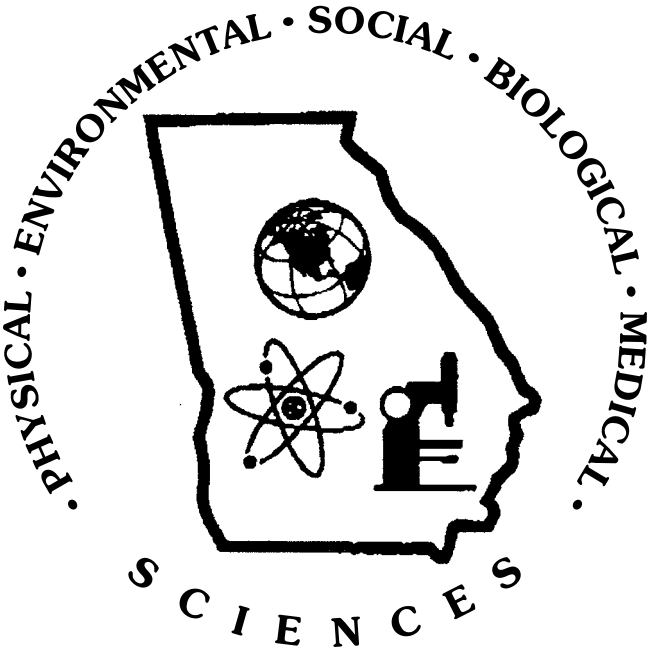


GEORGIA JOURNAL OF SCIENCE

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GEORGIA JOURNAL OF SCIENCE

Volume 69

2011

Number 1

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

Colleagues,

Welcome to the 88th Annual Meeting of the Georgia Academy of Science at Gainesville State College. Dr. Jennifer Mook and Dr. Jeanelle Morgan, Local Arrangements Co-Chairs, along with Dr. Martha Nesbitt, President of Gainesville State College have assembled a program that will be very informative. Our eight Section Chairs, Secretaries and Councilors have received and edited 109 abstracts, Dr. Barry Hojjatie our Technical Program Chair and Dr. John Aliff, our Georgia Journal of Science Editor, have assembled the program in this issue of the Georgia Journal of Science. Our website has been very successful with online registration and annual dues reception.

I have written Dr. Daniel S. Papp, President of Kennesaw State University, accepting his invitation to hold our 89th Annual meeting at their University on March 23 and 24, 2012. Dr. Susan Kirkpatrick Smith and Dr. Terry G. Powis will serve as our local arrangement Co-Chairs.

At this meeting I leave the Office of President of the Georgia Academy of Science and will hand over the reins to the able hands of Dr. Bob Powell, Chair of the Physics Department at West Georgia State University. I have enjoyed my two-year tenure as President and I would like to thank our Executive Council, especially Paul Camp, our Secretary, Mitch Lockhart, our Treasurer, and John Aliff our Georgia Journal of Science for making my job easier. Our Section Officers have done an excellent job in making our program possible and encouraging the growth of the Academy.

We have many challenges ahead of us in this upcoming year. Our foremost challenge is to our commitment to revitalize the Georgia Junior Academy of Science (GJAS). We have begun the process and will continue this year with a new GJAS Constitution and By-Laws. We will soon be contacted area high schools to recruit officers and members.

If you have any questions or suggestions concerning our Georgia Academy of Science, please contact me or any of our Academy Officers.

Respectfully submitted,
Bob McDonough
President
The Georgia Academy of Science

GAINESVILLE STATE COLLEGE
Office of the President



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I am delighted to welcome the Georgia Academy of Science to Gainesville State College for its 2011 annual meeting. Special thanks go to our faculty who invited the Academy and made local arrangements for the conference.

The Academy is to be commended for its mission of promoting science education and fostering scientific research in Georgia, especially at a time when this nation is so far behind other industrialized nations in producing enough scientists or science teachers. I also applaud your efforts of promoting science in the K-12 education system through the Georgia Junior Academy of Science and publication of the Georgia Journal of Science.

We are very proud of our science program here at GSC, including our nationally recognized Institute of Applied Environmental and Spatial Analysis. Our College's motto is "Student-Focused, Learning-Centered," and nowhere is this more evident than in our Departments of Science. Now included in the School of Science, Technology, Engineering and Mathematics, these departments have been institutional leaders in obtaining grants that have both enhanced teaching and also provided outreach activities to our community and region. In 2008, the National Science Foundation named GSC as one of four senior partners in the country designated to promote training of geo-spatial technicians.

Our science faculty members are actively engaged in professional activities in addition to exemplifying outstanding teaching. The College's Eminent Scholar is Professor of Physics, Dr. J.B. Sharma, and several of our science faculty members have been named "Faculty Member of the Year."

I hope you have a most productive conference as you continue your very important work.

Sincerely,

A handwritten signature in black ink that reads "Martha T. Nesbitt". The signature is written in a cursive style.

Martha T. Nesbitt
President



Serving Northeast Georgia since 1964, Gainesville State College is a non-residential unit of the University System of Georgia. The GSC Gainesville Campus, located 45 miles northeast of Atlanta in Oakwood, is easily accessible from I-985 via Exit 17 (Highway 53). It is near beautiful Lake Lanier, the Appalachian Trail, white water canoeing, and the rich multicultural activities of metropolitan Atlanta. The GSC Oconee Campus is located at 1201 Bishop Farms Parkway in Watkinsville, Georgia.

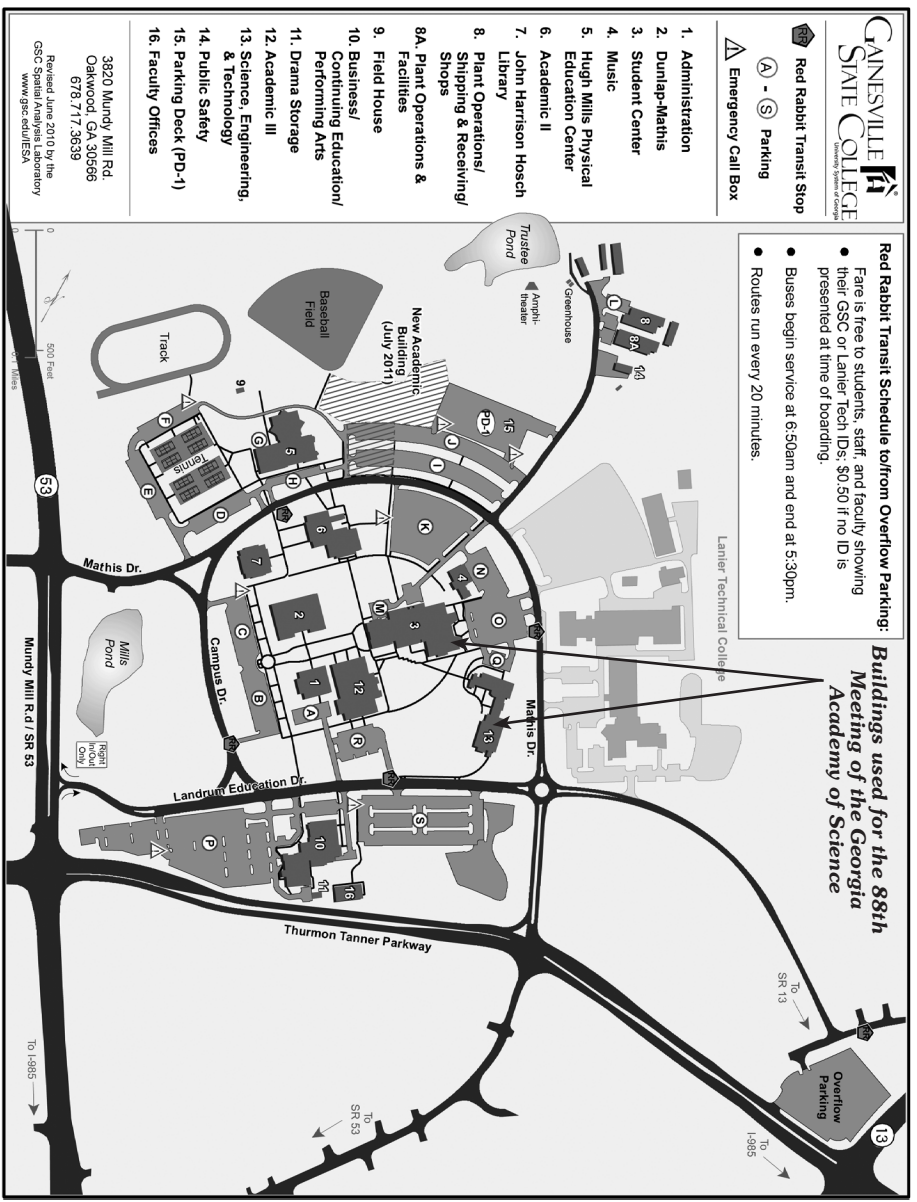
With an enrollment approaching 9,000, Gainesville State College offers courses leading to the Bachelor of Applied Science in Environment and Spatial Analysis, Bachelor of Science in Early Childhood Education for Grades P-5 (Teaching Certification), Bachelor of Science with a Major in Early Childhood Care and Education (Non-Teaching Certification), Bachelor of Applied Science with a Major in Technology Management, Bachelor of Fine Arts in Design and Technology for Theatre, Associate of Arts, Associate of Science, and Associate of Applied Science degrees, in addition to certificate programs in Information Technology, Geographic Information Systems, and Personal Fitness Training. Ninety percent of GSC students are in programs transferable to four-year colleges and universities.

GSC students enjoy the “total college experience” by participating in student activities such as intramurals, clubs and organizations, bands, chorus, publications, cultural affairs programs, fine arts offerings including theatre, extended orientation, and international-intercultural studies programs.

A close relationship with the community has strengthened a comprehensive Continuing Education program, supporting professional and avocational interests of area citizens and reflecting the lifelong learning philosophy of the institution.

www.gsc.edu

GAINESVILLE STATE COLLEGE MAP



GAS PROGRAM

Friday

Registration 11:00 a.m - 4:00 p.m.	Science Building Lobby
Executive Council Meeting - 10:00 a.m.	Student Center Meeting Room 1
Paper Presentations - 1:00-5:15 p.m.	Science Building
Posters - 3:00-5:30 p.m.	Student Center Ballroom
Reception - 6:00-8:30 p.m.	Elachee Nature Center

(The Elachee Nature Center has 13 miles of hiking trails available for your enjoyment during daylight hours!)

