interacts with the cell membranes of bacteria, which alters their mesosomal functions, such as their ability to aid DNA replication. The nature of the bactericidal activity of silver and even more specifically silver-impregnated alumina, its mechanistic details, and properties that influence disinfection are poorly understood. However, we hypothesize that silver in complex with alumina destroys bacteria by oxidation of the plasma membrane and inhibition of its energy metabolism. To study this hypothesis, we exposed *E. coli* to various concentrations of metallic silver, impregnated on the surface of alumina and determined its effects in compromising cellular integrity and disrupting cellular processes. Our studies reveal that increasing the concentration of silver-impregnated alumina results in a decrease in bacteria viability. This study suggests that silver's ability to kill bacteria is dose dependent. Also, this study suggests silver adsorption upon contact with bacteria. The results of our studies show that silver-impregnated alumina is an effective anti-microbial reagent. Based on this data, we believe that this novel silver anti-microbial reagent is an adequate and cost-effective medium that could be used to improve water quality. (This project was supported by NSF Grant # CTS-0120978, Water CAMPWS, and NIH Grant #GM08247.)

8:45 PHOTOCHEMICAL ANALYSIS OF SUBSTITUTED TETRAPHENYL PORPHYRIN DYES: TETRA AND PENTAFLUOROPHENYL SUBSTITUTION**, Adegboye Adeyemo[1], Nneamaka Enweani*[2], Zachary Gardner*[2], Donovan Tucker*[2] and James LoBue[2], [1]Savannah State University Department of Natural Science and Mathematics, Savannah, GA 31404 and [2]Department of Chemistry, Georgia Southern University, Statesboro, GA 30460. Previous work in this laboratory involved the measurement of the luminescence quantum yield of a trifluorinated tetraphenyl porphyrin against cresyl violet. Photolysis at 488 nm involving the photodestruction of diphenyl anthracene via energy transfer from the trifluorinated tetraphenyl porphyrin was also measured by comparison with methylene blue. Work described here will include similar measurements on 2,3,5,6 tetrafluoro tetraphenyl porphyrin and 2,3,4,5,6 pentafluoro tetraphenyl porphyrin. All dye solutions were dissolved in chloroform. Photolysis was monitored by UV-Vis spectrophotometry using a Shimadzu 2401 PC spectrometer. The photolysis light source was a Coherent Innova 90 Argon Ion laser. Fluorescence was measured using an ISS Phase Modulated Spectrofluorometer.

9:00 **Break**

9:15 PHOTOCHEMICAL ANALYSIS OF SUBSTITUTED TETRAPHENYL PORPHYRIN DYES: DIFLUOROPHENYL SUBSTITUTION**, Adegboye Adeyemo[1], Nneamaka Enweani*[2], Zachary Gardner*[2], Donovan Tucker*[2] and James LoBue[2], [1]Savannah State University Department of Natural Science and Mathematics, Savannah, GA 31404 and [2]Department of Chemistry, Georgia Southern University, Statesboro, GA 30460. Previous work in this laboratory involved the measurement of the luminescence quantum yield of a trifluorinated tetraphenyl porphyrin against cresyl violet. Photolysis at 488 nm involving the photodestruction of diphenyl anthracene via energy transfer from the trifluorinated tetraphenyl porphyrin was also measured by comparison with methylene

blue. Work described here will include similar measurements on four difluoro tetraphenyl porphyrin derivatives. All dye solutions were dissolved in chloroform. Photolysis was monitored by UV-Vis spectrophotometry using a Shimadzu 2401 PC spectrometer. The photolysis light source was a Coherent Innova 90 Argon Ion laser. Fluorescence was measured using an ISS Phase Modulated Spectrofluorometer.

9:30 DIELS ALDER REACTION IN WATER, Morgan Price and Nripendra Bose, Spelman College, Atlanta GA. Organic compounds are not favored to react in water due to their low solubility. However, there have been recent developments and findings that water can be a viable solvent used in organic synthesis. We want to explore the option of using water as a solvent because of its eco-friendly behavior. Exclusively, our interest is exploring a Diels-Alder reaction of furan and maleic anhydride in water. The optimum conditions and further details of the reaction will be explained.

9:45 LEWIS ACID AND BRONSTEAD ACID AS CATALYSTS FOR ORGANIC REACTIONS IN WATER, Shinelle Caldwell and Nripendra Bose, Spelman College, Atlanta GA. The low solubility of organic compounds in water has hindered the use of water in organic synthesis. However, the advantages of using water as a solvent in organic synthesis are significant because water is environmental friendly. We are exploring the possibilities of using water as a solvent for green organic synthesis. Lewis acid and Bronstead acid surfactants will be used to check the efficiency of water as a solvent for organic synthesis. The use of water as an organic solvent will be discussed in detail.

10:00 **Section business meeting**

10:45 SYNTHESIS OF IMINES, ENAMINES AND OXIMES CATALYZED BY SILICA, Jasmine Peterson*, Rajiv Villait, Jana Patton, Rebecca Aszman and John T. Barbas, Valdosta State University, Valdosta, GA 31698. Imines were synthesized in a facile reaction between primary amines and aldehyes or ketones, catalyzed by activated silica gel. No other acidic catalysts were utilized. Typically, 2 g of activated silica were added to a round bottomed flask equipped with a drying tube, followed with 20 mL of dry ether or other solvent. While stirring, equimolar amounts (2.0x10-3 mol) of the amine and the aldehyde or ketone were added. The mixture was stirred for half an hour. It was then filtered, and the silica washed twice with 20 mL portions of ether. The ether was removed under vacuum leaving behind the pure imines. Oximes were synthesized in the same way using aldehydes or ketones and hydroxylamine. Enamines were synthesized using aldehydes or ketones and secondary amines. The reactions took place equally well in the presence of dry silica alone with no solvent present and the yields were quantitative. This procedure is simple, goes to completion, is environmentally friendly, and requires no heating or harsh acidic catalysts. Analysis was done by GC-MS, proton and C-13 NMR and by IR.

11:00 PHOTOCHEMICAL ANALYSIS OF SUBSTITUTED TETRAPHENYL PORPHYRIN DYES: DIFLUOROPHENYL SUBSTITUTION**, Adegboye Adeyemo[1], Nneamaka Enweani*[2], Zachary Gardner*[2], Donovan Tucker*[2] and James LoBue[2], [1]Savannah State University Department of Natural Science and Mathematics, Savannah, GA 31404 and [2]Department of Chemistry, Georgia Southern University, Statesboro, GA 30460. Previous work in this laboratory involved the measurement of the luminescence quantum yield of a trifluorinated tetraphenyl porphyrin against cresyl violet. Photolysis at 488 nm involving the photodestruction of diphenyl anthracene via energy transfer from the trifluorinated tetraphenyl porphyrin was also measured by comparison with methylene

blue. Work described here will include similar measurements on four difluoro tetraphenyl porphyrin derivatives. All dye solutions were dissolved in chloroform. Photolysis was monitored by UV-Vis spectrophotometry using a Shimadzu 2401 PC spectrometer. The photolysis light source was a Coherent Innova 90 Argon Ion laser. Fluorescence was measured using an ISS Phase Modulated Spectrofluorometer.

11:15 PHOTOCHEMICAL ANALYSIS OF SUBSTITUTED TETRAPHENYL PORPHYRIN DYES: TETRA AND PENTAFLUOROPHENYL SUBSTITUTION**, Adegboye Adeyemo[1], Nneamaka Enweani*[2], Zachary Gardner*[2], Donovan Tucker*[2] and James LoBue[2], [1]Savannah State University Department of Natural Science and Mathematics, Savannah, GA 31404 and [2]Department of Chemistry, Georgia Southern University, Statesboro, GA 30460. Previous work in this laboratory involved the measurement of the luminescence quantum yield of a trifluorinated tetraphenyl porphyrin against cresyl violet. Photolysis at 488 nm involving the photodestruction of diphenyl anthracene via energy transfer from the trifluorinated tetraphenyl porphyrin was also measured by comparison with methylene blue. Work described here will include similar measurements on 2,3,5,6 tetrafluoro tetraphenyl porphyrin and 2,3,4,5,6 pentafluoro tetraphenyl porphyrin. All dye solutions were dissolved in chloroform. Photolysis was monitored by UV-Vis spectrophotometry using a Shimadzu 2401 PC spectrometer. The photolysis light source was a Coherent Innova 90 Argon Ion laser. Fluorescence was measured using an ISS Phase Modulated Spectrofluorometer.

11:30 DIELS GROUP-III NITRIDE SEMICONDUCTORS**, Jayla Subramanian, Spelman College, Atlanta, GA 30314. The formation of dimers of group-III materials were studied by theoretical methods. Their molecular structures, energies, and vibrational frequencies were determined using density functional theory and effective core pseudo potentials. Group-III materials are used as source materials to make group-III nitride semiconductors, such as InN, GaN and AlN. These materials have very high frequencies at high powers and high temperatures which makes them excellent for the creation of optical communication devices. The optical devices can range from the ultraviolet to the infrared region of the spectrum. In particular, InN has the lowest effective electron mass, and therefore exhibits an extremely high electron peak drift velocity at room temperature. Certain InN films have shown band gaps of 0.65V to 0.9V, a breakthrough in the production of III-nitride semiconductor for electronic devices. The advantage gained by the high frequency is that InN may be used in centimeter to nanomillimeter wave devices. Furthermore, using InN is very environmentally friendly, since no harmful toxins or poisons are produced or given off from it.

POSTERS

PROTEIN MODELING STUDIES TO IDENTIFY AND ANALYZE TARGET AMINO ACIDS RESIDUES FOR SITE-DIRECTED MUTAGENESIS STUDIES TO INCREASE THE DECARBOXYLASE ACTIVITY OF OXALATE OXIDASE FROM HORDEUM VULGARE, Crystal Bruce* and Ellen W. Moomaw, Gainesville State College, Oakwood, GA 30566. In this work, we employed the tools of molecular modeling (Deep View – Swiss pdb Viewer) to select appropriate amino acid residues in barley oxalate oxidase to mutate in order to increase the oxalate decarboxylase activity of the oxidase enzyme. Through structural comparisons of Hordeum vulgare oxalate oxidase (PDB code: 2ET1) and Bacillus subtilis oxalate decarboxylase (PDB code: 1UW8), we have selected and analyzed 8 second shell amino acid residues as targets for site-directed mutagenesis. These mutations

seek to provide the proton donor necessary in the proposed reaction mechanism for decarboxyation. Our results indicate that while all eight analyzed residues are reasonable targets for site-directed mutagenesis studies, the V151E mutant mimics the active site geometry of OxDC best.

CATION BINDINGS ON ATP BASE – A NMR STUDY OF 2D 1H-15N-HMBC SPECTRA, Zhiyan Song*, Kari J. Parker and Idorenyin Enoh, Department of Natural Sciences and Mathematics, Savannah State University, Savannah, GA 31404. Cation interactions with nucleotide ATP are essential for regulating ATP structural stability and biological function. While cation bindings on nucleotide phosphates are well established by 31P NMR analysis, here we apply 1H-15N HMBC pulse sequence to characterize binding of cations (Zn^{2+}, Ca^{2+}, Li^{+} etc) on ATP base. This NMR technique has great advantage in sensitive enhancement, thus makes it possible to acquire and process the weak signals from very-diluted 15N nuclear spins in regular ATP samples. The well-resolved 1H-15N two-dimensional spectra show four correlation peaks ($N\tilde{1}H2$, $N\tilde{3}H2$, $N\tilde{7}H8$, $N\tilde{9}H8$). Chemical shift changes of these peaks at varied cation species and pH indicate that Zn^{2+}, Ca^{2+} and Li^{+} are all capable of binding to N1 position of ATP base at lower pH (2-5), with maximum binding around pH 3-4. However, only Zn^{2+} shows significant binding to N7, concurrently with its binding on ATP phosphate groups. Such binding difference may have significant impact on ATP structure and hydrolysis rate.