Saturday

Registration - 7:30 a.m-10:00 a.m	Student Center Ballroom
Paper Presentations and Posters - 7:30 a.m-12:00 p.m	Science Building and Student Center Ballroom
Plenary Luncheon - 12:00-2:00 p.m	Student Center Commons

GAS 2011 Room Assignments Science Building Meeting Rooms

Meeting Rooms

Biological Sciences	103
Chemistry	312
Earth/ Atmospheric Sciences	201
Physics/Mathematics....	104
Biomedical Sciences	202
Philosophy/History of Science	136
Science Education	173
Anthropology	203

FRIDAY PAPER PRESENTATIONS

*Denotes student presenter

**Denotes student research in progress

Section I: Biological Sciences

Science Building, Room 103

Shane A. Webb, Presiding

- 1:15 POLYMERIZATION OF DENTAL COMPOSITE: LIGHT ANGLE AND MICROSHRINKAGE INFLUENCE ON RESTORATIVE LONGEVITY**, Katie P. Dyer*, Ronnie L. Dyer and Linda G. Jones
- 1:30 THE EFFECT OF XYLITOL ON PERIODONTAL DISEASE-CAUSING *FUSOBACTERIUM NUCLEATUM* SP. *POLYMORPHUM*, Meg Ruth Patterson*, Andrea L. Kwiatkowski and Paul T. Arnold
- 1:45 EFFECTS OF METHAMPHETAMINE ON MICROGLIA ACTIVATION AND DOPAMINERGIC NEURONS IN THE ARCULATE NUCLEUS**, Rick L. Roberts*, Beau Corkill*, Ezra U. Bortner*, Trevor Mott*, Steven A. Lloyd and Ryan A. Shanks
- 2:00 CELL SIGNALING CHARACTERIZATION OF AN *IN VITRO* MODEL OF MICROGLIA ACTIVATION**, Jonathan R. Taylor*, Ryan A. Shanks and Steven A. Lloyd
- 2:15 ISOLATION OF PROTOPLASTS FROM *NEPENTHES***, Jaylen B. Sweat* and Michael S. Bodri
- 2:30 A REVERSIBLE SMOKE-INDUCED SECONDARY DORMANCY IN VENUS FLYTRAP (*DIONAEA MUSCIPULA*) SEED, Timothy Kennel, Jr.*, Chuck Robertson and Michael S. Bodri
- 2:45 ANALYSIS OF ENAMEL HYPOPLASIA IN VIRGINIA OPOSSUMS IN BALDWIN COUNTY, GEORGIA, Ray J. Cornay* and Alfred J. Mead
- 3:00 **Break**
- 3:15 THE EFFECT OF TEMPERATURE ON THE LIFESPAN OF ADULT BEAN BEETLES (*CALLOSOBRUCHUS MACULATUS*)**, Caroline Hanrahan*, Allison D'Costa and Mark Schlueter
- 3:30 THE EFFECT OF FOOD ON ADULT BEAN BEETLE (*CALLOSOBRUCHUS MACULATUS*) SURVIVAL: DOES FEEDING INCREASE ADULT LIFESPAN?**, Christy Morgia*, Allison D'Costa and Mark Schlueter

- 3:45 GOLDEN MOUSE (*OCHROTOMYS NUTTALLI*) AND WHITE-FOOTED MOUSE (*PEROMYSCUS LEUCOPUS*) DIETARY RESOURCE PARTITIONING UNDER EXPERIMENTAL FIELD CONDITIONS, Alexander D. Wright* and Gary W. Barrett
- 4:00 SEASONAL ASSESSMENT OF NATIVE BUTTERFLY, BEE, AND POLLINATING FLY SPECIES RICHNESS IN NORTH GEORGIA APPLE ORCHARDS, Nicholas Stewart* and Mark Schlueter
- 4:15 A PRELIMINARY INVESTIGATION ON THE INFLUENCE OF GALLS ON REPRODUCTIVE EFFORT IN GOLDENRODS**, Brian D. West* and Mark S. Davis
- 4:30 A PRELIMINARY REPORT ON INTERSPECIFIC VARIATION IN CRANIAL ARCHITECTURE AND MANDIBULAR GEOMETRY IN AGABINE (COLEOPTERA: DYTISCIDAE) LARVAL CO-INHABITANTS OF A TEMPORARY HABITAT, Ally Treat*, Jessica Binkowski*, E.H. Barman, W.P. Wall and R.J. Wilkes
- 4:45 **Posters (on display until 5:30)**

Section II: Chemistry
Science Building, Room 174
Ellen W. Moomaw, Presiding

- 2:15 CALCULATED REDOX POTENTIAL OF INHIBITED CYP3A4**, Akash Naik* and Robert W. Zurales
- 2:30 SYNTHESIS AND ANTIMICROBIAL ACTIVITY OF ASPIRIN AND ASPIRIN BASED DERIVATIVES IN SODIUM BICARBONATE**, Ricky B. Sellers* and Cedrick M. Daphney
- 2:45 SYNTHESIS, CHARACTERIZATION AND METHANOLYSIS OF N-ACYLATED ETHANOLAMINE ESTERS, Mary Babb Visscher*, Beau Routh*, Scott Burley*, Kevin P. Gwaltney and John Haseltine
- 3:00 **Break**
- 3:15 CHARACTERIZATION OF IRON (III) OXIDE THIN FILMS DEPOSITED ON CONDUCTIVE SUBSTRATE**, Olivia R. Law* and Linda de la Garza
- 3:30 THE EFFECTS OF SOLVENTS, VISCOSITY, SONICATION AND MULTILAYER CARBON NANOTUBES ON ELECTROSPUN NANO POLYMER FIBERS**, Maher Atteya, Yassin Jeilani*, S. Scott, J. Green, N. Mohamed and I. Khan

3:45 CHARACTERIZATION OF *CERIPORIOPSIS SUBVERMISPORA* BICUPIN OXALATE OXIDASE, Kelsey Uberto*, Eric Hoffer*, Patricia Moussatche, Alexander Angerhofer, Witcha Imaram, Nigel G. J. Richards and Ellen W. Moomaw

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

**Section IV: Physics, Mathematics, Computer Science and Technology
Science Building, Room 104
Andreas Lazari, Presiding**

2:00 DYE-SENSITIZED PHOTOVOLTAIC CELLS USING NATURAL DYES EXTRACTED FROM MONDO GRASS BERRIES**, Victoria Martin*, A DeSilva, J. E. Hasbun, Sharmistha Basu-Dutt and Anne Gaquere

2:15 LOW FREQUENCY OSCILLATIONS IN A PLANAR MATERIAL**, Anton Hud* and Javier E. Hasbun

2:30 VIDEO CAPTURE ANALYSIS OF TOOL USE BY BEARDED CAPUCHIN MONKEYS, Bart Foster* and J.B. Sharma

2:45 INVESTIGATING MAGNETIC PROPULSION FOR USE IN ZERO EMISSION VEHICLES**, Brad Williams*, Michael Rodriguez* and Hauke Busch

3:00 GEOMETRIC HIGHWAY DESIGN USING LIDAR AND ORTHORECTIFIED IMAGERY, Christopher S. Tankersley* and J.B. Sharma

3:15 BALANCING PRECISION VERSES ACCURACY, AND IMPROVING THE EFFICIENCY OF THE ECONOMIC FOOD CALORIMETER**, Christopher Tran*, Sabir Siddique and Mark Schlueter

3:30 MULTI-TEMPORAL LAND USE CHANGE ANALYSIS OF THE ALCOVY WATERSHED FOR PRUDENT ENVIRONMENTAL MANAGEMENT DECISION SUPPORT, James Fitzgerald and Sudhanshu S Panda

3:45 MULTI-TEMPORAL LAND USE CHANGE ANALYSIS OF OCONEE COUNTY, GA FOR DEVELOPMENT SUPPORT AND LAND MANAGEMENT, John Hale and Sudhanshu S Panda

4:00 MONDO GRASS BERRY PIGMENTS FOR DYE-SENSITIZED SOLAR CELLS**, Marc Williams*, A DeSilva, J. E. Hasbun, Sharmistha Basu-Dutt and Anne Gaquere

4:15 EXPERIMENTAL DETERMINATION OF THE TEMPERATURE PROFILE ON A ONE DIMENSIONAL ROD, Matt Herren*, David McCall* and Dr. Tom Colbert

- 4:30 HIGH-PRESSURE PAIR DISTRIBUTION FUNCTION STUDY ON AMPORPHOUS GALLIUM**, Matthew M. Bishop*, Nenad Velisavljevic and Gary N. Chesnut
- 4:45 TWO POSSIBLE GEORGIA TEKTITES FOUND IN BIBB COUNTY, GEORGIA, Paul Scott and Richard Schmude, Jr.
- 5:00 FORMATION OF COLLAPSED TETRAGONAL PHASE IN EU-CO₂AS₂ UNDER HIGH PRESSURE, Matthew Bishop, Walter Uhoya, Georgiy Tsoi, Yogesh K Vohra, Athena S Sefat and Brian C Sales

Section VII: Science Education
Science Building, Room 173
Anil Banerjee, Presiding

- 2:00 EFFECT OF CLASSROOM ACTIVITIES ON STUDENTS' ATTITUDES AND PERFORMANCE, Sandra Rucker
- 2:15 IS GUIDED INQUIRY A BETTER METHOD TO DEVELOP PROCESS SKILLS AND REASONING ABILITIES? Anil C. Banerjee
- 2:30 OPTIMIZING THE *TETRAHYMENA* TOXICANT ASSAY FOR USE IN THE BIOLOGY CLASS SETTING**, Caitlin Cole*, Jesina Elliston, Rachael Fairhurst and Nancy Eufemia Dalman
- 2:45 **Break**
- 3:00 POPULATION HEALTH INDICATORS OF GEORGIA'S COUNTY PRIMARY HEALTH PROFESSIONAL SHORTAGE AREAS, Koosh Desai*
- 3:15 COLLEGE STUDENTS TEACHING PRE-COLLEGE STUDENTS SCIENCE AND MATH: A PROPOSAL FOR A MUTUALLY BENEFICIAL EXPERIENCE THAT PROMOTES THE LEARNING AND TEACHING OF SCIENCE AND MATH**, Juan Mora*, Nastassia Mondesir, Army Lester and Alvin Harmon
- 3:30 THE EFFECT OF A NOVEL CROSS-DISCIPLINARY LABORATORY EXPERIENCE ON SELF-REPORTED LEARNING**, Elizabeth M. Southard*, Laura M. Tarnowski*, Steven Lloyd and Ryan Shanks
- 3:45 BEST PRACTICES FOR IMPROVING RETENTION AND INCREASING THE NUMBER OF MINORITY STEM SCHOLARS TRANSFERRING TO FOUR YEAR INSTITUTIONS, Abe Ojo, Bonita Flournoy, Alvin Harmon and Bryan Mitchell
- 4:00 "SOAP" NOTES AND CASE STUDIES IN HUMAN ANATOMY AND PHYSIOLOGY, John V. Aliff

SATURDAY PAPER PRESENTATIONS

*Denotes student presenter

**Denotes student research in progress

Section I: Biological Sciences

Science Building, Room 103

Shane A. Webb, Presiding

- 8:00 AMPHIBIAN POPULATIONS AND THE INCREASE OF IMPERVIOUS SURFACE IN THE CHICOPEE WOODS AREA OF THE ELACHEE NATURE CENTER IN HALL COUNTY, GEORGIA**, Michelle Cash* and J.B. Sharma
- 8:15 STREAM FISH COMMUNITIES IN IMPACTED HEADWATERS OF THE CHESTATEE RIVER**, Michael Damron*, Melissa Daigle*, Kaleigh Sims*, Chelsea Young* and Thomas A. Nelson
- 8:30 WATER QUALITY IN THE LOWER OCONEE RIVER, GEORGIA**, Jeffrey T. Brittain*, K.M. Manoylov and S. Mutiti
- 8:45 THE EFFECTS OF TIRE CRUMB LEACHATE ON PHAGOCYTOSIS IN TETRAHYMENA**, Jesina Elliston*, Caitin Cole*, Rachael Fairhurst* and Nancy Eufemia Dalman
- 9:00 A COMPARISON OF *ESCHERICHIA COLI* LEVELS IN THE CHATTAHOOCHEE RIVER BETWEEN DROUGHT AND NON-DROUGHT YEARS, Tommy Jackson*, Amanda Smith*, George McMullan*, Ryan Orear*, Robert Fuller and Nancy Eufemia Dalman
- 9:15 EVALUATING RELATIONSHIPS BETWEEN MERCURY CONCENTRATIONS IN AIR AND IN SPANISH MOSS (*TILLANDSIA USNEOIDES* L.)**, Kathryn T. Sutton* and R.A. Cohen
- 9:30 FACTORS RELATING TO GERMINATION AND SEEDLING SUCCESS IN *BAPTISIA ARACHNIFERA***, Timothy J. Estep*, Lissa M. Leege and John Pascarella
- 9:45 DETECTION AND ENUMERATION OF *CHLAMYDIA MURIDARUM* IN TISSUE CULTURE**, A. Stevens*, G. Ananaba and F. Eko
- 10:00 **Section Business Meeting and Election of Officers**
- 10:30 ASSESSMENT OF THE ECOLOGICAL SIGNIFICANCE OF A MALE-INDUCING PHEROMONE IN THE FERN *CERATOPTERIS RICHARDII*, Brian W. Schwartz, R. Chris Moore* and Jodi L. Bosanko*

POSTERS

ESTABLISHMENT, BREEDING, AND MAINTAINANCE OF A ZEBRAFISH (*DANIO RERIO*) COLONY**, Victor Adegbesan* and Alvin C. Harmon

EFFICACY OF INDICATOR ORGANISMS IN PREDICTING HUMAN POLYOMAVIRUS REMOVAL IN A WASTEWATER RECLAMATION FACILITY**, A.J. Beatles*, B.O. Mitchell, A.C. Harmon, M.L. Lowder and V.L. Chivukula

THE VALUE OF SMALL FOREST OPENINGS TO FORAGING BATS**, Lindsay Brotherton* and Thomas A. Nelson

LEAF CARBON:NITROGEN RATIOS AND CHEMICAL DEFENSE IN PLANTS, Sarah Cranston* and Mark S. Davis

ASSESSING TERATOGENIC EFFECTS OF TIRE CRUMB LEACHATES ON FROG EMBRYO DEVELOPMENT**, Rachael Fairhurst*, Jesina Elliston*, Caitlin Cole*, George Dennison* and Nancy Eufemia Dalman

ARGENTINE ANT (HYMENOPTERA: FORMICIDAE) MORTALITY FOLLOWING EXPOSURE TO BORIC ACID, SODIUM BICARBONATE AND SALICYLIC ACID**, Stuart Kelly*, Nathan Baker*, Megan Babb*, Cathy Lee and Mark Brinkman

HABITAT SELECTION AND MOVEMENTS BY RACCOONS AND OPOSSUMS IN NORTH GEORGIA**, Greg Loebick* and Thomas A. Nelson

INITIAL ANALYSIS OF THE HUNTINGTON ASSOCIATED PROTEIN 1 PROMOTER**, Addias Mervin*, Natasha Dixon*, Claire-Anne Gutekunst and Fran Norflus

SERUM ACTIVATION OF MICROGLIA: EFFECTS OF METHAMPHETAMINE**, Stephen D. Milhollin*, Ryan A. Shanks and Steven A. Lloyd

STATISTICAL ANALYSIS OF SINGLE TRANSMEMBRANE CLUSTER OF DIFFERENTIATION PROTEINS, Ashlie K Patterson* and Jonghoon Kang

ILLICIT DRUGS IN WASTEWATER AT AN URBAN WASTEWATER TREATMENT FACILITY AS AN INDICATOR OF DRUG USE**, Denzel Pressey* and Alvin C. Harmon

UNDERSTANDING ALDO-KETO REDUCTASE STEREOSELECTIVITY**, Timothy Simpson*, Brent Feske, Cliff Padgett and Scott C. Mateer

Section II: Chemistry Science Building, Room 174 Ellen W. Moomaw, Presiding

8:30 SYNTHESIS OF CHIRAL *IMINES* AND *AMINES* ON SILICA GEL, Antonija Tangar*, Siddhi Shah and John T. Barbas

- 8:45 NOVEL MACROMOLECULAR-INORGANIC HYBRID SYSTEMS WITH POTENTIAL MULTIFUNCTIONAL FIRE-RESISTANT ACTIVITY, Joshua A. Valencia*, Sergey A. Isarov* and Gregory J. Gabriel
- 9:00 COMPUTER MODELING OF AN INHIBITOR BOUND TO IMPDH**, Alexandra K. Lowery* and Robert W. Zurales
- 9:15 SYNTHESIS OF BORONIC ESTERS ON SILICA, MOLECULAR SIEVES, AND ANHYDROUS SODIUM SULFATE, Vidushi Gupta*, Zach Capland and John T. Barbas
- 9:30 PHOTOCURRENT PRODUCTION OF SURFACE-MODIFIED TITANIUM DIOXIDE FILMS**, Jonathan L. Davis*, Olivia R. Law* and Linda de la Garza
- 9:45 PARAMETERS OF EXPLICIT WATER MOLECULES INCLUDED IN A HYBRID SOLVATION MODEL**, Vishwa Ravleker* and Robert W. Zurales
- 10:00 **Section Business Meeting and Election of Officers**
- 10:30 SYNTHESIS OF 1,13-DICHOLO-5,6,8,9 TETRAAZADIBENZO-ANTHRACENE, HELICAL CONSIDERATIONS, Ayunna Epps, Tonya Horne and Ghislain Mandouma
- 10:45 BIOTRANSFORMATION STUDIES OF ORGANOARSENICALS, Abe A. Ojo
- 11:00 **Posters (Posters will be displayed through 12:00)**

POSTERS

COMPARISON OF ANTIOXIDANT CAPACITY OF VARIOUS COMMERCIAL TEA PRODUCTS, Maria Guzman*, Tyler O'Malley*, Emily Gray* and Chulsung Kim

ENDOCRINE DISRUPTING COUMPOUNDS IN WASTEWATER AT AN URBAN WASTEWATER TREATMENT FACILITY**, Khallil Johnson* and Alvin C. Harmon

PERSONAL CARE PRODUCTS IN WASTEWATER AT AN URBAN WASTEWATER TREATMENT FACILITY**, Wesley Johnson* and Alvin C. Harmon

AN EXPLORATION INTO THE SOLUBILITY AND DISSOLUTION PROFILE OF CAFEINE AS DEFINED BY pH AND SOLVENT AT 37°C USING HPLC AND UV-VIS SPECTROSCOPY**, H. Khan*, K.C. Uberto* and M.C. Koether

THE EFFECTS OF REFRIGERATION ON THE ANTIOXIDANT CAPACITY OF THREE DIFFERENT BERRIES, Sana Shah*, Jason Lee*, Katelyn Bell* and Chulsung Kim

THE STRENGTH OF REDUCING 2,2'-AZINOBIS-(3-ETHYLBENZOTHIA-ZOLINE-6-SULFONIC ACID (ABTS) RADICALS BY VARIOUS COMMERCIAL WINES, Tookie Stalker*, Franco Cavalier*, Rijo Ooman*, Krishan Patel* and Chulsung Kim

Section III: Earth and Atmospheric Sciences
Science Building, Room 201
Donald Thieme, Presiding

- 9:00 THE INFLUENCE OF ABIOTIC FACTORS ON THE TEMPORAL AND SPATIAL PHYTOPLANKTON DISTRIBUTION IN COASTAL GEORGIA, S. Holcomb, M. Gillespie*, J. Brian, R. Etzel and C. Belin
- 9:15 REMOTE SENSING ANALYSIS OF LAND COVER CHANGE THROUGH TIME FOR MEXICO CITY, Alejandro Schwedhelm*
- 9:30 GPR INVESTIGATIONS OF BURIED KARST FEATURES ALONG THE WITHLACOOCHEE RIVER, Jesse Haag*, Can Denizman and Donald M. Thieme
- 9:45 GPR INVESTIGATION OF POSSIBLE UNMARKED GRAVES IN SUNSET HILL CEMETERY, VALDOSTA**, Jason Giddens* and Donald M. Thieme
- 10:00 **Section Business Meeting and Election of Officers**
- 10:30 AN ANALYSIS OF EXTREME TEMPERATURES IN MILLEDGEVILLE, GEORGIA (1910-2009)**, John J. Boncek and Sigfried B. Harden
- 10:45 LATE 20TH CENTURY SOIL EROSION ESTIMATED FROM SHORT CORES IN A SMALL ARTIFICIAL LAKE, Donald M. Thieme and Michael Burton*
- 11:00 TWO POSSIBLE GEORGIA TEKTITES FOUND IN BIBB COUNTY GEORGIA, Paul Scott* and Richard Schmude, Jr.

Section IV: Physics, Mathematics, Computer Science and Technology
Science Building, Room 104
Andreas Lazari, Presiding

- 8:00 DETERMINING PLANCK'S CONSTANT FROM THE PHOTOELECTRIC EFFECT USING LEDs AND LASERS AS LIGHT SOURCES, Max F. Heres*, Bob Powell and Robert Moore
- 8:15 EFFICIENCY INVESTIGATION ON ELECTROLYTIC GEOMETRY AS A FUNCTION OF FLUIDITY FOR PUMP-ABLE BATTERIES**, Max F. Heres*, Matthew Bishop*, Bob Powell and Robert Moore, Jr.
- 8:30 EXPLORING HUMAN ENERGY AND POWER OUTPUT DURING WALKING RUNNING USING GEO-SPATIAL TECHNOLOGY**, Shay A. Dickerson* and J.B. Sharma
- 8:45 THREE DIMENSIONAL WAVE GRADIOMETRY**, Tammy Dencker* and Christian Poppeliers

- 9:00 EFFECTS OF PRESSURE ON SOUND WAVES**, William I. Floyd IV and J.E. Hasbun
- 9:15 ANALYSIS OF MULTI-TEMPORAL LAND USE CHANGE IN JONES COUNTY, GEORGIA FOR PROPER LAND-USE PLANNING DECISIONMAKING**, Zack Phillips, Sudhanshu S Panda and J. B. Sharma
- 9:30 WEB-BASED TOOL FOR MAPPING COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES**, Arvind Shah, Boris Peltsverger and Durgesh Vishen
- 9:45 "LAWS OF NATURE" ARE DESCRIPTIVE, NOT PRESCRIPTIVE, Dennis W. Marks
- 10:00 **Section Business Meeting and Election of Officers**
- 10:30 COMPUTATIONAL MODELS FOR ANALYSIS OF THERMAL CONDITIONING OF LAYERED STRUCTURAL MATERIALS**, Barry Hojjatie, Mathew Vining and Hamid Garmestani
- 10:45 CONVECTION AND EVAPORATION DRIVEN PATTERN FORMATION OF SOLID DEPOSITION CONTROLLED BY A CURVED SURFACE, K. C. Chan
- 11:00 ANALYSIS OF A FRACTIONAL POWER DAMPED OSCILLATOR, Kale Oyedeji and Ronald Mickens
- 11:15 BRIGHTNESS MEASUREMENTS OF JUPITER MADE IN LATE 2010, Richard W. Schmude
- 11:30 DEFECT DETECTION BY ULTRASOUND IN THE POROUS STRUCTURES, APPLICATION TO BIOLOGICAL ORGANS, Hassan Tavossi

POSTERS

CONTROL OF EFFECTIVE PERMITIVITY OF ARTIFICIAL MATERIAL COMPOSED OF METAL BARS, Arun K. Saha

Section V: Biomedical Sciences Science Building, Room 202 Seyed H. Hosseini, Presiding

- 8:30 THE EFFECT OF PRENATAL METHYLPHENIDATE EXPOSURE ON 5CSRTT PERFORMANCE, Heather N. Ivester*, Hillary H. Doyle*, Kayla M. Fann*, Brian K. Phillips, Ryan A. Shanks and Steven A. Lloyd