VITAMIN C CONCENTRATION, SYNERESIS, AND CONSUMER PERCEPTIONS OF A FERMENTED DAIRY PRODUCT UPON FORTIFICATION WITH CUCUMBER AND RASPBERRY**, Ann C. Onyenwoke*, Joelle E. Romanchik-Cerpovicz, Laura D. Frost and Helen M. Graf, Georgia Southern University, Statesboro, GA 30460. Yogurt, buttermilk, and other fermented probiotic dairy products are good sources of calcium. Complementing the nutritional value of these products, cucumbers and raspberries contain vitamin C, a nutrient noted for its antioxidant properties and potential role in the prevention of chronic diseases such as cancer and cardiovascular disease. The purpose of this study is to fortify a fermented dairy product with a 50% (w/w) cucumber/raspberry puree to naturally increase vitamin C in the product while retaining textural quality and consumer acceptability. Low-fat fresh and dry milk, sugar, yogurt culture, and either 10 or 50% pureed cucumber/raspberry mixture (w/w) (replacing an equal amount of distilled water in the controls) are combined and fermented (8h, 50°C) prior to analysis. Following extraction, vitamin C concentration in the fermented products is quantified spectrophotometrically by the 2,4-dinitrophenylhydrazine method. Syneresis will be measured to evaluate textural quality while 100 consumers will evaluate color, odor, creaminess, flavor, aftertaste, and overall acceptability of the fermented dairy products using a hedonic scale (9=like extremely, 5=neither like nor dislike, 1=dislike extremely). The results and implications of these analyses will be discussed. This study is funded in part by a grant from the Georgia Southern University Honors Program.

A STRUCTURAL COMPARISON OF A PUTATIVE ACYL-COA THIOESTERASE FROM XANTHOMONAS CAMPESTRIS (XC229) AND A KNOWN THIOESTERASE (4-HYDROXYBENZOYL-COA) FROM PSEUDOMONAS SP(PSHTE)**, Saswat Panda*[1] and Ellen W. Moomaw[2], [1]Flowery Branch High School, Flowery Branch, GA 30542 and [2]Gainesville State College, Oakwood, GA 30566. In this work, we employ the tools of molecular modeling (Deep View - Swiss pdb Viewer) to compare and contrast the structure of XC229 (PDB code: 2fuj) with that of 4-hydroxybenzoyl-CoA thioesterase (PDB code: 1bvq). Our aim with this with study is twofold: 1) to learn about structure-function

relationships in enzymes/proteins in general and 2) to form a hypothesis as to whether or not XC299 is in fact an acyl-CoA thioesterase. Our observations include the following: 1) XC229 superimposes globally with a good fit to with PsHTE, 2) Sequence alignment of XC299 with PsHTE show a significant degree of homology, and 3) The putative active site residues of XC299 and PsHTE overlay well indicating similar active site geometries.

HOMOLOGY MODELING OF *CERIPORIOPSIS SUBVERMISPORA* OXALATE OXIDASE, Nathan Ray* and Ellen W. Moomaw, Gainesville State College, Oakwood, GA 30566. Oxalate oxidase from *Ceriporiopsis subvermispora* (CVO_xO_x) has recently been cloned and sequenced. Sequence analysis revealed that the sequence of CVO_xO_x more closely resembles that of oxalate decarbolylases than that of known oxalate oxidases. In this work we describe building a homology model based on the available sequence information and the available structural information of *Bacillus subtilis* oxalate decarboxylase (O_xDC, PDB code: 1uw8) and make observations about the inferred structure of CVO_xO_x. Molecular modeling of CVO_xO_x has allowed us to conclude that the manganese-binding site(s) is the site of catalysis. This model allows us to further explore how the very similar structures of CVO_xO_x and Bacillus subtilis O_xDC carry out such different reactions with the same substrate. This question has broad implications for how protein environment modulates chemical reactivity.

THERMODYNAMICS AND SEMICONDUCTORS**, Asia S. Jackson, Spelman College, Atlanta, GA 30314. The present theoretical study predicts the equilibrium distribution of species from the dissociation of trimethylindium [TMI = $In(CH_3)_3$] and ammonia (NH_3), under high temperatures and pressures. The temperature range considered is 500 K to 1200 K, and the pressure range is 1 atm to 100 atm. The predictions are based on calculated thermodynamic properties that have been obtained using quantum mechanical calculations and statistical thermodynamics. The experimental laboratory with whom this computational group collaborates produces indium nitride (InN) films in a high-pressure chemical-vapor-deposition reactor, using TMI and NH_3 as source materials. InN was originally obtained in the 1900s, from $InF_6(NH_4)_3$ and its crystal structure was resolved. InN has been later produced as InN film by the growth techniques of metal-organic vapor phase epitaxy (MOVPE) and metal-organic molecular beam epitaxy (MBE). In MOVPE, TMI is usually reacted with NH_3 in the presence of nitrogen gas (N_2). The key issue in the MBE experiment is to obtain an adequate nitrogen source; to obtain atomic reactive nitrogen, the N_2 molecules are dissociated by radio-frequency-plasma or electron cyclotron resonance method. During the last ten years, there have been many significant improvements in the growth of group III-nitride semiconductors. Specifically, there has been considerable interest in InN because it has the lowest effective mass for free electrons among all the group III nitride semiconductors. This characteristic leads to electron high mobility and high saturation velocity. InN also exhibits an extremely high peak drift velocity at room temperature, and achieves the highest steady-state peak velocity among all group III-nitrides. Overall, InN proves to be the best group III-nitride for electrical applications.

TANDEM MASS SPECTROMETRIC FRAGMENTATION OF ERYTHROMYCIN BY DIRECT INSERTION PROBE: A STUDY OF M/Z 158 PRECURSORS, Sarat Mohammed,* Yassin Jeilani and Victor Ibeanusi, Spelman College, Environmental Science and Studies. Collision induced dissociation of Erythromycin was studied by triple quadrupole mass spectrometry using direct insertion probe. Full scan spectrum of erythromycin typically shows a major peak at m/z 158 assigned as the amino sugar moiety of erythromycin. We were interested to identify all fragments that dissociate to give m/z 158. Precursor ion

scanning was performed by setting the first quadrupole to scan a specified mass range and the third quadrupole was set to scan m/z 158 while the second quadrupole was used as a collision cell. Precursor ion scanning of m/z 158 showed multiple peaks therefore suggesting a multi-pathway fragmentation mechanism. These peaks were further studied by product ion scanning. The $[M^+H]^+$,$[M^+H\text{-}H_2O]^+$ and m/z 558 peaks were among the precursors of m/z 158. A key step in the fragmentation pathway involves elimination of water from $[M^+H]^+$ to yield a protonated erythromycin enol ether at 716 m/z that eventually yields m/z 558 and 158. Based on the CID data, we propose a multipathway fragmentation mechanism for erythromycin to give m/z 158.

Section III: Earth & Atmospheric Sciences
Science Center, Room 134
Donald Thieme, Presiding

8:30 EXPLORING ALGAL MORPHOLOGY DURING EARLY DECOMPOSITION: CONNECTIONS TO ANCIENT ORGANIC REMAINS**, Ashley Manning* and Julie Bartley, University of West Georgia, Carrollton, GA 30118. The early fossil record consists entirely of microbial fossils, the first of which were unicellular and filamentous bacteria. During the Proterozoic, the record additionally contains single-celled planktonic eukaryotes (acritarchs), dominantly preserved in shales and a few macroscopic remains. The relatively simple morphology of these fossils makes them difficult to identify reliably and, particularly, to connect these remains to extant taxonomic groups. Furthermore, it is difficult to know whether preserved features reflect taxonomy or are instead due to taphonomic processes. Taphonomic alternation may be responsible for creating the morphotypes seen, leaving the original taxonomy unrecognizable. In this project, we are observing morphological features that are preserved or created during early post-mortem decomposition of modern megascopic algae. In this experiment, we aim to connect specific features observed in these modern algae to structures seen in ancient meso- and macroscopic algal remains, such as *Grypania*, *Chuaria*, and ancient organic films. In making these observations, we will identify specific processes that might have produced ancient features such as folding, rolling, or ultrastructural alteration and connect these to specific taxonomic groups.

8:45 INVESTIGATION OF METAMORPHIC CONDITIONS ASSOCIATED WITH THE GROWTH OF CENTIMETER-SCALE GARNET PORPHYROBLASTS AT THE GARNET HILL LOCALITY, WEST-CENTRAL GEORGIA**, Nelson Spratt IV* and C.A. Berg, University of West Georgia, Carrollton, GA 30118. Samples collected from the Garnet Hill locality contain idiomorphic garnet porphyroblasts up to two centimeters in diameter that have grown in a fine-grained phyllitic matrix. This study is a preliminary assessment of the metamorphic conditions associated with the development of this texture, and an investigation of how changes in pressure, temperature, fluid composition, and/or deformation during garnet growth may be manifested in the internal textures and chemical zoning of these porphyroblasts. Thin-sections cut approximately through the centers of the large garnet porphyroblasts were oriented orthogonal to the dominant matrix foliation, and either parallel or orthogonal to the weakly-developed mineral stretching lineation in these samples in order to identify metamorphic mineral assemblages and deformational fabrics preserved in the matrix and within the garnet porphyroblasts themselves. Analysis on the SEM-EDS instrument at UWG will identify important accessory phases and microscopic inclusions and to determine the spatial distribution of

inclusion assemblages. Chemical mapping using the SEM-EDS provides preliminary data on garnet chemistry and internal chemical zonation. Crystallographic orientation of subcrystals within the garnet porphyroblasts, the degree of development of low-energy grain boundaries, and deformational fabrics preserved within the matrix will be examined using electron backscatter diffraction (EBSD) mapping.

9:00 PRELIMINARY RESULTS FROM HIGH-RESOLUTION MAGNETIC SURVEY OVER LARAMIDE AND BASIN AND RANGE STRUCTURE, BIG BEND NATIONAL PARK, TEXAS, John Allison*, C. Parham* and C. Poppeliers, Augusta State University, Augusta, GA 30904. We present results of a ground-based magnetic survey of two Tertiary-aged intrusions in the northern portions of Big Bend National Park, TX. Ongoing field mapping of Cretaceous sedimentary rocks has identified numerous intrusions that appear to be cross cut by Laramide and post-Laramide deformation in the South Persimmon Gap Laccolith (SPGL) and Dagger Mountain areas. We use the results of several magnetic profiles to test hypothesis about fault/fold timing based on cross cutting relationships of these structures with the intrusions. The SPGL is crosscut by at least two NW-trending high-angle faults. Stratigraphic relationships suggest that the SPGL may be cross-cut by a large, Basin and Range normal fault to the east of the main outcrop, however, alluvium prevents direct observation. Pending isotopic age-dating of the intrusive rocks as well as modeled subsurface structure of the intrusions help to constrain the age and extent of faulting and folding in this area. Dagger Mountain is a large map-scale anticline south of the Dog Canyon area. Previous work suggests that the topographic expression of Dagger Mountain is due to purely structure deformation of the Cretaceous-aged rocks. However, an alternate hypothesis is that Dagger Mountain is cored by a map-scale intrusion of Tertiary-aged rocks similar to those seen in nearby outcrops. Two magnetic profiles help to support the latter hypothesis.

9:15 MINERALOGY AND CRYSTALLIZATION SEQUENCE OF INCLUSIONS WITHIN TOPAZ CRYSTALS OF THE TOPAZ BEARING RHYOLITE OF TOPAZ MOUTNAIN, JUAB COUNTY, UTAH,** Kimberly E. Cook* and Curtis L. Hollabaugh, Department of Geosciences, University of West Georgia, Carrollton, GA 30118. Topaz Mountain located in the Thomas Range of Juab County, Utah contains extensive F-rich rhyolite lava flows formed approximately 6.5 million years ago. The flow banding of the rhyolite provided pathways for the transportation of vapors and the crystallization of vapor phase minerals within vugs located along the distinctive bands. Over the years, several specimens were collected for the purpose of research at UWG. From the samples several topaz crystals were collected and analyzed. A series of orthogonal thin sections were created, examined under a polarizing microscope for initial mineral identification and then placed on a scanning electron microscope to create an elemental map of the inclusions within the topaz. Inclusions found within the topaz include quartz, bixbyite, and psuedobrookite. We hypothesize that a correlation exists between the crystallization of quartz and bixbyite. We plan to obtain a quantitative x-ray diffraction using the reference intensity ratio method (RIM) to identify elemental compositions of the minerals in question, and create additional thin sections of topaz crystals in an attempt to verify this correlation.

9:30 EVIDENCE FOR DEEP EVAPORATION WITHIN SAND DUNES AND THE INABILITY OF NORMAL PRECIPITATION EVENTS TO RECHARGE GROUNDWATER AT THE GREAT SAND DUNES NATIONAL PARK & PRESERVE IN COLORADO, Dion Stewart[1] and Andrew Valdez[2], [1]Georgia Perimeter College, Atlanta, GA 30338 and [2]Great Sand Dunes National Park and Preserve, Mosca, CO 81146. A

1,000,000 cm^3 volume of water covering an area of 9.3 m^2 was forced to uniformly infiltrate an active sand dune over a 24-hour period. The infiltration of this non-saturated water slug, which simulated a maximum 11cm. precipitation event, was monitored for seven days by a chain of buried moisture sensors at depths of 0.2 m., 0.5 m., 1.2 m., 2.75 m. and 4.3 m. within a dune where the water table was approximately 10 m. below the surface. A 3 by 3 meter array of melting ice, centered over the sensor chain, generated this evenly distributed slug of infiltration water, allowing the sensors to experience no lateral outflow to a depth of 2.75 m., and the deepest sensor should receive 92% of the initial water if infiltration losses were due solely to lateral flow. The hydraulic conductivity varied from a maximum of 1.4 m/day near the surface to 1.0 m/day at a depth of 1.2 m., well below the saturated value of 10 m/day. This slug of soil moisture was funicular in nature, coexisting with air in the pores during its movement through the vadose zone. The passage of this slug of soil moisture showed a 30% decline in soil moisture between 0.2 m and 0.5 m. and an additional 30% decline between 0.5 m and 1.2 m. The slug of infiltrating water was never recorded by the 4.3 m. sensor. The results indicate that evaporation of pendular water occurs at depths greater than 3 meters within the dunes and that infiltration from normal precipitation events will not reach the water table. The source of pendular water in the vadose may relate to evaporation at the shallow water table.

9:45 CREATING A HISTORICAL STORM SURGE DATA WEB SITE, Andrew J. Maloof* and Rochelle F. Legaspi*, University of West Georgia, Carrollton, GA. Researchers of hurricane impacts often encounter roadblocks when trying to evaluate storm surge history. The National Hurricane Center's Tropical Cyclone Reports contain comprehensive information on each storm, including synoptic history, meteorological statistics, casualties and damages, and the post-analysis best track (six-hourly positions and intensities) dating back only to 1958. Federal agencies, private companies, and academic institutions have unpublished reports for some storms but not for all; and especially not for older hurricanes. Access to reports is difficult, and even for archived storms the data is often sketchy at best. For early hurricanes a combination of lack of understanding of the importance, lack of reliable surveying devices, and the overwhelming need to concentrate on rescue and recovery efforts probably led to poor storm surge data. For more recent hurricanes, very precise storm surge measurements are available, but often there are not enough of them or they are in error. A georeferenced database is being created of all storm surge measurements in the southeastern United States. All data are evaluated for quality, methodology, and usefulness for scientific inquiry. Links are established to reports, photos, and other pertinent documents. It is hoped that the database will provide the basis for statistical evaluation of the various factors impacting coastal storm surge. In addition, it will be a critical resource for numerical modelers who are in need of such data for model calibration and verification of predictive coastal flooding models. The web site is undergoing constant updating. The web address is www.stormsurgedatabase.org.

10:00 **Section business meeting**

10:30 HISTORICAL CHANGES OF GOULDS INLET, GEORGIA, FROM GEOSPATIAL ANALYSIS OF AERIAL PHOTOGRAPHS, Rochelle Petruccelli*, University of West Georgia, Carrollton, GA 30118. Goulds Inlet is a relatively small Georgia inlet running between St. Simons and Sea Islands. Typically, inlet dynamics cause adjacent shorelines to experience varying degrees of erosion and accretion as hydrographic conditions vary seasonally or at longer temporal scales. Goulds Inlet, though seemingly stable, has historically migrated south, hugging the St. Simons shoreline, allowing the Sea Island

spit to follow suit, building out towards the south. The relative persistence of the channel against St. Simons Island creates shoreline accretion/erosion processes driven by complex linkages between the movements of the ebb channel, asymmetry of the ebb-tidal delta, and migration of the swash bars. Georectified aerial photos of the study area spanning roughly sixty years (1942-2003) were used within ArcGIS to delineate the high-water line (HWL) shoreline, ebb delta shoals, and the middle of the inlet channel and stored as shapefiles. Measurements of spatial and temporal changes of these features were performed within ArcGIS using ArcToolbox and in-house scripts. Preliminary results of the shoreline change analyses suggest net long-term accretion along the adjacent shorelines. However, a small segment on the St. Simon's inlet shoulder was identified that has net long-term erosion (~ -1.5 m/yr). This portion of the shoreline appears to be less influenced by the ebb delta morphology and more so with the position ebb channel's thalweg and periodic advance and retreat of the Sea Island spit. A few hundred meters south of this shoreline segment, net accretion is occurring along a "bulge" in the shoreline associated with inlet swash bar welding. Cursory inspection of the aerial photos suggests the shoreline position along this region also tends to fluctuate in response to the movement/orientation of the ebb channel and changes in ebb delta symmetry (~ +1 to 7 m/yr). More aerial photos and historical maps are being added to the GIS database to better ascertain long and short-term trends.

10:45 CONTAMINANT TRENDS IN LAKE CORE SEDIMENTS OF LAKE PALMER AND LAKE HARRIET, MINNEAPOLIS, MN, Ellie L. Busse*, USGS Austin, TX 78754. Lake coring and paleolimnology have been used to better understand how water quality has changed within watersheds. This project focused on two lakes in Minneapolis, MN: Lake Palmer and Lake Harriet. Each lake has very different land usages and urban development impacting its watershed. Lake Palmer is composed of two lobes, referred to as the east and west lobe. The east lobe has a pristine watershed with no urban development; this lobe represents a "reference" lake. In contrast, the watershed of the west lobe has undergone rapid urban sprawl over the past 50 years, representing "new urban." Lake Harriet was urbanized in the early 20th century; this watershed represents "old urban". The two lakes are used in this study to compare the impact of different amounts and timing of urbanization. Lake cores were retrieved from Lake Harriet and both lobes of Lake Palmer in 1997. The deposited sediment was analyzed for organochlorine compounds (OCs), metals, radionuclides, and polycyclic aromatic hydrocarbons (PAHs) to investigate trends with land use and urbanization. The results demonstrate that water quality in Lake Harriet and the west lobe of Lake Palmer have been impacted by urban growth. Levels of DDT, PCBs, and lead increased with urbanization. The decrease in concentrations resulted from bans on leaded gasoline and use of DDT and PCBs. In contrast, concentrations of metals and chemicals in the east lobe of Palmer are low and unchanging, correlating to the lack of urbanization in the watershed.

11:00 CONTAMINATION POTENTIAL FOR CAVES IN THE SUWANNEE RIVER BASIN, FLORIDA**, Krystalynn Batts*, Valdosta State University, Valdosta, GA 31698. The Floridan Aquifer is one of the largest aquifers in the world making it a very valuable resource. The potential for contamination of this karstic aquifer is a study of great importance. The goal of this project is to analyze the vulnerability of caves in the Suwannee River Basin to various pollutants. Many potential means of contamination will be examined throughout this project. Land use practices, and distances from hazardous material and superfund sites have been evaluated using GIS in order to help determine the individual cave susceptibility. The depth to the cave is also being evaluated using GIS

in order to help determine the vulnerability to contamination.

11:15 SPATIAL AND TEMPORAL CHANGES OF WETLAND AREAS IN THE COASTAL PLAINS REGION**, GA, John Ray*, Valdosta State University, Valdosta, GA 31698. Wetlands during the time periods of 1974, 1985, 1991, and 2001 are spatially analyzed through GIS (Geographic Information System) to determine the loss in wetlands. Areas of lost wetlands were further analyzed to determine the replacing land cover and percentages of land use/land cover taken over the wetlands are obtained. GIS was also used to analyze fragmentation of wetlands during this time period.

11:30 CONSTRUCTED WETLANDS: AN INVESTIGATION OF FILTRATION QUALITY AND EFFICIENCY**, Cameron G. Wolfe* and Curtis L Hollabaugh, Department of Geosciences, University of West Georgia, Carrollton, GA 30118. The United States Fish and Wildlife Service estimated in 2004 that there are 107.7 million acres of wetlands in the continental United States. The majority of these wetlands serve only as wildlife refuges, green space and unwanted areas for urbanization. Technologies utilizing wetlands as groundwater filters are becoming more prevalent outdating the process of land application of treated sewage. Constructed wetlands manufactured primarily to filter treated sewage also become natural habitats, green spaces and wildlife refuges for communities. Wetland sewage reclamation facilities are extremely versatile, able to service a small community of ten or less homes or able to provide enough drinking water for a county with a population over 250,000 several systems of constructed wetlands. As constructed wetlands become a more prominent treated sewage filtration system research must be done to improve filtration quality and efficiency. A model will be created designed after a small scale, freshwater constructed wetland and will be used for testing multiple parameters affecting the filtration quality and efficiency. The variables to be tested include grain size, roundness, soil type, and plants.

11:45 EVALUATION OF PROPOSED LONG-TERM SOLUTIONS FOR FUTURE GEORGIA DROUGHTS, Curtis L. Hollabaugh, University of West Georgia, Carrollton, GA 30118. Proposed long-term solutions for droughts during 2010 to 2050 include conservation/rain water harvesting, sewage to wetland to drinking water supply, well fields, local reservoirs, redefinition of Lake Lanier as a drinking water reservoir and West Point Lake as supply reservoir for lower Chattahoochee River, and aqueducts from Tennessee and Savannah Rivers to metro Atlanta. Each proposed solution is evaluated on a 0 to 10 scale with 0 least support and 10 maximum support. The evaluation is based on seven factors: (1) environmental issues, (2) effectiveness, (3) time required for implementation, (4) cost, and state support from (5) Georgia, (6) Alabama and (7) Florida. A perfect favorable score would be 70. It is proposed that water conservation coupled with small scale rain water harvesting has the highest score of 60. It is considered that resistance to conservation within Georgia is because of lack of its perceived effectiveness and need for more reservoirs. The least favorable (25) solution is the aqueduct plan to purchase and transport water from the Tennessee River near Chattanooga, Tennessee to metro Atlanta and water from the Savannah River to Athens, Georgia. Such a plan would have high environmental problems, be very expensive, take decades to complete, and require cooperation of Tennessee and South Carolina. Redefinitions of Lake Lanier (41) and West Point Lake (26) have unfavorable evaluation because of state opposition, the long time that would be required, and the uncertainty of the environmental effect.

Posters

RIDGE AND SWALE MICROTOPOGRAPHY IN THE ST. JOSEPH'S BAY STATE BUFFER PRESERVE**, Antonio Cano* and Donald M. Thieme, Valdosta State University, Valdosta, GA 31698. The St. Joseph's Bay State Buffer Preserve occupies over 50,000 km2 on several parcels of land in Gulf County, Florida. Ridge and swale features were mapped in the field at two very different locations within the preserve. The first location is along the bayshore south of the preserve office where the local relief is less than 70 cm and the land surface has been modified by construction of County Road 30A and private homes. The other field location was along the bayshore at Richardson Hammock on St. Joseph's Peninsula. Local relief there is more than 2 m and has been modified primarily by prehistoric Native American habitation which began at least 1500 years ago. Contour maps prepared using ArcGIS from field mapping with a Sokkia SET 600 total station show differences in spacing, orientation, and relief of features on the land surface at the two locations. The results of the study provide some indications of effects which tropical storms and other external factors have had in shaping the coast of the Florida panhandle.

COMMUNITY DEVELOPMENT ALONG HIGHWAY 41**, Stevee Edwards* and Michael G. Noll, Valdosta State University, Valdosta, GA 31698. Within the past couple decades, communities throughout Georgia have changed dramatically. Family owned stores, that once dominated Main Street USA, were driven to bankruptcy, as strip malls and retail giants like Wal-Mart conquered the popular shopping culture. More recently, a growing influx of Hispanic immigrants has reshuffled old neighborhoods, created new ones, and introduced a new bilingual reality to our state, ranging from store fronts and ATM machines, to church services and TV programs. This research focuses on yet another aspect of change, which began to transform parts of Georgia in the 1960s. Until then, US Highway 41 was a major route for people traveling north or south through the Peach State, and many businesses along its path depended on the regular flow of customers. By utilizing information from AAA and various Chambers of Commerce within the state, and by a careful analysis of its cultural landscapes, the community development along Highway 41 will be analyzed. For instance, the Dixie Motel in Adel was a popular place for travelers to stop, and other ventures in town, such as gas stations, retail stores and restaurants, too, profited from these overnight stays. However, when the Interstate system was introduced in the 1960s, communities along Highway 41 were irreversibly transformed, as businesses used to a steady flow of travelers, saw a decline in their number of customers, were forced to relocate to I-75, or were closed down altogether. Thus, by focusing on Valdosta, Hahira, Adel, Tifton, Ashburn, Perry, and Macon, this poster will analyze and illustrate the effects I-75 has had on communities along Highway 41.