- 8:45 PRENATAL METHAMPHETAMINE EXPOSURE ALTERS EXECUTIVE FUNCTIONS IN ADULT MICE, Corina I. Oltean*, H.N. Ivester*, H.H. Doyle*, K.M. Fann*, R.A. Shanks and Steven A. Lloyd
- 9:00 **Break**
- 9:15 CXCL4 AND CXCL10 PREDICT RISK OF FATAL CEREBRAL MALARIA, Nana Wilson*, Vidhan Jain, Christina Roberts*, Naomi Lucchi, Pradeep Joel, Mrigendra P. Singh, Avinash Nagpal, Aditya Dash, Venkatachalam Udhayakumar, Neeru Singh and Jonathan K. Stiles
- 9:30 BEHAVIORAL SENSITIZATION IN ADOLESCENT MICE, ** Hillary H. Doyle*, Brittany N. Picou*, Ryan Shanks and Steven Lloyd
- 10:00 **Section Business Meeting and Election of Officers**
- 10:30 ROLE OF CHOLESTEROL AND APOE GENOTYPES IN THE PATHOGENESIS OF PROSTATE CANCER AMONG DIFFERENT POPULATIONS, Godwin O. Ifere, A. Cobb, A. Campbell, A. Amouzou and G. A. Ananaba
- 10:45 *CHLAMYDIA TRACHOMATIS* CRYPTIC PLASMID ANTIGENS IN *CHLAMYDIA* VACCINE DEVELOPMENT, ** A. Campbell*, G. Ifere, E. Ekong, K. Joseph, F. Eko, L. Damelin, G. Zhong, J. Igietseme and G. Ananaba
- 11:00 ANTIMICROBIAL EFFECTS OF HEN EGG ROTATION AND ITS IMPLICATION ON THE BENEFICIAL EFFECTS OF CONTINUOUS LATERAL ROTATION THERAPY**, Chris Wallace*, Chanel French, Army Lester and Virlin Lester

POSTERS

LEPTIN PRO-ANGIOGENIC SIGNATURE IN BREAST CANCER COULD BE LINKED TO IL-1 SIGNALING, Weiqiang Zhou, Shanchun Guo, Corey Gillespie and Ruben R. Gonzalez-Perez

CHEMOPREVENTION OF DMBA-INDUCED MAMMARY TUMORS IN LEAN AND DIET-INDUCED-OBESITY (DIO) MICE BY LEPTIN SIGNALING INHIBITION, Gillespie C, Guo S, Zhou W and Gonzalez-Perez RR

COMPARISON OF MICROARRAY AND MULTIBLOT ANALYSES OF GENE EXPRESSION IN CD77-POSITIVE AND CD77-DEFICIENT BURKITT LYMPHOMA CELLS**, Shayla Thomas*, Leonard Anderson, Marisela DeLeon Mancía and Mark Maloney

METHAMPHETAMINE'S EFFECT ON AGGRESSION IN ADULT MALE MICE USING THE RESIDENT-INTRUDER MODEL**, Laura M. Tarnowski*, Elizabeth M. Southard*, Ryan Shanks and Steven Lloyd

LEPTIN REGULATES VEGF/VEGFR2 IN BREAST CANCER THROUGH STAT3-Rac CROSSTALK**, Miles Fuller, Manzy Byrd, Shanchun Guo and Ruben R Gonzalez-Perez

Section VI: Philosophy and History of Science
Science Building, Room 136
Vivian Rogers-Price, Presiding

- 9:00 THE SOCIAL, ECONOMIC AND ENVIRONMENTAL RAMIFICATIONS OF THE STRIP MINING OF COAL IN CENTRAL APPALACHIA, John V. Aliff
- 9:30 THE ROLE OF PRE-THEORY IN THE CONSTRUCTION OF THEORIES, Ronald E. Mickens
- 10:00 **Section Business Meeting and Election of Officers**
- 10:30 THE EARLY EVOLUTION OF EVOLUTION: DARWIN, HAECKEL AND HUXLEY, Emerson Thomas McMullen
- 11:00 TWENTIETH CENTURY TRENDS IN MIDWIFE TRAINING: SAVANNAH, GEORGIA, Christy M. Crisp
- 11:30 THE LOBLOLLY BAY GORDONIA – A SURVIVOR, Elliott O. Edwards, Jr., Bartram
- 12:00 THE BEGINNINGS OF MODERN SCIENCE, Emerson Thomas McMullen

Section VII: Science Education
Science Building, Room 173
Anil Banerjee, Presiding

- 8:15 AUTHENTIC RESEARCH PROJECTS: PRE-COLLEGE STUDENTS' PERSPECTIVES, Warren Bernard
- 8:30 DYKNOW AND STREAMING AUDIO AND VIDEO: MAKING A COLLABORATIVE CLASSROOM ENVIRONMENT IN CLASS AND OUT, Ken Moss and Luise E. Strange de Soria
- 8:45 GENERAL BIOLOGY AS AN INDICATOR OF STUDENT SUCCESS IN HUMAN ANATOMY AND PHYSIOLOGY I AT A COMMUNITY COLLEGE, Alvin C. Harmon
- 9:00 **Break**
- 9:15 CONDUCTING A SIMULTANEOUS ONLINE AND FACE TO FACE PRESENTATION WITH WIMBA BY EXAMPLE OF THE POPULAR STEM TALKS, Ulrike G. Lahaise
- 9:30 THE EFFECTIVENESS OF A SRA CORRECTIVE READING PROGRAM ON THE CRCT SCORES FOR THE MIDDLE GRADES STUDENTS, Andreas Lazari

- 10:00 **Section Business Meeting and Election of Officers**
- 10:30 FACULTY PERCEPTIONS OF TEACHING IN A GRADUATE ON-LINE DEGREE PROGRAM, Ollie Manley and Gladys Yarbrough
- 10:45 TEACHER TRAINING IN PHYSICS AND PHYSICAL SCIENCE, SECOND GRANT, Bob Powell, Sharon Kirby and Ann Robinson
- 11:00 LACTOSE INTOLERANCE: AN ENGAGING CHEMISTRY LAB FOR NON-CHEMISTRY MAJORS, Michael Sakuta, Teresita Lampe, Vivian Mativo and Melissa Schoene
- 11:15 A COMPARISON OF FMCE RESULTS FOR INTRODUCTORY PHYSICS STUDENTS WITH THE USE OF ILD'S VERSUS COMPUTER-BASED PHYSICS LABS, Julie L. Talbot

**Section VIII: Anthropology
Science Building, Room 203
Terry G. Powis, Presiding**

- 8:30 MODERN SKELETAL POPULATIONS, SECULAR INCREASE IN STATURE, AND PROPORTIONS OF THE LONG BONES OF THE LOWER LIMBS**, Tony Fitzpatrick* and Frank L. Williams
- 8:45 SPATIAL AND TEMPORAL ANALYSIS OF THE CERAMICS AND LITHICS AT THE BURNT VILLAGE, 9TP9**, Vanessa N. Harvey*
- 9:00 EXAMINING TWO METHODS FOR DETERMINING SEASONALITY OF ARCHAEOFAUNAL DEPOSITS FROM THE GEORGIA COAST, USA**, Kathy E. Wiggins*, Carol Colaninno-Meeks and Terry G. Powis
- 9:15 A PROJECTILE TRAUMA: A STUDY OF THE EFFECTS OF BULLETS ON CRANIAL BONE, Donald Michael Weaver*
- 9:30 A CRITICAL ASSESSMENT OF THE HISTORIC EVIDENCE OF BISON IN GEORGIA, Wayne Van Horne
- 9:45 CHERT HUNTING: MODELING PREHISTORIC LITHIC RESOURCE RANGES IN THE NORTHWEST GEORGIA RIDGE AND VALLEY GEOLOGICAL PROVINCE USING GEOGRAPHIC INFORMATION SYSTEMS (GIS)**, Vicki Ina F. Gloer*, Jonathon B. Bruce*, Terry G. Powis and Mario Giraldo
- 10:00 **Section Business Meeting and Election of Officers**
- 10:30 PREDICTING THE PAST: USING PREDICTIVE MODELLING TECHNIQUES TO ASSESS PILGRIMAGE ROUTES IN THE ANCIENT MAYA LANDSCAPE**, Jennifer Weber*

- 10:45 USING TETRACYCLINE TO MEASURE HAVERSIAN SYSTEM FORMATION RATES IN A NUBIAN POPULATION**, Amanda A. Winburn* and George J. Armelagos
- 11:00 AN ANALYSIS OF CHERT DEBITAGE AT THE CHARLES HOLLAND SITE IN PAULDING COUNTY, GEORGIA**, R. J. Gibbs Thompson* and William J. Wilson*
- 11:15 COMPARISON OF AGE-AT-DEATH ESTIMATION METHODS USING DATA FROM A GEORGIA BUREAU OF INVESTIGATION SAMPLE AND THE WILLIAM M. BASS DONATED SKELETAL COLLECTION**, Alice E. Fazlollah*
- 11:30 THE LACY HOTEL SITE: AN EXAMINATION OF A NINETEETH-CENTURY FAMILY IN A RURAL BOARDING HOUSE SETTING**, Melissa Scharffenberg*
- 11:45 EXCAVATIONS OF STRUCTURE 36 AT PACBITUN, BELIZE: RESULTS OF THE 2010 FIELD SEASON**, Robert B. Reece*

POSTERS

CONTEXTUAL HEAVY ALCOHOL USE AMONGST HOMELESS INDIVIDUALS, VETERANS WITH POST TRAUMATIC STRESS DISORDER AND NOTRE DAME STUDENTS**, Mark W. Flanagan*

SMALL FINDS FROM THE CHOOGHA GAVANEH SITE IN THE ISLAMABAD PLAIN, CENTRAL ZAGROS MOUNTAINS, IRAN**, Firoozeh Forouzan*

FRIDAY PAPER PRESENTATIONS

*Denotes student presenter

**Denotes student “in progress” research

Section I: Biological Sciences Science Building, Room 103 Shane Webb, Presiding

1:15 POLYMERIZATION OF DENTAL COMPOSITE: LIGHT ANGLE AND MICROSHRINKAGE INFLUENCE ON RESTORATIVE LONGEVITY**, Katie P. Dyer*, Ronnie L. Dyer and Linda G. Jones, Young Harris College, Young Harris, GA 30582. We propose that the angle of light that induces polymerization of dental composite and inherent composite shrinkage determine the longevity of a dental restoration. Preliminary trials indicated that with ineffective curing angles, fillings had fractures. These results were compared to the control group (autocure composite), which had significantly fewer fractures. We correlated the angle of light focused on the tooth to induce polymerization with the fractures present after the curing process using 40 extracted human teeth (10 control and 10 per experimental group cured at 90, 180, or 225° angles). After drilling a 3 mm deep by 3 mm wide cavity in each tooth, we placed etchant in each cavity which was subsequently washed. Each tooth cavity was painted with a Dentin Primer for 20 s before painting the cavity with SE Bond that was cured using a Plasma Arc light source. For the control group, 3 mm of autocure composite was placed in the cavity and allowed to harden for two minutes. With the remaining 30 teeth, 3 mm of hybrid shade A2 composite was placed in each cavity and cured using the Plasma Arc at the designated angle (90, 180, or 225°) as measured by a protractor. Afterwards, all teeth were sliced, placed in methylene blue for 48 h, and washed. We examined teeth for gaps and fractures using a dissecting microscope. Results are currently being obtained by counting fractures in each experimental group and comparing these with the control.