A NEW OCCURRENCE OF BALD CYPRESS IN A PALEOSOL ON THE SILVER BLUFF FORMATION EXPOSED ON THE BEACH OF JEKYLL ISLAND, GA, Timothy M. Chowns, University of West Georgia, Carrollton, GA 30118. Jekyll Island consists of a nucleus of Pleistocene sands and clays deposited during the Silver Bluff highstand, questionably dated around 35-50 ka. This nucleus underlies most of the northern part of the island with the exception of the area north-east of Clam Creek, which is Holocene. The southern half of the island is a Holocene spit. Shoreline retreat and beach erosion has recently begun to expose the easternmost part of this Pleistocene core as a wave-cut platform. Coastal erosion is evidently accelerating as a consequence of rising sea levels and the beach is being starved of sand by a rip-rap sea wall. The top of the Pleistocene is characteristically capped by a thick iron-humate paleosol (spodosol), which currently forms pinnacles up to about 1 m high on the beach. Within this paleosol are the roots of

at least six well preserved specimens of Bald Cypress (*Taxodium distichum*). An age of 3290 +/- 40 BP is indicated by 14C. Similar fossils with radiometric ages ranging from about 2.4-3.1 ka have been reported from various localities close to the coast, generally beneath Holocene marsh. Apparently, freshwater cypress swamps were abundant immediately prior to the time the Silver Bluff deposits were inundated by the Holocene transgression. The age of these trees effectively dates the time the Holocene transgression first reached Jekyll Island.

Section IV: Physics, Mathematics, Computer Science, Engineering and Technology
Science Center, Room 232
Solomon Fesseha, presiding

8:00 MOTION OF A MAGNETOTACTIC BACTERIA**, Timothy Kurtz*[1] and Trinanjan Datta[2], [1]Department of Biology and [2]Department of Chemistry and Physics, Augusta State University, Augusta, GA 30904. We investigate the motion of magnetotactic bacteria in the presence of an external magnetic field. We explore the cases when the net torque acting on the bacteria is both zero and non-zero. Using Mathematica, we perform numerical simulations of the model bacteria system to investigate the various types of motion. In the absence of an external torque we find that the system can exhibit both a synchronous and an asynchronous motion. In the presence of a net external torque the system can exhibit oscillatory motion.

8:15 AN EXPERIMENTAL STUDY OF THE LENGTHENING PENDULUM, Seth Clark* and J. A. Hauger, Augusta State University, Augusta, GA 30904. The lengthening pendulum involves a mass oscillating at the end of a string which lengthens at a steady rate. A closed form solution exists for this system if one assumes small oscillation amplitude and ignores damping forces. We have recently measured the motion of such a pendulum using standard video techniques. A stepper motor controls the lengthening rate of the pendulum. We find that the motion of the pendulum is in close agreement with the theoretical predictions. We will present the theory, experimental techniques, and results.

8:30 PRELIMINARY RESULTS OF A ROTARY PENDULUM DESIGNED TO MEASURE THE ROLLING RESISTANCE OF PNEUMATIC TIRES**, Rebecca Sawyer* and C. Poppeliers, Augusta State University, Augusta, GA 30904. We developed a novel method to quantify the rolling resistance of pneumatic bicycle tires using a rotary pendulum. We model the damping as an elastic deformation of the tire as the wheel rotates about its axis, and is similar to the damping term in a simple harmonic oscillator. We estimate the damping parameter by a least squares fit to the analytical model using a parameter search technique. Preliminary data suggests that there is a power-law relationship between the magnitude of the damping term and the tire pressure. Currently, we are investigating the physical significance of the damping parameter in terms of the actual rolling resistance.

8:45 SIMPLER FORMULAE FOR GEOMETRIC ALGEBRA, Dennis W. Marks, Valdosta State University, Valdosta, GA 31698. Using the number of dimensions n and the signature s, instead of the number p of space-like dimensions and the number q of time-like dimensions, simplifies many formulae of geometric algebra. The number of dimensions is $n = p + q$ and the signature is $s = p - q$. Real geometric algebras $\mathbf{R}_{n,s}$ are isomorphic to algebras of real, complex, or quaternionic matrices $\mathbf{R}(2^{n/2})$, $\mathbf{C}(2^{(n-1)/2})$, or

$\mathbf{H}(2^{(n-2)/2})$, or of block diagonal matrices ${}^2\mathbf{R}(2^{(n-1)/2})$ or ${}^2\mathbf{H}(2^{(n-3)/2})$, for $|(s+3)_{\mathrm{mod}8}-4| = 1$, 2, 3, 0, or 4, respectively. Complex geometric algebras $\mathbf{C}_{n;s}$ are isomorphic to $\mathbf{C}(2^{n/2})$ for even n and to ${}^2\mathbf{C}(2^{(n-1)/2})$ for odd n, independent of s. Each of the n basis vectors $\boldsymbol{e}_{\nu/n}$ satisfies $\boldsymbol{e}_\mu \cdot \boldsymbol{e}_\nu = \frac{1}{2}(\boldsymbol{e}_\mu \boldsymbol{e}_\nu + \boldsymbol{e}_\nu \boldsymbol{e}_\mu) = \eta_{\mu\nu}\,\mathbf{I}_{n;s}$, where the $\boldsymbol{e}_\nu$ are orthogonal ($\eta_{\mu\nu} = 0$ for $\mu \neq \nu$) and normalized ($\eta_{\mu\nu} = +1$ for p space-like ν and $\eta_{\mu\nu} = -1$ for q time-like ν), and where $\mathbf{I}_{n;s}$ is the identity matrix whose rank is given by the isomorphisms above. The n-volume pseudoscalar is $\mathbf{J}_{n;s} = \boldsymbol{e}_0 \boldsymbol{e}_1 \cdot \cdots \boldsymbol{e}_{n-1}$. From the equation for $\boldsymbol{e}_\mu \cdot \boldsymbol{e}_\nu$, we have $(\mathbf{J}_{n;s})^2 = (-1)^{n(n-1)/2}(-1)^q\,\mathbf{I}_{n;s} = (-1)^{n(n-1)/2}(-1)^{(n-s)/2}\,\mathbf{I}_{n;s} = (-1)^{s(s-1)/2}\,\mathbf{I}_{n;s}$, since the possible values of n for a given s are given by $s + 2k$ with k a non-negative integer. Whether the n-volume is space-like or time-like therefore depends only on the signature s modulo 4. The periodic table (modulo 8) of geometric algebras is similarly simplified when expressed in terms of n and s, instead of p and q.

9:00 DEPOSITION PATTERNS OF NONIONIC SURFACTANT ON A GLASS SUBSTRATE, Neville Brackett, K.C. Chan, Scott M. Pierce and Yunjie Mi, Albany State University, Albany GA 31705. Non-ionic surfactants are comprised of linear or nonylphenol alcohols and/or fatty acids. When used in agricultural applications, this class of surfactant reduces surface tension and improves spreading, sticking and herbicide uptake. Some of the most common nonionic surfactants are X-77 (UAP), Induce (Helena), Activator 90 (UAP), Triton Ag 98 (Rhone-Poulenc) and R-11 (Wilfarm). The formation of multiple rings via sessile droplet evaporation of the R-11 non-ionic surfactant is investigated. Each drop was allowed to evaporate in a chamber whose temperature and relative humidity were kept constant at 24°C and 50 percent respectively. Concentrations varying from 0.075% to 0.75% surfactant in aqueous solution were used to analyze the differences in ring formation and spreading patterns. Three substrates were used to simulate biological conditions: smooth glass slides, polystyrene and mica. Each substrate has different surface characteristics, and hence the pinning effect on each is very different. The results were analyzed to determine whether concentration or contact angle has a greater effect on the ring formation. Results show increasing the concentration causes a similar increase in the total base area of deposition. At concentrations between 0.075% and 0.15% three rings were formed; at between 0.25% and 0.45% two rings were formed; and for 0.50% and above concentrations, there were no rings formed. Funding acknowledgement: Funding was made possible (in part) by 5P20MD0001085-04 from the National Ctr on Minority Health and Health Disparities. Views expressed are the presenter(s)', and do not constitute endorsement by DHHS.

9:15 SIMULATING A WATER DROPLET'S EVAPORATION, J. E. Hasbun[1], K.C. Chan[2] and Scott Pierce[2], [1]University of West Georgia, Carrollton, GA 30118 and [2]Albany State University, Albany, GA 31705. When a water droplet is placed on a substrate and the atmospheric conditions are carefully kept in equilibrium, the droplet evaporates in a few minutes. In general, the evaporation rate depends on the substrate as well as on the surfactant (the substance mixed in with the water). In this presentation, we investigate a pure water droplet's evaporation rate and develop a spherical water droplet model to simulate the evaporation rate. Comparing with experimental data, our simulations show that the scheme we use does very well indeed in simulating the water droplet evaporation during the time the droplet is pinned to the substrate.

9:30 HYSTERESIS LOOP AREA OF THE KINETIC ISING MODEL WITH NEXT-NEAREST NEIGHBOR INTERACTION, William D. Baez*, Trinanjan Datta and Christian Poppeliers, Department of Chemistry and Physics, Augusta State University, Augusta, GA 30904. We investigate the effects of the next-nearest neighbor interaction

on the hysteresis loop area of the square lattice kinetic Ising model subject to an oscillatory magnetic field. We use the Metropolis algorithm to study the hysteresis dispersion law in the low frequency limit (f → 0) for both high and low magnetic fields. We find that in the presence of the next-nearest neighbor interactions the dispersion relationship for the loop area A(Ho, f), where Ho is the external magnetic field amplitude, changes from the nearest neighbor relationship.

9:45 ON THE DERIVATION OF THE DISTRIBUTION OF AN ESTIMATOR FOR THE INVERSE MEAN, Andreas Lazari, Valdosta State University, Valdosta, GA 31698. The problem of estimation of the inverse mean often arises in Econometrics and Biological sciences. Based on a random sample of size n, $\bar{X}$ and S^2 are unbiased estimators of μ and σ^2, respectively. Since the exact distribution of $\frac{1}{\bar{X}}$ does not exist in the case of a normal population, the following estimator was proposed, $t_k = \frac{\bar{X}}{\bar{X}^2 + k\frac{S^2}{n}}$ where k > 0. If we let $Z = \frac{\bar{X}\sqrt{n}}{\sigma}$, $\Theta = \frac{\sigma^2}{\mu^2}$, and $W = \frac{(n-1)S^2}{\sigma^2}$, then we know that $Z \sim N(\mu = \sqrt{\frac{n}{\theta}},\ \sigma^2 = 1)$ and $W \sim \chi^{2(n-1)}$. Furthermore, the two random variables, Z and W, are independent. The distribution of t_k is $f(t_k) = \frac{R}{\sqrt{A}} \int_{-\infty}^{\infty} e^{-V^2} e^{-\frac{V}{\sqrt{A}} \frac{(n-1)}{2\sigma^2} \frac{n}{kt_k} - \frac{n\mu}{\sigma^2}} \left(\frac{V}{t_k\sqrt{A}} - \frac{V^2}{A}\right)^{\frac{n-3}{2}} \left(\frac{V}{t_k^2\sqrt{A}}\right)$ where R and A are constants, $R = \frac{n^{\frac{n}{2}}(n-1)^{\frac{n-3}{2}} e^{-\frac{n\mu^2}{2\sigma^2}}}{\sigma^{n-2}\sqrt{\pi}\,\Gamma\left(\frac{n-1}{2}\right) k^{\frac{n-1}{2}}}$ and $A = \frac{n}{2\sigma^2} - \frac{n(n-1)}{2\sigma^2 k}$.