1:30 THE EFFECT OF XYLITOL ON PERIODONTAL DISEASE-CAUSING *FUSOBACTERIUM NUCLEATUM* SP. *POLYMORPHUM*, Meg Ruth Patterson*, Andrea L. Kwiatkowski and Paul T. Arnold, Young Harris College, Young Harris, GA 30582. *Fusobacterium nucleatum* is an obligate anaerobic, gram-negative bacterium that is known to contribute to periodontal disease. This bacterium is a main component of periodontal plaque due to its abundance and ability to co-aggregate with other species of bacteria in the oral cavity. Xylitol is a five-carbon sugar alcohol sweetener used as a naturally occurring sugar substitute, and is extracted from the fibers of many fruits and vegetables. Xylitol has been shown to inhibit growth of *Streptococcus mutans*, the main periodontal disease-causing bacterium in the oral cavity, at concentrations of 0.01% or higher. The objective of this study was to determine the extent of growth inhibition of *F. nucleatum* caused by varying concentrations of xylitol in culture media. A *F. nucleatum* sp. *polymorphum* culture (taken from the inflamed gingiva of an adult male, ATCC# 10953) was grown anaerobically using BBL Schaedler Broth with vitamin K1. Tubes containing 8 mL of broth at four different xylitol concentrations (0, 1, 2, and 3%) were each inoculated with 100 µL of *F. nucleatum* from the same stock culture. These concentrations correspond to the range of xylitol concentrations reported in the literature from saliva samples of individuals chewing a piece of xylitol gum for 10 min. Tubes were incubated for 30 h at 37°C in an anaerobic chamber using BBL Gas Paks. A Genesys 20 spectrophotometer was used to measure the absorbance in each tube after incubation. Our results indicate that all concentrations of xylitol greater than 1% inhibit growth of *F. nucleatum*.

1:45 EFFECTS OF METHAMPHETAMINE ON MICROGLIA ACTIVATION AND DOPAMINERGIC NEURONS IN THE ARCUATE NUCLEUS**, Rick L. Roberts*, Beau Corkill*, Ezra U. Bortner*, Trevor Mott*, Steven A. Lloyd and Ryan A. Shanks, North Georgia College & State University, Dahlonega, GA 30597. Methamphetamine (METH) induces excessive release of dopamine (DA) leading to oxidative damage and reactive gliosis in several areas of the brain. However, METH's effect on microglia and neurons in the tuberoinfundibular DA pathway is not clear. Alterations of the TI pathway and hypothalamic function have implications for the nervous system and neuroendocrine functioning. Microglia are innate monocytic cells, which phagocytose cellular debris and release inflammatory mediators in response to brain insults. Reactive microglia are morphologically distinct. Their increased number is a hallmark of neuronal toxicity and/or vulnerability. Using lectin histochemistry and image analysis, we observed a decreased number of reactive microglia in the TI pathway after chronic METH exposure in C57Bl/6J mice. Using immunohistochemistry for tyrosine hydroxylase, we will also investigate the effect of chronic METH exposure on the number of dopaminergic neurons in the TI pathway. Finally, we will investigate proinflammatory cytokine signaling alterations in the ventromedial hypothalamus after chronic METH exposure using qPCR analysis of total RNA isolated from fresh brain dissections. Based on preliminary data, we expect to find METH-induced down-regulation of cytokines, which is in keeping with reduced microglia activation, but a lack of effect on DA neuron loss.

2:00 CELL SIGNALING CHARACTERIZATION OF AN IN VITRO MODEL OF MICROGLIA ACTIVATION**, Jonathan R. Taylor*, Ryan A. Shanks and Steven A. Lloyd, North Georgia College & State University, Dahlonega, GA 30597. Understanding the signaling pathways responsible for microglial activation is crucial for the prevention of microglia-enhanced neurodegeneration. Microglia are monocytic-derived immune cells in the central nervous system (CNS) that respond to cellular disruption by phagocytosing cellular debris and producing inflammatory cytokines. Stimulation of specific signaling cascades leads to the activation of microglia and neurodegeneration caused by microglia-induced inflammation. The outer membrane component of gram negative bacteria, lipopolysaccharide (LPS), is commonly used to induce microglia activation in vitro systems. We believe that homogenized mouse brain (HMB) provides a better system to model the in vivo neurodegenerative microenvironment that stimulates microglia. We hypothesize that although both HMB and LPS signal microglia activation, these stimulatory treatments work through different signaling mechanisms ultimately leading to alternative gene expression patterns. Phagocytosis assays will provide a functional assay for microglia activation following specific inhibition of three cornerstone signaling molecules, PKA, PI3 kinase, and protein phosphatases. The 50% inhibitory concentration for each signaling inhibitor will be identified using HMB as a stimulant, and compared to inhibition with LPS. We expect to find significant differences between the signaling mechanisms responsible for LPS and HMB microglial stimulation, indicating potential differences in downstream gene regulation of cytokines. These studies will provide insight into the signaling mechanisms responsible for microglia activation, and identify HMB as an alternative stimulatory model.

2:15 ISOLATION OF PROTOPLASTS FROM *NEPENTHES***, Jaylen B. Sweat* and Michael S. Bodri, North Georgia College & State University, Dahlonega, GA 30597. Protoplasts are plant cells that have been altered by mechanical and/or enzymatic procedures for the purpose of removing the cell wall. This research was aimed at isolating and culturing protoplasts from *Nepenthes* grown and maintained under greenhouse conditions in order to develop a protocol suitable for wild species. Preliminary data was

generated by attempting to liberate leaf mesophyll protoplasts from *N. ampullaria* and the hybrid *N. 'Rokko' Exotica* following surface sterilization of the lamina. Effects of using various concentrations of cellulase, hemicellulase, and pectinase in differing molarities of mannitol or sorbitol were evaluated. The most successful treatment for protoplast isolation from *N. 'Rokko' Exotica* was a 25°C digestion under low light in a 0.5 M sorbitol enzymatic media of 5% Cellulase Onozuka RS + 0.5% Macerozyme R-10 + 0.3% Pectolyase Y-23, shaken gently at 40 rpm for four hours. Our protocol produced an average protoplast yield of 4.35×10^6 / gm of leaf tissue (n=3) of which a mean of 62.1% were viable as determined by fluorescein diacetate (FDA) staining. In an attempt to regenerate plants, varying densities of protoplasts in modified Murashige and Skoog media were cultured by a variety of methods including hanging drops, thin-film alginate, embedding in low melting point agarose, and liquid culture on agarose with differing concentrations of the synthetic plant auxins 2,4-Dichlorophenoxyacetic acid (2,4-D) or picloram and the cytokinin kinetin. The osmotic environment of the media was maintained with sorbitol and sucrose during culture attempts. Subsequent staining with FDA and Calcofluor-white verified cells survived in vitro and regenerated a cell wall. Cell division has not been observed. This plant tissue culture method shows promise for regenerating whole *Nepenthes* plants from these cells and is the basis for ongoing research.

2:30 A REVERSIBLE SMOKE-INDUCED SECONDARY DORMANCY IN VENUS FLYTRAP (*DIONAEA MUSCIPULA*) SEED, Timothy Kennel, Jr.*, Chuck Robertson and Michael S. Bodri, North Georgia College & State University, Dahlonega, GA 30597. The Venus flytrap (VFT), *Dionaea muscipula*, is fire adapted because it can regenerate vegetatively from its rhizome after seasonal fires. Additionally, fire triggers regrowth of VFT after plants have gone dormant when outcompeted for light by other vegetation. Many plants that are fire adapted also have fire adapted seed that only germinate after exposure to smoke, yet VFT seed are quiescent at maturity and germinate almost immediately when exposed to the correct combination of physical environmental factors. Here we show that exposure to smoke induces a secondary dormancy in VFT seed. Smoke-exposed seed exhibited either complete inhibition or a significant delay of germination; however, our results indicate that the smoke-induced, secondary dormancy can be reversed by soaking the seed in a hydrogen peroxide solution or stratifying the seed. Whereas the treatment with hydrogen peroxide resulted in immediate germination comparable to controls, stratification resulted in germination of VFT seed over a prolonged time period. Therefore, we propose that smoke-induced dormancy of VFT seed demonstrates a unique fire adaptation as dormancy would prevent summer germination under potentially adverse conditions and will stagger germination in the spring following winter stratification, allowing seeds to germinate over a wider and more favorable range of environmental conditions.

2:45 ANALYSIS OF ENAMEL HYPOPLASIA IN VIRGINIA OPOSSUMS IN BALDWIN COUNTY, GEORGIA, Ray J. Cornay* and Alfred J. Mead, Georgia College & State University, Milledgeville, GA 31061. Characterized by pits, furrows, or grooves on the surface of teeth, enamel hypoplasia is a permanent record of disturbances that hindered the development of ameloblasts (cells responsible for enamel deposition). These defects are suggested to be the result of physiological stressors that disrupt normal enamel formation. In this study, the mandibles of fifty-seven road-killed opossums (*Didelphis virginiana*) collected from Baldwin County, Georgia, were inspected macroscopically for the presence of enamel hypoplasia. Pits and furrows were noted in 54% of the opossums, most commonly on the buccal surface. Amongst the subset displaying the defect, enamel hypoplasia was observed on 45% of m1's, 68% of m2's, 35% of m3's and 3% of m4's.

No difference was observed in the frequency of occurrence between males and females. Analysis of the order of tooth formation in the Virginia opossum indicates that m1 and m2 are developing at the time of weaning and m3 is developing during post-weaning dispersal. The high frequency of hypoplasia on m1 and m2 suggests that weaning is a time of severe physiological stress in young opossums.

3:00 **Break**

3:15 THE EFFECT OF TEMPERATURE ON THE LIFESPAN OF ADULT BEAN BEETLES (*CALLOSOBRUCHUS MACULATUS*)**, Caroline Hanrahan*, Allison D'Costa and Mark Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. *Callosobruchus maculatus*, commonly referred to as bean beetles or cowpea weevils, are common agricultural pests found in the tropics and subtropics of both Africa and Asia. Bean beetle larvae feed and develop exclusively inside the seeds of legumes (Fabaceae). They have a rapid life cycle that includes a 10-14 day adult stage. During this brief two-week period, adult bean beetles focus solely on reproduction, and it is believed that they may not feed. The main purpose of this study was to determine whether temperature influences the lifespan of the adults. Adult lifespan was monitored at three different temperatures: 25°C, 30°C and 35°C. At each temperature, petri dishes containing whole mung beans and 1-2 virgin males or 1-2 virgin females, or combinations of 1-2 virgin males and 1-2 virgin females were established with five replications per group. To determine the average lifespan at each temperature, beetles will be monitored every 4-8 h, and the time of death of each beetle will be recorded. We hypothesize that colder temperatures will prolong beetle lifespan. In addition, we also hypothesize that temperature will have a greater effect on female lifespan than male lifespan because reproductive activities may have a larger impact on males. Male bean beetles lose up to 10% of their body weight after their first successful reproductive interaction with a female.

3:30 THE EFFECT OF FOOD ON ADULT BEAN BEETLE (*CALLOSOBRUCHUS MACULATUS*) SURVIVAL: DOES FEEDING INCREASE ADULT LIFESPAN?**, Christy Morgia*, Allison D'Costa and Mark Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Bean beetles (*Callosobruchus maculatus*) are common agricultural pests found in the tropics and subtropics of both Africa and Asia. Bean beetle larvae feed and develop exclusively inside the seeds of legumes (Fabaceae). They have a rapid life cycle that includes a 10-14 day adult stage. It is currently believed that adult bean beetles do not feed. The purpose of this study was to determine whether food would influence the lifespan of adult bean beetles. Seven different food treatment groups were tested: 1) no food (control group), 2) whole mung beans, 3) natal beans (mung beans from which adults emerged), 4) naked beans (mung beans without seed coats), 5) prepared fruit fly media (cooked with water), 6) yeast paste, and 7) sugar water. For each food treatment group, Petri dishes were provisioned with 1-2 virgin males, or 1-2 virgin females, or one virgin male and one virgin female. Each combination had five replications. All groups were tested at room temperature in the same light/dark cycle. To determine average beetle lifespan in each food treatment, dishes were observed every 4-8 h until all beetles died. We hypothesize that beetles will live longer in Petri dishes that contain food items.