10:00 **Section business meeting**

10:30 A NEW LAW OF COOLING, Ronald E. Mickens, Physics Department, Clark Atlanta University, Atlanta, GA 30314. Many introductory textbooks in calculus and physics give a relationship called "Newton's law of cooling." This law can be written as dT/dt = -k(T-Te) where T is the temperature of the object and Te is the temperature of the object's surrounding environment, and k is a positive parameter. The solutions to this differential equation have the feature that they all approach Te as the time increases, but reaches this value only after an infinite duration. However, experiment shows that actual physical objects/systems come to equilibrium in a finite time. We display a new law of cooling that is consistent with this physical fact, give its exact solution, and calculate the finite time for the object to reach the equilibrium value of temperature. We also discuss mathematical properties of this new law and provide some physical explanation for why it is applicable.

10:45 JUPITER: BRIGHTNESS AND COLOR, Richard W. Schmude, Jr., Gordon College, Barnesville, GA 30204. The writer carried out brightness measurements of Jupiter between April 9 and July 8, 2008. Measurements were made through four different filters (blue, green, red and infrared). The purpose of this work is to look for seasonal brightness and color changes of Jupiter and to also look for brightness and color changes as the belts and zones change. The selected normalized magnitudes of Jupiter for 2008 are: B(1,0) = -8.54, V(1,0) = -9.44, R(1,0) = -9.89 and I(1,0) = -9.72. It is concluded that seasonal brightness changes in the V (or green) filter are less than three percent (or 0.03 magnitudes).

11:00 SATURN: BRIGHTER THAN EXPECTED, Richard W. Schmude, Jr., Gor-

don College, Barnesville, GA 30204. The writer carried out brightness measurements of Saturn + rings during late 2008. Saturn's brightness was measured as 0.952, 0.965 and 0.989 on Oct. 29, Oct. 30 and Nov. 20, 2008 respectively. All measurements were made through a filter that was transformed to the Johnson V system. The predicted magnitude for all three dates was +1.1. Therefore, Saturn was about 0.1 to 0.15 magnitudes (or about 15%) brighter than expected in late October 2008. A similar observation was made in 1996 when the ring plane was tilted at an angle of about four degrees with the ecliptic. It is concluded that at low ring tilt angles Saturn's brightness is different from model calculations. This has motivated the writer to gather more data and to develop a new model for Saturn's brightness.

11:15 THE FEBRUARY 21, 2008 TOTAL LUNAR ECLIPSE, Richard W. Schmude, Jr., Gordon College, Barnesville, GA 30204. Over 30 students and the writer observed the total lunar eclipse on February 21, 2008 from Barnesville, GA. Students estimated the Danjon number and the average value of their estimates was 2.2. The writer carried out brightness measurements of the Moon between 3:05 UT and 3:31.6 UT. The moon's total brightness was equivalent to a stellar magnitude of -3.50. After the Moon-sun and Moon-Earth distances are considered along with the full moon brightness, it is concluded that the Moon's brightness fell by a factor of 7870 times (or 9.74 stellar magnitudes) as a result of the eclipse.

11:30 PRODUCT QUALITY AND ENERGY CHALLENGES IN PULP AND PAPER INDUSTRY, Barry Hojjatie and Chad Handley, Valdosta State University, Valdosta, GA 31698. An important issue for the paper industry, specifically in southern Georgia, is the shortage of highly qualified engineers, technicians, and undergraduate students who have the knowledge and interest in paper science and technology. Using a grant from the State of Georgia ICAPP program, the purpose of this investigation was to involve the students in Engineering Studies Program at VSU in projects related to analysis of paper quality and energy through collaboration with a local in pulp and paper industry. We continued to develop a paper creep tester to simulate deformation behavior of container board materials under the influence of functional loads. The equipment has the capability for cyclic loading and allows for experimental analysis of sheet-like materials subjected to cyclic tension. A computer program in LabView was developed for data acquisition and control of cyclic loading. The system is being employed to train engineering students in fundamental principles related to mechanics, and product quality and energy issues related to paper industry. However, it can be employed for characterization of other types of engineering materials. Samples of linerboards were obtained from the paper manufacture and their deformation subjected to constant and cyclic loading were analyzed. Time-dependant deformation of linerboard materials is believed to be responsible for failure of container boards during shipping and storage.

11:45 SOURCE LOCALIZATION OF SHOCK-WAVES IN THE GROUND MODEL MEDIA, Hasson M. Tavossi, Department of Physics, Astronomy and Geosciences. Valdosta State University, Valdosta, GA 31698. Shock wave speed and attenuation in a ground model media are investigated. The goal of the study is to identify factors that control shock wave speed and energy dissipation in a non homogeneous discrete media for inverse problem of source localization. It is shown that material properties of ground model constituents depend on the wave frequency. The wave behavior at high frequency and low frequency limits are analyzed as well as the effect of compression and depth on spectral content, dispersion and attenuation. Wave speed profile and spectral content are

factors that need to be included in the future model for source localization. In conclusion; results of this research are applicable to the near ground impulsive source localization by micro-seismic wave detection.

Section V: Biomedical Sciences
Tapley Hall, Room 119
Francis Eko, presiding

9:00 REPLACEMENT OF MEMBRANE CHOLESTEROL DURING PHYTOSTEROL SUPPLEMENTATION IN PROSTATE CANCER CELLS**, Wambui S. Wandu*, Godwin O. Ifere and Godwin A. Ananaba, Department of Biological Sciences, Clark Atlanta University, Atlanta, GA 30314. Enhancement of cellular phytosterol levels may improve its chemotherapeutic potential in prostate cancer cells. This is due to the suggestion that phytsoterols may replace membrane cholesterol, which is known to promote cell proliferation. There is little information that supports phytosterol replacement of membrane cholesterol. We therefore hypothesize that cutback of in vitro cholesterol absorption by supplementation of prostate cancer cells with phytosterols may result in membrane cholesterol depletion and increased phytosterol buildup. In vitro cultures of prostate cancer cell lines PC-3 were supplemented with cholesterol and phytsoterol, facilitated by β-cyclodextrin (as vehicle). After 72 h of incubation at 37°C, the cells were harvested and their membranes isolated by density gradient centrifugation. After extraction of membrane lipids with chloroform /methanol, cholesterol was estimated by a sensitive enzymatic assay. Our results indicate a minimized level of cholesterol in membranes from phytosterol-treated cells. We conclude that phytosterol treatment might diminish membrane cholesterol and contribute to the success of prostate cancer chemotherapy.

9:15 PLASMA INTERLEUKIN-1β CONCENTRATION PREDICTS RISK OF STROKE IN SICKLE CELL DISEASE, Kwaku O. Asare[1], Beatrice E. Gee[1], Jonathan K. Stiles[1], Nana Wilson[1], Adel Driss[1], Alexander Quarshie[1], Robert J. Adams[2], Abdullah Kutlar[3] and Jacqueline M. Hibbert[1], [1]Morehouse School of Medicine, Atlanta, GA, [2]Medical University of South Carolina, Charleston, SC and [3]Medical College of Georgia, Augusta, GA. The pathogenesis of sickle cell disease (HbSS), which has numerous complications including stroke, involves inflammation resulting in alteration of plasma inflammatory protein concentration. We investigated HbSS children with abnormal cerebral blood flow detected by transcranial Doppler ultrasound (TCD) who participated in a multi-center stroke prevention (STOP) study, to determine if plasma inflammatory protein concentration is associated with the risk of developing stroke. Thirty-nine plasma samples from HbSS participants with elevated TCD who had no stroke, HbSS-NS (n=13) or had stroke, HbSS-S (n=13), HbSS steady-state controls (n=7) and controls with normal hemoglobin, HbAA (n=6), were analyzed simultaneously for 27 circulating inflammatory proteins. Logistic regression and receiver operator characteristics (ROC) curve analysis of stroke on plasma inflammatory mediator concentration, adjusted for age and gender, demonstrated that IL-1β was protective against stroke development and was a good predictor of stroke risk. This result demonstrates a strong association of systemic inflammation with stroke risk in HbSS via moderately increased plasma interleukin-1β concentration, which is furthermore associated with a decreased likelihood of stroke in HbSS.

9:30 IL-10 AND TGF-β1 EXPRESSION IN IP-10-/- C57BL/6 MICE WITH

EXPERIMENTAL CEREBRAL MALARIA: ROLE OF REGULATORY T CELLS**, Bismark Sarfo*[1], Nana Wilson[1], Danielle Whittaker[2], Vincent Bond[1] and Jonathan Stiles[1], [1]Morehouse School of Medicine and [2]Vanderbilt University, Nashville, TN. Recent reports indicate that C57BL/6 IP-10-/- mice are less susceptible to experimental CM, and also blocking T cells prevent ECM. Regulatory T cells (Tregs) secrete IL-10 and TGF-β1 which limit malaria brain inflammation but their role in CM severity is unclear. We hypothesize that enhanced Tregs production in IP-10-/- mice will prevent ECM. Our objective is to compare Tregs (CD4+CD25+Foxp3), IL-10 and TGF-β1 in IP-10-/- and IP-10+/+ mice during ECM. Female IP-10-/- and IP-10+/+ mice were injected with P. berghei parasites and uninfected RBC as controls. ECM symptoms were monitored and mice were sacrificed at day 2, 4 and 8 pi. ELISA was performed to determine IL-10 and TGF-β1 in plasma and semi-qRT-PCR was performed to evaluate Foxp3 and TGF-β1 in brain. IL-10 and TGF-β1 in infected IP-10-/- plasma were significantly upregulated and down regulated, respectively, compared to infected IP-10+/+ at day 2 and 4 pi. Foxp3 mRNA was significantly increased in IP-10-/- brain at day 4 pi compared with IP-10+/+ and controls. Thus P. berghei infection up regulates IL-10 and Foxp3 in plasma and brain respectively in IP-10-/- but not in IP-10+/+ mice and down regulates plasma levels of TGF-β1. Ongoing re-stimulation assay will ascertain if CD4+CD25+ or CD4+CD25- T cells is the predominant source of IL-10 during ECM.

9:45 PCGEM1 MEDIATES CHOLESTEROL ASSUALTS ON PROSTATE CELLS BY INITIATING THE ATTENUATION OF P53 EXPRESSION, Godwin O. Ifere*, Sylvia Wandu, Angela Campbell, Nehemiah Diala, Lucky Nwankwo and Godwin A. Ananaba, Department of Biological Sciences, Clark Atlanta University, Atlanta, GA 30314. Over-expression of the novel prostate-specific proto-oncogene, PCGEM1 is reputed to mediate aggressive prostate tumorigenesis, thus suggesting that it favors prostate cell division. The exact mechanism by which this non-coding RNA gene stimulates hysterical cell division is not yet understood. Since cell growth involves uncoupling of blockades across checkpoints, we hypothesize that PCGEM1 may stimulate cell division by triggering the passage for instance, through the G1 checkpoint. We therefore investigated PCGEM1 effects on the expression of p53, a pro-apoptotic gene, and on the production of D-type cyclins and the retinoblastoma (RB) gene product. Our results show that over-expressed PCGEM1 mediates cell progression by regulating cylin production and substantial enrichment of sub-mitotic cell populations. Elucidation of the checkpoint proteins amenable to over-expressed PCGEM1 may enable their scrutiny as potential anticancer therapeutic targets in prostate cancers that show elevated PCGEM1.

10:00 **Section business meeting**

10:30 EX-VIVO PULSED IL-10 DEFICIENT DENDRITIC CELLS INFLUENCE THE PRODUCTION OF IMMUNE MODULATORS OF PROSTATE CANCER, Godwin Ananaba*[1], Lucky Nwankwo [1], Kereen Gordon[1], Godwin Ifere [1], Angela Campbell [1], Francis Eko[2], Qing He[2/3], Eno Ekong[2] and Joseph Igietseme[2/3], [1]Clark Atlanta University, [2]Morehouse School of Medicine and [3]Centers for Disease Copntrol and Prevention, Atlanta, GA. Cancer cells evade the immune system by eliciting the production of immunosuppressive factors such as IL-10, VEGF, PGE2 and TGF-β. Abnormal differentiation of dendritic cells gives rise to accumulation of immature DCs with dysregulated expression of costimulatory molecules. Our goal is to elucidate the role of IL-10 deficiency on the ability of dendritic cells to regulate immune response against prostate cancer. We investigated the hypothesis that ex-vivo pulsing of DCs overcomes the suppressive effects of immature DCs, accumulation of Tregs and nonresponsiveness of antigen-specific T cells to cancer.

A combination of genomic and proteomic methods were used to assess the transcriptional and translational activities of chemokines and cytokines expressed by prostate cancer associated antigen (PCAA)-pulsed DCs. The results show that IFN-γ, IP-10 are reduced in prostate cancer cells compared to immortalized normal prostate epithelial cells. Also, PCAA pulsed DCs enhanced the expression of IFN-γ, MIP-1α/β, and IP-10 and CXCR3. These results suggest that the expression of cytokines and chemokines could be used as prognostic markers for prostate cancer progression. The efficacy of an anti-prostate cancer vaccine will depend on its ability to inhibit the recruitment of functional immunosuppressive molecules.

10:45 THE BACTERIAL GHOST PLATFORM AS A NOVEL STRATEGY FOR VACCINE AND DRUG DELIVERY, Francis O. Eko*[1], Eno Ekong[1], Qing He[2], Godwin Ananaba[1] and Joseph U. Igietseme[1,3], [1]Morehouse School of Medicine, Atlanta, GA 30310, [2]Clark Atlanta University, Atlanta, GA 30310 and [3]National Center for Infectious Diseases (CDC), Atlanta GA 30333. The bacterial ghost system is a novel vaccine and drug delivery system endowed with intrinsic adjuvant properties as well as carrier and targeting functions. Bacterial ghosts are non-living Gram-negative bacterial cells devoid of cytoplasmic contents that retain the morphological characteristics and structural integrity of their living counterparts. They are produced by the controlled expression of PhiX174 protein E and have a high capacity to simultaneously carry and present multiple antigens to the immune system. They are stable at room temperature as lyophilized preparations, have no 'cold chain' or refrigeration requirements and provide a simple method for packaging various antigens for effective delivery. In addition to being effective adjuvants, ghosts are an efficient vaccine and drug delivery system. Thus, bacterial ghosts represent a novel approach for drug delivery and offer an exceptional opportunity to develop multiple or combination vaccines.

Section VI: Philosophy and History of Science
Science Center, Room 238
Vivian Rogers-Price, presiding

8:30 UNRAVELING THE MYSTERY OF THE CHEROKEE ROSE, Charles A. Walker, North Carolina State University, Raleigh, NC 27695. The Cherokee Rose (*Rosa laevigata* Michaux), the state flower of Georgia, is actually a Chinese plant with no connection to the Cherokee Indians except in name. Its history in America had long been obscure and a subject for varied speculation until a posthumously published article by Georgia botanist Stephen Elliott provided a crucial key. Subsequent research produced a defensible scenario for the arrival and early cultivation of the Cherokee Rose in the southeast. Among those involved in the American story of this rose were a Georgia merchant/assemblyman (who later became a Tory), a French botanist, Prussian and Scottish plant collectors, and a generous South Carolina plantation owner. The American Revolution had a part in obscuring its history. Early records of the vegetative spread of the Cherokee Rose have been confirmed by DNA analysis.

9:00 PHYSICAL MATHEMATICS: WHAT IS IT?, Ronald E. Mickens, Physics Department, Clark Atlanta University, Atlanta, GA 30314. Mathematics is the language of science. This sentiment is expressed by many scientists and scholars in the history and philosophy of science. We present a discussion of the relationships which exist between analogous concepts in "pure mathematics" and "physical mathematics," denoted, respectively, by PM and pm. In particular, an analysis is made of the following con-

cepts: infinity, equilibrium, point, line, continuity, and periodic behavior. We demonstrate that PM concepts do not necessarily have a unique mapping to the corresponding pm concepts. Further, we show that this ambiguity also occurs within the domain of PM. A prime example is the relationship between Euclidean and analytical geometry. (This work is supported by funds from CAU's School of Arts and Sciences Faculty Development Funds.)

9:30 NOTES ON *EREMAEOZETES ROGERSI*, A NEWLY DESCRIBED SPECIES OF ORIBATID MITE (ACARI: ORIBATIDA, EREMAEOZETIDAE) COLLECTED FROM SANDSTONE OUTCROPS IN COFFEE COUNTY, GEORGIA, USA, F. Michael McAloon, The Taft School, Watertown, CT 06795. A survey of the arthropods of The Broxton Rocks Nature Preserve was underway when in 1999, 756 individuals of an undescribed oribatid mite species were collected using a Berlese-funnel from an approximately 20x40cm patch containing species of *Polytrichum* and *Sphagnum* mosses; *Selaginella* (fern-ally); and *Cladonia* (lichen). The Broxton Rocks Nature Preserve's habitat consists of the typical coastal plain long-leaf pine and wiregrass community, but because of the nature of the sandstone formations is also home to a unique assemblage of plants and some exceptional animals found in no other parts of Georgia's Coastal Plain. The mites collected at The Preserve were identified as belonging to the genus *Eremaeozetes*. Of the 31 species of *Eremaeozetes* that have been previously described, none had been collected outside of a tropical biome. These tropical regions were Southern Africa, Pacific Islands, Central and South America, and Southeast Asia. Southern Georgia is considered humid-subtropical. While the ecology of oribatid mites is well studied, the habits of this mite are not well known. Covered in a thick cerotegument, this heavily sclerotized mite has the ability to withdraw its legs into its body much like a tortoise – an adaptation that likely aids in the mites' ability to survive the xeric conditions on the sandstone rocks. Further study on live mites as well as detailed study on the flora they inhabit should be undertaken. The mite has been named in honor of Dr. George A. Rogers, Professor Emeritus and distinguished naturalist, Georgia Southern University.

10:00 **Section business meeting**

10:30 ELIZA FRANCES (FANNY) ANDREWS (1840-1931): WRITER, TEACHER BOTANIST, Charlotte A. Ford, Georgia Southern University, Statesboro, GA 30460. Fanny Andrews, probably best known for "The War-Time Journal of a Georgia Girl, 1864-1865,' also wrote three novels, many articles and stories published in over forty newspapers and magazines, and two botany textbooks. 'Botany All the Year Round' in 1903, followed the next year by a second edition which included a section on southern flora, and 'A Practical Course in Botany' in 1911 for high school and college students. Several scientific magazines, among them Science, Torreya, Botanic Gazette, carried her work. She had contact with some of the outstanding botanists of the era: C.O. Townsend, Charles W. Dodge, Alvan W. Chapman and Roland M. Harper with whom she corresponded for more than twenty years. Fanny taught in Washington, Georgia, Dallas, Texas, Yazoo, Mississippi, and Wesleyan College, Macon, Georgia. A self-taught botanist, Andrews believed that nature, not books, provided the best teacher.

11:00 ERATOSTHENES AND THE CIRCUMFERENCE OF THE EARTH, Jacob Todd Hewell*, Amanda Brock*, Bob Powell and Robert Moore, Jr., University of West Georgia, Carrollton, GA 30118. In the third Century BC, Eratosthenes determined the circumference of the Earth. His geometrical method used the length of the shadow cast by a vertical rod at local noon during the summer solstice and his knowledge that

the length of the shadow at a point further south was zero. With this information and the measured distance between two locations in Egypt for which he knew the shadow angle, he was able to calculate the circumference. Eratosthenes probably determined the circumference very well, but his value cannot be compared to modern results because of the unit of distance he used. Others have repeated this measurement, typically at four times during the year: the equinoxes and solstices. We are measuring the shadow angle produced by a rod at least once a week throughout the year. The objectives of this project are to demonstrate that this measurement may be accomplished at local noon for any day of the year and to look for anomalies that suggest the measurements could be performed more accurately at certain times of the year. A typical measurement made during the Fall Semester, 2008 yields a result with an error of less than one percent from the accepted value of the circumference of the Earth.

11:30 PHYSICS, INFORMATION, AND INTELLIGENT DESIGN, E.T. McMullen, Georgia Southern University, Statesboro, GA 30460. In the late 19th century, scientists reformulated the Second Law of Thermodynamics in a statistical manner to include the microworld. Seeing entropy expressed in this form, James Clerk Maxwell posited a gas in a closed system divided by a wall with a door in it that a 'sorting demon' opened to let fast-moving gas particles from side A into side B and slow-moving ones from side B into A. Eventually, with no work, the temperature in side B would be higher than side A, seemingly in violation of the law of entropy. In the 20th century, Leo Szilard realized Maxwell's decision-making 'demon' was processing information to generate negative entropy. This led C.N. Lewis, Claude Shannon and others to develop a science where the irreversible losses during information processing equate to increasing disorder and greater entropy. Interestingly, this applies to the genomic information carried by our DNA. Our extensive genetic information could not have come originally from naturalistic sources such as earth, air, and/or water, which obviously have none. The implications are 1) that information ultimately has a mental source, and 2) that an intelligent source initially provided the very high quality genetic information contained in our original DNA. This information has ever since degraded as it is processed and transferred from one generation to another. This explains the fact that the number of genomic disorders tied to a specific gene, often called Mendelian diseases, now totals more than 2,220.

Section VII: Science Education
Tapley Hall, Room 130
Bonita Flournoy, presiding

9:00 COMPARISON OF ACTIVE LEARNING AND TRADITIONAL LEARNING IN INTRODUCTORY BIOLOGY, Jonathan M. Lochamy, Georgia Perimeter College, Dunwoody, GA 30338. Preliminary to a broader application of active learning techniques in science curriculum, it was first our goal to reproduce the observation that content mastery was not reduced by techniques which took away from traditional lecture time. Three courses in Cell Biology and Genetics (for non-science majors) were taught with either traditional lecture alone or active learning techniques comprising 30% of the class time. Students were compared in performance on a 35 question test composed of content mastery questions designed by an independent committee. Students in the traditional lecture class showed no significant difference from students in the active learning class (64% vs. 66%, $p = 0.73$). Unexpectedly, student evaluations for the courses showed an average 0.87 point increase in the active learning class compared to traditional lecture (4.91* vs. 4.14). This added information suggests that, independent of aims to deepen

conceptual understanding, active learning techniques have significant benefits to the learning process from the student perspective.

9:15 AN ACTION RESEARCH STUDY ON THE EFFECT OF GUIDED INQUIRY TEACHING ON STUDENT UNDERSTANDING AND VIEWS OF SCIENTIFIC INQUIRY, Anil Banerjee[1], Bonita Flournoy[1] and Susan Sneed[2], [1]Columbus State University, Columbus, GA 31907 and [2]Northside High School, Columbus, GA 31909. The study in a high school physical science classroom with 30 students is designed to improve our knowledge base on effectiveness of guided inquiry strategies to develop concepts in physical science, and explore how student understanding and views of science inquiry are related. The action research design includes pre-post tests, student interviews and reflections. Guided inquiry strategies include inquiry lessons, guided inquiry labs, post lab group discussion, and student reflection on inquiry. A 15-item science inquiry test and "Views of Scientific Inquiry" instrument were used as pre- and post- tests to collect quantitative data on student understanding and views of scientific inquiry, respectively. Student interviews and reflections are used to generate qualitative data on the effectiveness of inquiry on student understanding and attitudes about inquiry. Analysis of pre-tests indicate students have limited knowledge about inquiry skills, processes, and nature of science inquiry. Classroom observation and student reflection indicate improvement in science inquiry skills and attitudes about inquiry. Student participation in the guided inquiry labs also increased .Statistical analysis of pre-post tests data and inferences based on student interviews and reflection indicate some increase in student attitudes and inquiry skills.

9:30 STUDENTS' PERCEPTIONS OF THE IMPACT OF SYNCHRONOUS AND ASYNCHRONOUS COMMUNICATION IN AN ONLINE COURSE, Ollie I. Manley, Georgia State University, Atlanta, Georgia 30303. In an online course there are two types of communication that are used; synchronous and asynchronous. Synchronous communication is defined as the sharing of information in real time, meaning that two or more persons are online and are corresponding at the same time. Asynchronous communication takes place over time and does not require the parties to be online at the same time. Both forms of communication are used in this research, and both are believed to have an impact on the interactions between student/student and student/teacher. The research question for this study is: What are students perceptions of the use of communication tools in an online course and how will the use of these tools impact interactions between student/student and student/facilitator? The participants in this study are enrolled in a graduate online course where they are asked to post discussions and respond to the postings of other students, participate in group projects, and submit assignments in a drop box. Students are also required to meet in a virtual classroom once a week for presentations, discussions, and dialogue. Data were collected from discussion postings, email, and interviews. The analysis of data showed that both types of communication impacted interactions between student/student and student/facilitator.