3:45 GOLDEN MOUSE (*OCHROTOMYS NUTTALLI*) AND WHITE-FOOTED MOUSE (*PEROMYSCUS LEUCOPUS*) DIETARY RESOURCE PARTITIONING UNDER EXPERIMENTAL FIELD CONDITIONS, Alexander D. Wright* and Gary W. Barrett, Eugene P. Odum School of Ecology, University of Georgia, Athens, GA 30602. *Ochrotomys nuttalli* and *Peromyscus leucopus* are two small mammal species that share

similar life histories and body mass. This relationship allows for a high degree of sociality between the two species and extreme niche overlap. We investigated differences in diet preference and daily caloric intake under experimental field conditions based on reported diets for each species in nature to better understand this relationship. Five food resources were provided to 20 adult individuals (10 male, 10 female) of each species for three consecutive days. Individuals were contained in separate covered mesocosm tanks located in a riparian forest ecosystem. The dietary choices were Chinese privet (*Ligistrum sinense*) and Staghorn sumac (*Rhus typhina*) seeds, Water oak (*Quercus nigra*) and White oak (*Quercus alba*) acorns, and Flowering dogwood (*Cornus florida*) fruits. Golden and white-footed mice preferred acorns of *Q. nigra*, and to a lesser extent, acorns of *Q. alba* and fruits of *C. florida*. Although dietary preference did not vary between species, white-footed mice consumed more energy per day than golden mice (0.89 and 0.72 kcal • g⁻¹ live wt, respectively). These caloric values are considerably less (2.38 and 1.48 kcal • g live wt, respectively) than those reported by Gibbes and Barrett (Am. Midl. Natur., in press) when fed identical diets under laboratory conditions. This study was supported in part by funds from the Eugene P. Odum Endowed Chair held by Gary W. Barrett.

4:00 SEASONAL ASSESSMENT OF NATIVE BUTTERFLY, BEE, AND POLLINATING FLY SPECIES RICHNESS IN NORTH GEORGIA APPLE ORCHARDS, Nicholas Stewart* and Mark Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Recent concerns over Colony Collapse Disorder (CCD) in European Honeybee (*Apis mellifera* L.) populations have prompted interest in identifying native insect pollinators which could replace or supplement the dwindling commercial honeybee. In this study, four apple orchards in North Georgia were sampled from early-March through October to determine species presence and density of native flies (Order Diptera) and bees (Superfamily Apoidea). Domesticated apple trees (*Malus domestica* Borkh.) have an earlier flowering period than most other commercial agricultural crops in Georgia, which means fewer pollinator species may be potentially available. In March, prior to the bloom, native pollinator species are present at low initial numbers, marginally increasing until the first blossoms open in early April. Upon flowering, both the diversity and abundance of native pollinator species (especially bees) explode. While calyprate dipteran flies were consistently diverse and abundant throughout the study, hymenopteran (bee) taxa varied in abundance from pre- through post-bloom. Overall, andrenids and apids proved to be the most prevalent of all native bee taxa before and during the bloom, while many halictid bees showed a steady increase over the same period, reaching maximum abundance well after the last apple blossoms had dropped. Syrphid flies were present during the bloom, but like halictid bees, became abundant only later in the season. Butterflies were present, but never in significant numbers. Overall, the most abundant native pollinators available during the apple bloom were bees in the family Andrenidae.

4:15 A PRELIMINARY INVESTIGATION ON THE INFLUENCE OF GALLS ON REPRODUCTIVE EFFORT IN GOLDENRODS**, Brian D. West* and Mark S. Davis, North Georgia College & State University, Dahlonega, GA 30597. Goldenrod galls are conspicuous outgrowths that form in response to insects ovipuncturing plant shoots. Larvae hatch from eggs and release chemicals that induce the shoot to produce a gall-gall tissue serves as food and protection for the developing larvae. We examined the effect of galls on the reproductive output of the native goldenrod *Solidago altissima*. Local populations (Lumpkin County, GA) are attacked primarily by goldenrod rosette gall flies, *Rhopalomyia solidaginis* (DIPTERA: Cecidomyiidae), and goldenrod ball gall flies, *Eurosta solidaginis* (DIPTERA: Tephritidae). These species produce galls that are distinct in appearance. Total inflorescence lengths of galled and ungalled stems were measured in

random samples of three goldenrod populations. Total inflorescence length is a simple indicator of reproductive output because a positive correlation between inflorescence length and seed production has been demonstrated in goldenrods and other plant species. Data were analyzed using a one-way ANOVA followed by a Tukey-Kramer post-hoc test. Galls significantly reduced reproductive output ($F_{2,74} = 51.06$, $P < 0.0001$) and rosette gall flies had more impact on reproduction than ball gall flies. All ungalled stems produced flowers, whereas only 74% of ball-galled stems and 22% of rosette-galled stems produced flowers. Our results are consistent with the negative impact hypothesis which states that herbivory can lead to lowered reproductive success in plants.

4:30 A PRELIMINARY REPORT ON INTERSPECIFIC VARIATION IN CRANIAL ARCHITECTURE AND MANDIBULAR GEOMETRY IN AGABINE (COLEOPTERA: DYTISCIDAE) LARVAL CO-INHABITANTS OF A TEMPORARY HABITAT, Ally Treat*, Jessica Binkowski*, E.H. Barman, W. P. Wall and R. J. Wilkes*, Georgia College & State University, Milledgeville, GA 31061. Mature larvae of *Agabus disintegratus* and *A. punctatus* collected concurrently from the same habitat have the potential of engaging in competition for prey. An analysis of larval crania and mandibles using images and dimensions from a Meiji ML2000 microscope and a National DC3-420T digital microscope with Motic Imaging 2000-1.3 revealed significant differences in cranial architecture. Although both species exhibit equivalent maximum head widths, a narrowing of the distal region of the cranium of *A. disintegratus* results in a significantly ($P < 0.0001$) smaller gape ($\bar{x} = 0.84 \pm 0.03$ mm) than that of *A. punctatus* ($\bar{x} = 0.98 \pm 0.02$ mm). Mandibles of *A. disintegratus* ($\bar{x} = 0.62 \pm 0.03$ mm) are significantly ($P < 0.0001$) shorter than those of *A. punctatus* ($\bar{x} = 0.71 \pm 0.03$ mm) although arcs and angles of attack appear similar. These data indicate that potential competition may be reduced at this site because *A. disintegratus* may exploit a prey regime characterized by a smaller size than of *A. punctatus*. Apparent similarities in mandibular geometric parameters indicate that characteristics of the prey regimes other than size may be similar. This project was supported in part by a Faculty Research Grant, Office of Research Services, GC&SU. Aquatic Coleoptera Laboratory Contribution No.80.

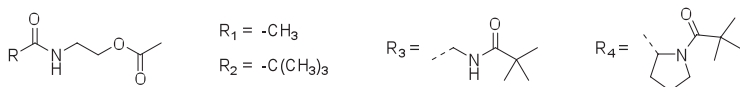
Section II: Chemistry
Science Building, Room 174
Ellen Moomaw, Presiding

2:15 CALCULATED REDOX POTENTIAL OF INHIBITED CYP3A4**, Akash Naik* and Robert W. Zurales, Middle Georgia College, Cochran, GA 31014. The enzyme cytochrome P4503A4 (CYP3A4) metabolizes drugs. The drug ritonavir inhibits CYP3A4, increasing the availability of other drugs. It has been suggested that ritonavir reduces the redox potential of the hemoprotein CYP3A4 and prevents its reduction by its redox partner cytochrome P450 reductase. To test this explanation, we created a small model of the system with an iron ion bound to the four nitrogen atoms of a porphine ring (representing porphyrin IV), the sulfur of a methylthiolate (representing a cysteine side chain), and a thiazole ring (representing a small model of ritonavir). Energies were calculated at BY3LP level of density functional theory using a 6-311G++(2d,2p) basis set.

2:30 SYNTHESIS AND ANTIMICROBIAL ACTIVITY OF ASPIRIN AND ASPIRIN BASED DERIVATIVES IN SODIUM BICARBONATE**, Ricky B. Sellers* and Cedrick M. Daphney, Atlanta Metropolitan College. Aim: To evaluate antimicrobial activity of aspirin and aspirin derivatives against microorganisms *Staphylococcus aureus* and

Escherichia coli. Materials and Methods: Acetylsalicylic acid, (ASA) was synthesized from salicylic acid (SA) and acetic anhydride (AA). Solutions of ASA ranging in concentrations from 3.33 mg ml⁻¹ to 16.8 mg ml⁻¹ were prepared in solutions of 5% sodium bicarbonate (NaHCO₃) and 9% NaHCO₃ respectively. Solutions of ASA in water were also prepared and used as a negative control. The solutions were loaded onto sterile disks that were placed on prepared colonies of *Staphylococcus aureus* and *Escherichia coli*. The bacterial colonies were incubated with the disks for a 24 Hr period. For the *Staphylococcus aureus* samples, antimicrobial activity was observed on the following disks: 5% NaHCO₃ (only), 3.33 mg ml⁻¹ ASA in 9% NaHCO₃, and 7.03 mg ml⁻¹ ASA in 5% NaHCO₃. For the *Escherichia coli* samples, antimicrobial activity was observed on the following disks: 13.3 mg ml⁻¹ ASA in 9% NaHCO₃, 3.33 mg ml⁻¹ ASA in 9% NaHCO₃, 7.03 mg ml⁻¹ ASA in 5% NaHCO₃. Current research is involved with attempting to understand the chemical effects of ASA with NaHCO₃ on both *Staphylococcus aureus* and *Escherichia coli*. Research is also focused on designing, and synthesizing ASA derivatives for the purpose of elucidating antimicrobial activity on different types of bacteria.

2:45 SYNTHESIS, CHARACTERIZATION AND METHANOLYSIS OF N-ACYLATED ETHANOLAMINE ESTERS, Mary Babb Visscher*, Beau Routh*, Scott Burrey*, Kevin P. Gwaltney and John Haseltine, Kennesaw State University, Kennesaw, GA 30144. The synthesis, characterization and methanolysis of N-acylated ethanolamine esters are reported. Acylation was achieved by pyridine-promoted reaction with acetic anhydride. Acylated molecules were characterized using 1H NMR, 13C NMR, and FT-IR spectroscopy. The O-acyl transfer reactivity of the products was studied by using 1H NMR to monitor the rate of methanolysis (deacylation) by N,N-diisopropylethylamine in methanol. Reaction rates were used to determine pseudo-first-order rate constants which between $-1.2 \times 10^{-4} \text{ s}^{-1}$ and $-6.37 \times 10^{-5} \text{ s}^{-1}$ depending on the compound. The ongoing synthesis and analysis of such molecules, especially those containing amino acids, are instrumental in exploring the relationship between long-range constitution and acyl-transfer reactivity. This work is expected to contribute to an understanding of the effects that a protein's constitution has on its fundamental reactivity and mechanisms.



3:00 Break

3:15 CHARACTERIZATION OF IRON (III) OXIDE THIN FILMS DEPOSITED ON CONDUCTIVE SUBSTRATE**, Olivia R. Law* and Linda de la Garza, Valdosta State University, Valdosta, GA 31698. Hematite iron (III) oxide thin nanocrystalline films have become highly desirable for the fabrication of efficient solar cells due to the possibility of efficient energy conversion in the visible range of the electromagnetic spectrum and their potential for the photocatalytic splitting of water for hydrogen gas production that can be used as an alternative, carbon-free energy source. Samples of Fe₂O₃ are obtained through the hydrolysis of iron (III) chloride (FeCl₃) and mixed with a polymer to increase the porosity of the films. Indium doped tin oxide (ITO) on aluminosilicate glass is used as a substrate for films of Fe₂O₃ nanoparticles (Fe₂O₃/ITO) obtained through deposition using a dip-coating method. The Fe₂O₃/ITO slides are heated after each coating and later annealed in an atmosphere saturated with oxygen. The absorbance spectra of the Fe₂O₃/ITO slides are measured before and after deposition and annealing. The slides

are also characterized by their X-ray diffraction patterns. Authors would like to acknowledge the Faculty Research Seed Grant from Valdosta State University for making funds available for this project.

3:30 THE EFFECTS OF SOLVENTS, VISCOSITY, SONICATION AND MULTILAYER CARBON NANOTUBES ON ELECTROSPUN NANO POLYMER FIBERS**, Maher Atteya¹, Yassin Jeilani*², S. Scott³, J. Green⁴, N. Mohamed*¹ and I. Khan⁵, ¹Georgia Perimeter College, Clarkston, GA 30021, ²Spelman College, Atlanta, GA 30310, ³Fort Valley University, Fort Valley, GA 31030, ⁴Southern University at Shreveport, Shreveport, Louisiana 71107 and ⁵Pope High School, Marietta, GA 30062. The PEO-CF (polyethylene oxide- chloroform) charcoal systems gave more electrospun nano fibers with viscosities of moderate values. In general, PS (polystyrene) systems gave more nano fibers than the PEO systems. Sonication before electrospinning led to very few nano fibers. The sonication breaks the morphology and the texture of the multilayer nano tubes. The few nano fibers produced are dispersed over the polymer. This is confirmed by the sonicated but not electrospun Polymer – Solvents systems where the CNT (carbon nanotubes) were found to be broken and dispersed all throughout the polymer. The procedures in this work show the possibilities of producing nanofibers from cheaper systems: Charcoal/polymer (PS and PEO). The nano fibers obtained from charcoal are comparable with those obtained from pretreated carbon; namely carbon nanofibers with multi walls or layers.

3:45 CHARACTERIZATION OF *CERIPORIOPSIS SUBVERMISPORA* BICUPIN OXALATE OXIDASE, Kelsey Uberto*¹, Eric Hoffer*¹, Patricia Moussatche², Alexander Angerhofer², Witcha Imaram², Nigel G. J. Richards² and Ellen W. Moomaw¹, ¹Department of Chemistry and Biochemistry, Kennesaw State University, Kennesaw, GA 30144 and ²Department of Chemistry, University of Florida, Gainesville, FL 32611. Oxalate oxidase catalyzes the oxygen-dependent oxidation of oxalate to carbon dioxide in a reaction that is coupled with the formation of hydrogen peroxide. CsOxOx activity directly correlates with Mn content and other metals do not appear to be able to support catalysis. EPR spectra indicate that the Mn is present as Mn(II), and are consistent with the coordination environment expected from homology modeling with known X-ray crystal structures of oxalate decarboxylase from *Bacillus subtilis*. EPR spin-trapping experiments support the existence of an oxalate-derived radical species formed during turnover. We have determined that acetate and a number of other small molecule carboxylic acids are competitive inhibitors for oxalate in the CsOxOx catalyzed reaction. The pH dependence of this reaction suggests that the dominant contribution to catalysis comes from the monoprotinated form of oxalate binding to a form of the enzyme in which an active site carboxylic acid residue must be unprotonated. This work was funded by the National Science Foundation (MCB-1041912) to EWM.

**Section IV: Physics, Mathematics, Computer Science,
Engineering and Technology
Science Building, Room 104
Andreas Lazari, Presiding**

2:00 DYE-SENSITIZED PHOTOVOLTAIC CELLS USING NATURAL DYES EXTRACTED FROM MONDO GRASS BERRIES**, Victoria Martin*, A DeSilva, J. E. Hasbun, Sharmistha Basu-Dutt and Anne Gaquere, University of West Georgia, Carrollton, GA 30118. Pigment extracted from Mondo Grass (*Ophiopogon japonicas*) is

used to construct a dye-sensitized solid state solar cell of the configuration $\text{TiO}_2/\text{dye}/\text{CuI}$ by adsorbing the pigment from an alcoholic solution of pigment onto a TiO_2 film and deposition of the hole collector p-CuI. The optical and chemical properties of the dye and photovoltaic characteristics of the cell will be presented.

2:15 LOW FREQUENCY OSCILATIONS IN A PLANAR MATERIAL**, Anton Hud* and Javier E. Hasbun, University of West Georgia, Carrollton, GA 30118. When a specific frequency of sound is applied to a planar material, such as a piece of glass, a wave travels along the length of the material. It is possible to vary the sound frequency in such a way to induce resonance. The property of the material to resonate is dependent on the material's Young's modulus, density, and physical dimensions. These are factors that must be taken into account in any theory that explains the vibrational behavior. There already exists a box used for demonstrating this property of planar materials; however, a unifying theory explaining why the material oscillates at the specific frequency has not been put forth. In previous work we developed a 1st order harmonic theory to explain the vibrations we observed. However, the theory lacked generality. We believe that the Euler-Bernoulli beam theory is better suited to explain our observations. In this presentation, we will present our results from the comparison between theory and experiment (Hud and Hasbun, 2010).

2:30 VIDEO CAPTURE ANALYSIS OF TOOL USE BY BEARDED CAPUCHIN MONKEYS, Bart Foster* and J.B. Sharma, Gainesville State College, Gainesville, GA 30503. The purpose of this paper is to analyze the kinematics of the bearded capuchin monkeys of Brazil. These are the first New World primates to have been observed using stone tools. In Brazil, wild bearded capuchin monkeys have been observed using large hammer stones and anvils made of stone or wood to break open nuts, mainly ground palm nuts. The goal of this project is to analyze a short movie clip of a bearded capuchin monkey and determine the kinematics and energetics of the monkey's motion. The work and power output for the attempt will be calculated and analyzed using Logger Pro software. The data will be compared to a study showing how many strikes it takes on average to break a ground palm nut open. This will be used to determine how much work is done on average to break open a ground palm nut. The video clip has been edited using Adobe Premier to stabilize the frames so that all the frames are centered on a common point, greatly reducing the shake in the video.

2:45 INVESTIGATING MAGNETIC PROPULSION FOR USE IN ZERO EMISSION VEHICLES**, Brad Williams*, Michael Rodriguez* and Hauke Busch, Georgia College and State University, Milledgeville, GA 31061. A number of renewable energy sources are available for transportation purposes to build zero emission vehicles. Magnetic propulsion can be used to propel those vehicles in a more efficient way than done with conventional methods. This project investigates the plausibility of using these magnetic forces as a means of efficiently transferring power to a bicycle wheel by applying a magnetic propulsion device to that bicycle. To do this, neodymium magnets are mounted at even intervals around an aluminum bicycle wheel, which is fed through a series of copper coils. A spoke-less rim only wheel is replacing the conventional wheel design. Several bearing and mounting methods are being explored for minimal friction losses and optimal handling of the wheel. In addition several magnetic coils, magnets and control systems are being tested for optimal power transfer to the wheel. The coils will have a current running through them that is alternating in sequence with the rotational velocity of the wheel in order to pull and then push the permanent magnets through the coils. At present the

current will be supplied by a battery mounted on the bike but it is planned that they can be replaced with fuel cells in the future. The GCSU Astronomy and Physics Club is funding this project.

3:00 GEOMETRIC HIGHWAY DESIGN USING LIDAR AND ORTHORECTIFIED IMAGERY, Christopher S. Tankersley* and J.B. Sharma, Gainesville State College, Oakwood, GA 30566. Safety in highway transportation has been an important factor since the automobile was invented in 1885. One major problem is crashes involving curves and/or single vehicles. Hall County has the highest rate in Georgia (per 100 million vehicle miles traveled) in both crashes in curves and crashes involving a single vehicle. This is a function of the hilly terrain of this area and road design that has preceded contemporary highway safety standards. To try and identify why this was happening and possibly find a solution we investigated the geometric design of an accident prone area. Using information from the Department of Transportation involving accident areas, along with Google Earth for coordinates, we were able to use aerial LiDAR images and 2009 NAIP multispectral images to make geometric measurements. With this data, we were able to calculate the actual radius of curvature for horizontal and vertical curves as well as the sight distance at various points. Comparing this to the American Association of State and Highway Transportation Officials (AASHTO) guidelines we were able to tell if, based on the design speed and parameters of the road, whether or not the design is safe. The conclusion we were able to derive was that the speeds on the roads designed before the AASHTO guidelines were implemented are too high and thus unsafe. This project demonstrates the utility of geospatial technology to effectively and economically facilitate safe highway design.

3:15 BALANCING PRECISION VERSUS ACCURACY, AND IMPROVING THE EFFICIENCY OF THE ECONOMIC FOOD CALORIMETER**, Christopher Tran*, Sabir Siddique and Mark Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Food calorimeters are common equipment found in undergraduate laboratories. These instruments allow students to measure calories in food by burning them and measuring the heat produced. How accurate or precise are these instruments? Accuracy refers to how close the calorimeter measures the actual calories of an item, while precision is a measure of consistency or repeatability of the measurements. For some scientific experiments, consistent measurements (precision) are most important; however, in other experiments the measuring the true value (accuracy) of an item is more important. The goal of our study was to determine just how accurate and precise the food calorimeters are. In order to determine precision and accuracy of the food calorimeter, three different types of food (corn pops, popcorn, and cheerios) were measured. In these measurements, we used an unmodified calorimeter and five different styles of modified calorimeters. The five variations of modified food calorimeters were modified in several ways with different types of insulation materials. The results indicated that the insulated calorimeter was more precise and more accurate than the original unmodified calorimeter. The accuracy of unmodified calorimeters was about 42%, while modified calorimeters improved accuracy and precision by more than 20%. The calorimeter modified with insulating tape was significantly more accurate than the naked calorimeter; while calorimeters modified with heavy insulation (thicker) materials showed less accuracy, but much more precise measurements. We found that it is difficult to improve both accuracy and precision at the same time in the economic food calorimeter. If the experimenter desires more accurate results they should use a lightly modified calorimeter, and for more precise they should then utilize the thicker insulated calorimeter.

3:30 MULTI-TEMPORAL LAND USE CHANGE ANALYSIS OF THE ALCOVY WATERSHED FOR PRUDENT ENVIRONMENTAL MANAGEMENT DECISION SUPPORT, James Fitzgerald and Sudhanshu S Panda, Institute of Environmental Spatial Analysis, Gainesville State College, Gainesville, GA 30566. Alcovy watershed in Newton County, GA suffers from poor environmental management practices. The objective of this study was to use advanced geospatial and land-use management techniques to study the environmental degradation in the watershed and propose mitigation measures for the improvement of the watershed environment. NAIP imageries (1-m) of 2005 and 2009 were classified using hybrid classification techniques of ISODATA and Maximum Likelihood Classification algorithms to obtain information about land-use types in the watershed in both years. ArcGIS 9.3's Map Algebra tools were used to analyze the land-use change over these five years. From the classified imagery of 2009 and 2005, the wetlands, upland forest, and urban cover acreage was computed. Then, the change by acres for each was computed along with their spatial locations. Finally, riverine wetlands and bottomland hardwood ecosystems were delineated using the watershed topographic map and STATSGO soil data to locate Tupelo Gum stands (a unique coastal flora seen only in this piedmont watershed) in the watershed with information from Georgia Wildlife Federation. Then, the temporal change results were analyzed and found that Tupelo Gum stand areas were encroached with new urban growth. Prospective remedial majors were suggested and communicated to the watershed management authorities along with the results to save the Tupelo Gum stand in the watershed.