9:45 DEVELOPING COGNITION AND EXPERIENCE: THE CASE FOR EARLY CHILDHOOD SCIENCE EDUCATION, David J. Martin, Kennesaw State University, Kennesaw, GA 30144. Young children are natural-born scientists with seemingly insatiable curiosity. They love to solve problems by building theories through deductive and inductive reasoning and investigative thinking. Science education provides children with hands-on opportunities to investigate their curiosities. These opportunities are tailored to the needs and interests of individual children and typically arise from questions children ask about phenomena that interest them. Children investigate and solve these

scientific problems through using the processes of science such as observing, communicating, classifying, measuring, predicting, inferring, and higher-level processes. Goals of early childhood education include the development of thinking skills, wide experiential bases, social skills, early literacy, number sense, and other academic goals. Science can help foster the accomplishment of these basic goals. The process skills and hands-on investigative experiences provide both cognitive development and broadening and deepening of children's experiential bases. Social skills are fostered as children interact with peers and teachers to develop and conduct their investigations and validate their conclusions. Language development is fostered as children find ways to communicate their ideas, observations, predictions, and inferences. Number sense is fostered as children find ways to quantify and interpret data. Science, then, functions as a catalyst to promote the integration of all subject areas. The result is cognitive and experiential development appropriate and meaningful to each child.

10:00 **Section business meeting**

10:30 MAKING THE DAPHNIA HEART RATE LAB WORK: OPTIMIZING THE USE OF ETHANOL, NICOTINE, AND CAFFEINE, Darrel Ceballos*, Adam Lee*, Lindsey Vinson* and Frank Corotto, North Georgia College & State University, Dahlonega, GA 30597. Students commonly test the effects of chemical agents on the heart rate of the crustacean *Daphnia magna*. The literature provides little guidance as to what should be tested to obtain particular results. The effect of three concentrations of ethanol, nicotine, and caffeine (n=6 per concentration), and a control solution (n=18) on Daphnia's heart rate. Ethanol at 5% and 10% (v/v) reduced mean heart rate to ~50% and ~20% of its initial value were determined, respectively. Recovery was rapid after removing 5% ethanol, but recovery from 10% ethanol took 20-30 min. Nicotine at 100 μM reversibly increased mean heart rate by ~20%. Higher concentrations produced varied and sometimes irreversible effects that depended on the duration of exposure and the initial heart rate of the animal. Caffeine at 0.1%, 0.5%, and 2% (w/v) had no convincing effect on heart rate. Of the three compounds tested, ethanol is best-suited for use in teaching labs. At 5% and 10%, its effects are unambigous. Heart rates recover quickly after removing 5% ethanol, allowing students to explore this strategy as an alternative to having a separate control group. Caffeine may be used to emphasize the need for blind observers because it does not increase Daphnia's heart rate. If students find that it does, their bias is revealed. There is little reason to test nicotine. Its effects are modest and vary depending on concentration

10:45 INTERDISCIPLINARY PROFESSIONAL LEARNING EXPERIENCES FOR MIDDLE AND SECONDARY TEACHERS USING THE PRISM MODEL, Ollie I. Manley[1], Neva Rose[1] and Donna Whiting[2], [1]Georgia State University, Atlanta, GA 30303 and [2]Georgia Institute of Technology, Atlanta, GA 30303. As a part of the Partnership for Reform in Science and Mathematics (PRISM) project, teachers from the metropolitan Atlanta area were given an opportunity to participate in a professional learning program at Georgia State University that was designed to help them teach across disciplines as well as to integrate technology into the teaching of science. The professional learning sessions targeted the theoretical and practical knowledge of teachers in which they were required to develop inquiry lessons that focused on topics in earth science, seventh grade life science and biology. Data were collected from the State of Georgia End of Course Test for Biology, Georgia Criterion Reference Test, and Advanced Placement Test in Biology. Students whose teachers participated in the professional learning experiences

performed better than those students who had not participated in the program at Georgia State University.

11:00 STUDENTS IN A FRESHMAN EARTH SCIENCE COURSE MODEL ENERGY BALANCE AT THE EARTH'S SURFACE, Randal L.N. Mandock, Clark Atlanta University, Atlanta, GA 30314. An energy-balance project and laboratory assignment were developed for a core-curriculum earth science course at Clark Atlanta University. The energy-balance project analyzes surface weather data from an assigned station of the Georgia Automated Environmental Monitoring Network (AEMN). The first part of the project requires the student to print observations of the "Current Conditions" web page for the assigned station. A satellite image of the southeastern United States must accompany each of these printouts. The second part of the project can be completed only after the student has modeled 4 environmental scenarios taught in the energy-balance laboratory assignment. The student uses an energy-balance model to determine the energy-flux components (net radiation, sensible and latent heat fluxes, ground heat flux, heat storage, anthropogenic heat, and advective heat transport) for the printed weather conditions at the assigned station. The model draws an energy-balance diagram composed of sky elements, a line or box representing the land or sea surface, and arrows which indicate magnitude and direction of each of the energy fluxes. On successful completion of the project, the student has become familiar with: (1) how weather observations can be used to constrain parameters in a microclimate model, (2) one common type of error in measurement made by weather sensors, (3) some of the uses and limitations of environmental models, and (4) fundamentals of the distribution of energy at the earth's surface. Students consider the project informative, and they remark that the lab assignment is their all-time favorite. The project is an effective instructional tool.

11:15 ATTITUDES and PERCEPTIONS OF PRE-SERVICE TEACHERS ABOUT USING A TECHNOLOGICAL INSTRUCTIONAL STRATEGY IN TEACHING SCIENCE CONCEPTS, Bonita Flournoy, Bonita Williams and Paulina Kuforiji, Columbus State University, Columbus, Georgia, 31907. Educational technology has demonstrated that it has a significant positive effect on academic achievement. Interactive video is especially effective when the skills and concepts to be learned have a visual component and when the software incorporates a research-based instructional design. Digital Storytelling (DS) revolves around the idea of combining the longstanding art of telling stories with any of a variety of available multimedia tools, including graphics, audio, video animation, and Web publishing. DS has been found to be a useful tool for middle and secondary grade students to document pictorially, orally, and through text, their own stories about science in their lives. It promotes science literacy through the writing process, provides opportunities for technology skill development, and makes learning relevant and meaningful. Students enrolled in undergraduate middle grades science methods and reading courses developed photo stories about topics in science. They were required to include a controversial issue, indicate a point of view, and incorporate sound and graphics. A scoring rubric was used to determine the quality of the photo stories, and an evaluation instrument was administered to identify pre-service teachers' attitudes and perspectives about the use of this method of instruction Results from the Photo Story Usage Evaluation indicated that preservice students thought the photo stories engaged students in science literacy, increased their technological skills and would be useful in middle and secondary grade classrooms in science and other disciplines.

11:30 USING PHOTO STORIES AS A TECHNOLOGICAL INSTRUCTIONAL

MECHANISM TO TEACH SCIENCE INQUIRY IN AN ALTERNTIVE FORMAT MIDDLE GRADES SCIENCE CLASSROOM, Katherine Moultrie*[1], Bonita Flournoy[1] and Teresa Hedger[2], [1]Columbus State University, Columbus, GA 31907 and [2]Veterans Middle School, Columbus, GA 31909. An alternative format classroom, which was composed of all girls, of varying grade levels in a middle school, was taught using inquiry methods. Students were engaged in a thematic unit involving earth and environmental science concepts. As a culminating project students developed Photo Stories, capturing their experiences during the instructional inquiry unit. Data about the learning styles of the students, grades on assessment measures during the unit, and overall experiences of the students were collected and analyzed. Additional units will be developed and implemented to determine if this alternative format of classroom structure, use of inquiry in science, and type of technology will be effective in enriching science understanding of middle grades students.

11:45 EARTHQUAKE ANALYSIS IN AN INTEGRATED LECTURE AND LABORATORY PROJECT, Randal L.N. Mandock, Clark Atlanta University, Atlanta, GA 30314. An integrated earthquake project and laboratory assignment was developed for a core-curriculum earth science course at Clark Atlanta University. A major earthquake is assigned to all sections of the course to familiarize freshman students with how geophysicists at the U.S. Geological Survey (USGS) analyze earthquakes. The students use relations found at the USGS Earthquake Hazards Program page to calculate the different earthquake magnitude types used by earthquake seismologists. They also use the seismic record sections for Western-Hemisphere earthquakes to locate the earthquake epicenter on a map. They apply their knowledge of earth structure and dynamics to understand how and why the earthquake happened. If the earthquake produced a tsunami, the students calculate its wave properties and speed. Students who complete the project become familiar with basic earthquake magnitude calculations, seismic hazard estimates, tsunami wave analysis, and the plate interactions that caused the earthquake. Although the students consider the project quantitatively challenging, the measurements they make teach them about some of the limitations in our knowledge of earth movements.

POSTERS

EXPLORING NEW METHODS OF TEACHING UNDERGRADUATE COLLEGE SCIENCE**, Diandria L. Barber*, Spelman College, Atlanta, GA, 30314. Significant research has been done concerning how students learn at the undergraduate level and the methods teachers use to assist them in learning. Learning environments play a major role in the way students learn, especially in the subject area of science. The aim of this research is to explore different methods of teaching science and the environment that is created when these methods are being used.

Section VIII: Anthropology

Science Center, Room 308
Terry G. Powis, presiding

7:45 THE EVOLUTION OF SOCIAL ORGANIZATION: TESTING CULTURAL HYPOTHESES OF SOCIAL EVOLUTION ON A CAPTIVE *LEMUR CATTA* POPULATION, Vicki Ina F. Gloer*, Kennesaw State University, Kennesaw, GA 30144. A number of evolutionary theories have been advanced based on diet and reproduction needs. This has been particularly true of research into the evolution of social organization in primates. A study was conducted of a captive population of *Lemur catta* residing at Zoo Atlanta in Atlanta, Georgia, to discover if theories regarding the evolution of social behavior are supported in populations where competition for food and mates does not exist. The captive *Lemur catta* could be expected to develop more individualistic behaviors if nutritional and reproductive competition is the primary reason for the development of group living. The results of the study demonstrated that captive *Lemur catta* continue to exhibit social behavior despite the fact that there is no need to compete for limited food resources or potential mates. Recent research into physiological causes for the evolution of social organization in primates may explain these results and further research of captive primate populations is suggested.

8:00 RECONSTRUCTING THE DIET OF *PARAPAPIO JONESI* FROM TWO PLIO-PLEISTOCENE SITES: STERKFONTEIN AND SWARTKRANS, SOUTH AFRICA, Edgar R. Reyes* and Frank L. Williams, Georgia State University, Atlanta, GA 30303. *Parapapio jonesi*, a small baboon-like monkey, is known from the Pliocene cave of Sterkfontein as well as the Pleistocene deposits of Swartkrans. The aim of this study is to establish whether the diet is broadly similar between the two, or whether *Parapapio jonesi* from Sterkfontein (n = 8) and Swartkrans (n = 4) are actually more similar to their counterparts at Sterkfontein (*Parapapio broomi*, n = 7) and Swartkrans (*Dinopithecus ingens*, n = 7) respectively. Diet was inferred by counting dental microwear features, such as small, large and puncture pits, and fine, coarse and hypercoarse scratches, within a 0.4 by 0.4 mm ocular reticle using a low-magnification stereomicroscope (35x) and an external light source. The microwear scars were counted twice and averaged before ANOVA and Least Square Means were calculated. Although ANOVA do not significantly differentiate the four groups, F values greater than one exist for small pits, large pits and fine scratches demonstrating substantial between group variation for these features. Least Square Means show broad similarities for small and large pits, and coarse scratches between the *Parapapio jonesi* specimens from Sterkfontein and Swartkrans. *Parapapio jonesi from* Swartkrans exhibits fewer fine scratches and heavy microwear features than *Pp. jonesi* from Sterkfontein, indicating fewer grasses and hard objects were consumed by the specimens from Swartkrans. If indeed *Parapapio jonesi* from Sterkfontein and Swartkrans represent the same species, then a dietary shift must have occurred as seeds became less abundant and more specialized grass consumers, such as *Dinopithecus ingens*, evolved in the Pleistocene.

8:15 URBAN AND RURAL DIETS OF COLONIAL CHARLESTON: A COMPARATIVE ANALYSIS OF STONO PLANTATION AND THE CITY OF CHARLESTON, Kevin S. Gibbons*, The University of Georgia, Athens, GA 30605. Colonial Charleston, South Carolina, was a thriving market center. Contributing to this were sea island plantations along the coast, such as Stono Plantation (38CH851) on James Island. A sample of the faunal material from excavations at Stono Plantation is analyzed to compare the use of pig and cow both on the sea island plantations and in the larger economic center

of Charleston, including residential areas and the Beef Market. Stono might have contributed cattle and other resources to Charleston, but Charleston was not reciprocating, with the diets on Stono markedly less diverse than their urban counterparts.

8:30 TROUP FACTORY: ARCHAEOLOGICAL INVESTIGATIONS OF A 19TH CENTURY MILL SITE IN SOUTHWEST GEORGIA**, Greg Hansen*, Lindsey Moats* and Patrick Severts, Kennesaw State University, Kennesaw, GA 30144. Troup Factory, the first cotton mill in Troup County, and the second such plant in Georgia, was established in 1846 on Flat Shoals Creek. The mill was in operation throughout the latter half of the century before being relocated to LaGrange. Troup Factory sheetings and homespun were standards of excellence in a widespread area of Georgia, and their use is within the memory of many present-day citizens. The business of the plant was so great that in 1857 a railroad was incorporated for the purpose of handling the products, which was called the LaGrange and Troup Factory Railroad. To date, no research has been carried out on this very important mill site in early Georgia. The purpose of this paper is to document through archaeological survey the physical structural remains of the mill operation and through archival research the land use history. This project was funded by the Department of Geography and Anthropology, Kennesaw State University.

8:45 INDUSTRIAL DENTAL WEAR PATTERNS IN AN ARCHAIC MALE FROM EAST CRETE, GREECE, Katherine Austin*, Jennifer Weber* and Susan Kirkpatrick Smith, Kennesaw State University, Kennesaw, GA 30144. Dental wear patterns can provide information about an individual's occupation and environment. When teeth are used for industrial tasks, specific wear patterns emerge on the teeth over time. This paper presents the case study of an adult male from eastern Crete, Greece, who lived in the Archaic period (ca. 600 BC). His teeth had peculiar heavy dental wear on the mandibular and maxillary incisors. The teeth were worn down to create u-shaped grooves on the occlusal surfaces. Similar dental wear patterns have been documented on individuals who habitually pulled fibrous material through their teeth while weaving or spinning. The analysis of the individual's dental wear shows a wear pattern that suggests that he used his teeth as a form of tool, possibly for domestic household procedures. Funding for this research was provided by a grant from the Center for Excellence in Teaching and Learning at Kennesaw State University.

9:00 PRELIMINARY ARCHAEOLOGICAL EXCAVATIONS AT THE HOLLAND SITE: A LATE WOODLAND PERIOD OCCUPATION IN PAULDING COUNTY, GEORGIA**, Lindsey Moats*, Kong Cheong and Terry G. Powis, Kennesaw State University, Kennesaw, GA 30144. The Woodland Period in Georgia prehistory is transitional between the Archaic (9000-1000 BC) and Mississippian (AD 1000-1550) Periods. The Archaic is viewed as a time of population growth, increased sedentism, and reliance on plant resources while the Mississippian is seen as a time of complex agricultural chiefdoms. While we have a good understanding of the Woodland period in parts of Georgia, there are gaps in the archaeological record. At present, there is a lack of research on the Late Woodland Period (AD 700-900) in central Georgia, specifically Paulding County. This paper focuses on addressing this problem through the excavation of the Holland Site, which has yielded significant diagnostic artifacts and intact cultural features. This information will augment our current understanding and interpretation of this underrepresented time period in Georgia prehistory. This project was funded by the Department of Geography and Anthropology, Kennesaw State University.

9:15 RELATIONSHIPS BETWEEN DENTAL MICROWEAR, ENAMEL THICK-

NESS AND DIET IN EXTANT PRIMATES, Unnati Patel* and Frank Williams, Georgia State University, Atlanta, GA 30320. Tooth enamel thickness is known to vary from one species to the other. However, there is a lack of information about dental enamel thickness within species. Using dental microwear, it is possible to see how enamel thickness would play part in how primates would determine their diet. Theoretically, primates with thicker enamel would exhibit more resistance to hard object perforation, than primates with thinner enamel. In this respect, enamel thickness would have a direct relationship to dental microwear and ultimately to diet. To test this hypothesis, dental microwear was observed in 15 individuals from *Gorilla gorilla* (n = 3), *Pan troglodytes* (n = 2), *Theropithecus gelada* (n = 1), *Papio cynocephalus* (n= 2), *Papio anubis* (n = 2), *Papio ursinus* (n = 2), *Cebus apella* (n =2) and *Pongo pygmaeus* (n = 1) using low-magnification stereomicroscopy with an external and moveable light source. Dental microwear features were counted twice within an 0.4 by 0.4 ocular reticle and averaged. ANOVA and Least Square Means were employed to identify differences per taxon in microwear features. *Cebus apella* demonstrates the most extreme dental microwear, such as hypercoarse scratches and puncture pits, suggesting selection for thick enamel, whereas thin enameled African apes, such as Gorilla and Pan exhibit smaller microwear features, such as small and large pits and coarse scratches. Papio demonstrates a variety of dental microwear features indicating a pronounced diversity of dietary resources. The degree to which enamel thickness corresponds to dental microwear depends on the seasonality and diversity of foods consumed by the living primates.

9:30 MISSISSIPPIAN POLITIES OF THE INTERIOR COASTAL PLAIN**, M. Jared Wood*, University of Georgia, Athens, GA 30602. Mississippian period research in the Southeastern U.S. has traditionally focused on hierarchical social organization. Chiefdoms have been invoked from ethnohistoric accounts in literature; elaborate burials, monumental architecture, and exotic goods from excavations; and assumptions of pan-southeastern phenomena. Recent authors have criticized this approach, suggesting that the key to understanding Mississippian period social organization lies in abandonment of the chiefdom model or acceptance of variation in late prehistoric sociopolitics. To investigate these competing views of Mississippian sociopolitical organization, data from sites in the interior Coastal Plain of Georgia and South Carolina are discussed.

9:45 AN ANALYSIS OF DENTAL ATTRITION RATES AND CARIES IN A LATE MINOAN POPULATION FROM PALAIKASTRO, CRETE, GREECE, Bridget N. Ebeling*, Vicki Ina F. Gloer* and Susan Kirkpatrick Smith, Kennesaw State University, Kennesaw, GA 30144. Dental health is affected by the subsistence patterns of population groups. Attrition patterns and rates of carious lesions from a sample of sixteen individuals from the Late Minoan site of Palaikastro, 1700-1420 BC, were recorded and compared to similar studies of ancient mainland Greeks (3300 BC to 150 AD) and a population from Knossos, Crete (1750-1550 BC). Similarities in the attrition rates and carious lesion rates were found between the populations on Crete more so than with populations from mainland Greece suggesting that the diets in Crete have been relatively steady over time and have differed from the populations of mainland of Greece in the Middle Bronze Age, Mycenaean, and Sub Mycenaean periods. Funding for this research was provided by a grant from the Center for Excellence in Teaching and Learning at Kennesaw State University.

10:00 **Section business meeting**

POSTERS

DIET AND HABITAT RECONSTRUCTION AT SWARTKRANS SOUTH AFRICA USING LOW-MAGNIFICATION STEROMICROSCOPY OF DENTAL MICROWEAR**, Justin Hosbey*, Georgia State University, Atlanta, GA 30302. Stereomicroscopic analysis of dental microwear can provide insight into the dietary patterns of extinct forms and can assist in reconstructing past ecological habitats. At the Pleistocene site of Swartkrans, South Africa, a number of primate fossils have been found alongside the remains of an early hominid, *Australopithecus robustus*. Microwear features, including small and large pits, fine and coarse scratches and puncture pits, were counted twice within a 0.4 by 0.4 mm ocular reticle and averaged. Manipulation of an external light source helped to manifest the microwear scars on the paracone of the second molar. The primates examined represent a cross-section of species found at the Swartkrans site and include *Theropithecus danieli*, *Dinopithecus ingens* and *Papio robinsoni*. These three primates help to reconstruct what kinds of dietary resources were available during this time interval for *Australopithecus robustus* to consume. Bivariate plots show that *Australopithecus robustus* exhibits numerous small pits and nearly every individual examined (n = 8) demonstrates small, medium or large puncture pits suggesting fruit consumption and hard object feeding regularly occurred. The other fossil primates show a diversity of foods was available, but only some of these were exploited consistently by *Australopithecus robustus*.

DIET DIFFERENTATION AND SPECIES ATTRIBUTION AT TAUNG, SOUTH AFRICA INFERRED FROM LOW-MAGNIFICATION OF DENTAL MICROWEAR FEATURES ON FOSSIL PRIMATES, James W. Patterson* and Frank L. Williams, Georgia State University, Atlanta, Georgia 30302. At Taung, where *Australopithecus africanus* was first discovered, a wealth of primate fossils is preserved that bear on the reconstruction of paleoecology at this Plio-Pleistocene site. To pursue an ecological reconstruction of Taung, and to compare diet niche patterns to the attribution of specimens, the dental microwear signals of fossil papionins from Taung, including *Parapapio antiquus* (n = 8), *Papio izodi* (n = 12), and Indeterminate (n = 10) were examined by counting dental microwear features at low-magnification stereomicroscopy (35x) within a 0.4 by 0.4 mm ocular reticle on the paracone of the second molar. The fossils were compared to extant *Papio ursinus*, a savanna dwelling animal. A discriminant function analysis of four dental microwear features clearly separates *Papio ursinus* from fossil taxa on the basis of fine scratches. The Taung specimens all cluster together on the first canonical axis. On the second axis, *Parapapio antiquus* is generally separated from *Papio izodi* from the proportionally greater number of small pits in the former and coarse scratches in the latter. Indeterminate specimens mostly cluster where *Parapapio antiquus* and *Papio izodi* overlap in their diet signal, although TP 12 and TP 14 are well within the range of *Papio izodi*. The Taung primates exhibit relatively large numbers of small pits and coarse scratches indicative of fruit and other arboreal resources, and relatively small numbers of fine scratches associated with grass consumption suggesting a wetter more forested habitat prevailed at Taung than in contemporary southern Africa.

DIET VARIABILITY AMONG *AUSTRALOPITHECUS AFRICANUS* AND *AUSTRAL-*

OPITHECUS ROBUSTUS FROM DENTAL MICROWEAR ANALYSIS, Monica Ponce* and Frank Williams, Georgia State University, Atlanta, GA 30303. Analysis of dental microwear allows for dietary reconstruction in fossil taxa and is applied here to two species of Australopithecus to make inferences on the variability of foods consumed. These two Hominini species include *A. africanus* (n=7), found at the Pliocene deposits of Sterkfontein, and *A. robustus* (n=9) from the Pleistocene cave of Swartkrans. The dental microwear signal of *Parapapio broomi* (n=10) from Sterkfontein and *Dinopithecus ingens* (n=9) from Swartkrans provide evidence for the diets available from these distinct deposits. To investigate potential dietary differences, dental microwear features were examined under low-magnification (35x) stereomicroscopy using a 0.4 by 0.4 ocular reticle and an external light source. Dental microwear features were counted twice on the occlusal surface of the second molar paracone and averaged. Small pits, fine scratches and puncture pits are the features most commonly found in the taxa. Linear regression shows a significant relationship exists only between small pits and fine scratches, while puncture pits are not significantly associated with other microwear scars. Bivariate plots show that *Parapapio broomi* differs from the other taxa on the prevalence of small pits, whereas both Australopithecus taxa show large numbers of puncture pits and fine scratches, and fewer small pits. *Dinopithecus ingens* resembles Australopithecus more than does *Parapapio broomi*. The tremendous variability in the two species of Australopithecus suggest a wide range of foods, including grasses, seeds and terrestrial resources, were exploited despite the availability of forests in the Pliocene, and more open habitats in the Pleistocene. These results largely agree with isotopic evidence of Australopithecus dietary variation.

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