3:45 MULTI-TEMPORAL LAND USE CHANGE ANALYSIS OF OCONEE COUNTY, GA FOR DEVELOPMENT SUPPORT AND LAND MANAGEMENT, John Hale and Sudhanshu S Panda, Institute of Environmental Spatial Analysis, Gainesville State College, Gainesville, GA 30566. Incessant urban sprawl along with underdevelopments create huge environmental hazard. Oconee County, GA has a large amount of unfinished constructions in the last five years that enhances soil erosion and subsequent water quality deterioration. The main objective of the project was to perform a land-use change analysis of the Oconee County to determine the increase in urban sprawl over the last five years (2005 – 2010) and locate unfinished constructions. High resolution, NAIP orthoimageries were collected for 2005 and 2010. The 2-m resolution imagery of 2005 was resampled to 1 m pixel size of 2010 image resolution. Training samples were collected from the unfinished construction sites using Trimble GeoXH GPS instrument and used to classify (supervised) both 2005 and 2010 imageries. In ArcGIS 9.3, Map Algebra tools were used to perform a land-use change analysis. Thus, we obtained the information about the urban growth in the county during these five years including the spatial locations of the unfinished construction sites. The stream network layer for the county was buffered with a distance of 0.25 mile to find unfinished constructions within that distance of a stream. Selection by location tool provided us with the spatial locations of these sites that are contributing for stream water quality deterioration in the county. This result along with proper land management suggestions was communicated to relevant authorities to take precautionary measures.

4:00 MONDO GRASS BERRY PIGMENTS FOR DYE-SENSITIZED SOLAR CELLS**, Marc Williams*, A DeSilva, J. E. Hasbun, Sharmistha Basu-Dutt and Anne Gaquere, University of West Georgia, Carrollton, GA 30118. Pigment extracted from berries of Mondo grass is used to sensitize TiO₂ and construct a dye sensitized photo-electrochemical cell. The photoanode was prepared by forming a TiO₂ Degussa P25 nano-particle (~25 nm) film on a conducting glass substrate. The counter-electrode was

prepared by spraying Chloro-Platinic acid/Isopropyl alcohol solution onto heated FTO glass. Iodide/Triiodide solution is used as the electrolyte. Details of the pigment extraction procedure and photovoltaic characteristics of the cell will be presented.

4:15 EXPERIMENTAL DETERMINATION OF THE TEMPERATURE PROFILE ON A ONE DIMENSIONAL ROD, Matt Herren*, David McCall* and Dr. Tom Colbert, Augusta State University, Augusta, GA 30904. Following the application of a step function in temperature at one end we have measured the temperature profile across an insulated metal rod as it approaches steady state. Measurements were made using a series of thermocouples spaced evenly every ten centimeters across the rod with length of 97.5cm and diameter of 3.6 centimeters. The system was wrapped with three layers of insulation; the inner layer being 1cm wide foam, surrounded by 3.5cm wide fiberglass insulation, and a thin, outer layer of foil for reflection. The insulation layers gave us a good approximation of a one-dimensional model for the temperature profile. The rod was initially set at room temperature. During the experiment we held one end of the rod at a constant 100°C using a steam generator. We observed the changing temperature profile as the rod approached steady state, taking readings at each point every fifteen minutes. We compared the experimental data to predictions from solutions of the one-dimensional heat flow equation. The model shows a good agreement with predicted data when using the diffusivity for carbon steel as $\alpha=1.72 \times 10^{-5} \text{ m}^2/\text{s}$.

4:30 HIGH-PRESSURE PAIR DISTRIBUTION FUNCTION STUDY ON AMPORPHOUS GALLIUM**, Matthew M. Bishop*¹, Nenad Velisavljevic² and Gary N. Chesnut¹, ¹University of West Georgia, Carrollton, GA 30118 and ²Los Alamos National Laboratory, Los Alamos, NM 87545. Gallium, a member of the boron group, is a solid metal that liquefies slightly above room temperature. Widely used in the semiconductor industry for a large range of electronics, there is significant interest in the fundamental electronic and atomic behavior of gallium. Due to the amorphous nature of gallium, the investigation into short and long-range atomic ordering requires pair distribution function analysis in conjunction with x-ray diffraction. Gallium experiences a number of structural phase transitions, which provide information about the behavior of the atomic arrangement, and the influence of electron interplay. Pressure is induced by the utilization of a diamond anvil cell with synchrotron radiation providing intense x-rays for monitoring electronic and atomic behavior. The high-pressure pair distribution function study on amorphous elemental gallium will provide a fundamental understanding of short and long-range atomic ordering, as well as, the electronic and structural phase transitions. Student funding for this research is provided by a Student Travel Award through the University of West Georgia. Additional funding for this research is provided the Department of Energy, contract # DE-AC52-06NA25396. CHESS is supported by the NSF & NIH/NIGMS via NSF award DMR-0936384.

4:45 TWO POSSIBLE GEORGIA TEKTITES FOUND IN BIBB COUNTY, GEORGIA, Paul Scott¹ and Richard Schmude, Jr.², ¹Auburn University, Auburn, AL and ²Gordon College, Barnesville, GA 30204. The author (Paul Scott) found two tektites in Bibb County, Georgia. The larger one had a density of $2.44 \pm 0.02 \text{ g/mL}$ and the smaller one had a density of $2.42 \pm 0.03 \text{ g/mL}$. These densities are similar to those for other tektites which include one from Europe (2.33 g/mL), one from Libya (2.20 g/mL), two from Texas, USA (average = 2.36 g/mL), five from western China (average = 2.39 g/mL), 286 from eastern China (average = 2.43) and 99 Georgia tektites (average = 2.33 g/mL). The two tektites found in Bibb County have a similar color, density and surface texture as tektites from Asia and Australia. It is concluded that these two tektites could be Georgia tektites but in order to verify this claim, more specific forms of analysis must be performed.

5:00 FORMATION OF COLLAPSED TETRAGONAL PHASE IN EuCo_2As_2 UNDER HIGH PRESSURE, Matthew Bishop¹, Walter Uhoya², Georgiy Tsoi², Yogesh K Vohra², Athena S Sefat³ and Brian C Sales³, ¹Department of Physics, University of West Georgia, Carrollton, GA 30118, ²Department of Physics, University of Alabama at Birmingham, Birmingham, AL 35294 and ³Oak Ridge National Laboratory, Oak Ridge, TN 37831. The structural properties of EuCo_2As_2 have been studied up to 35 GPa, through the use of x-ray diffraction in a diamond anvil cell at a synchrotron source. At ambient conditions, EuCo_2As_2 (I4/mmm) has a tetragonal lattice structure with a bulk modulus of 48 ± 4 GPa. With the application of pressure, the a axis exhibits negative compressibility with a concurrent sharp decrease in c-axis length. The anomalous compressibility of the a axis continues until 4.7 GPa, at which point the structure undergoes a second-order phase transition to a collapsed tetragonal (CT) state with a bulk modulus of 111 ± 2 GPa. We found a strong correlation between the ambient pressure volume of 122 parents of superconductors and the corresponding tetragonal to collapsed tetragonal phase transition pressures. MB acknowledges support from the National Science Foundation (NSF) Research Experiences for Undergraduates (REU) site under grant no. NSF-DMR-06446842. The Adanced Photon Source is supported by DOE-BES, under Contract No. DE-AC02-06CH11357. The research sector, HPCAT is supported by DOE-BES, DOE-NNSA, NSF, and the W.M. Keck Foundation.

Section VII: Science Education
Science Building, Room 173
Anil Banerjee, Presiding

2:00 EFFECT OF CLASSROOM ACTIVITIES ON STUDENTS' ATTITUDES AND PERFORMANCE, Sandra Rucker, Clark Atlanta University, Atlanta, GA 30314. We will discuss the implementation of pedagogical strategies designed to enhance students' performance in introductory college mathematics courses. Two calculus courses taught by the same instructor were used for the study. The experimental group used structured peer tutoring groups, and a structured homework design. The control group did not use structured peer tutoring groups or a structured homework design. The study employed a mixed-methods design. Qualitative data consisted of student interviews and an instructor developed attitude survey. Quantitative data included student quizzes. Our results indicate that students' perceptions and performance are enhanced by the use of well-structured peer tutoring groups.

2:15 IS GUIDED INQUIRY A BETTER METHOD TO DEVELOP PROCESS SKILLS AND REASONING ABILITIES? Anil C. Banerjee, Department of Chemistry, Columbus State University, Columbus, GA 31907. A quasi-experimental research design was used to explore whether guided inquiry is a better instructional strategy to develop process skills and reasoning abilities in high school chemistry students. The experimental class of 26 students was enrolled in a year-long high school chemistry course and the class was taught by a teacher with experience on inquiry teaching. Ten guided inquiry labs were used to teach the concepts and develop inquiry abilities. The control group was made of 24 students enrolled in a similar chemistry course from another high school from the same area. The control group was taught by an experienced chemistry teacher using traditional lecture and cook book laboratory methods. A 15-item science inquiry test was

developed and standardized. The items measured laboratory and process skills, and reasoning abilities. Statistical analysis of pre-post test scores indicated both groups improved in process skills and reasoning abilities. However, the pre-post test score difference of the experimental group was statistically significant compared to the control group. The inquiry class also developed better reasoning abilities.

2:30 OPTIMIZING THE *TETRAHYMENA* TOXICANT ASSAY FOR USE IN THE BIOLOGY CLASS SETTING**, Caitlin Cole*, Jesina Elliston, Rachael Fairhurst and Nancy Eufemia Dalman, North Georgia College & State University, Dahlonega, GA 30597. *Tetrahymena pyriformis* are inexpensively grown protozoans commonly used for toxicological tests and in college laboratory courses. *Tetrahymena* feed indiscriminately and external changes, such as toxicant exposure, will alter feeding rate. We refined a currently available *Tetrahymena* phagocytosis protocol and made it more amenable for the classroom. First, *Tetrahymena* were starved for 24 h prior to the experiment, thus increasing feeding rate and allowing the experiment to be completed in a single laboratory period. Second, India ink, the typical food source in this lab exercise, causes differences in both number and size of food vacuoles, which can confound results. Changing the food source from ink to fluorescently coated latex beads enables students to more accurately view the rate of feeding. A bead concentration was established that gave each *Tetrahymena* ready access to 100 beads. In our pilot study, *Tetrahymena* began feeding immediately after beads were provided, and the protozoans were subsequently fixed with Lugol's solution in 15 min intervals. The number of phagocytized beads was counted using a compound microscope, and the feeding rate was determined by graphing the number of food vacuoles formed as a function of time. Further assessment of the technique as an educational tool will be conducted in the introductory biology lab course. Funding was provided by the Center for Undergraduate Research & Creative Activities at NGCSU.

2:45 **Break**

3:00 POPULATION HEALTH INDICATORS OF GEORGIA'S COUNTY PRIMARY HEALTH PROFESSIONAL SHORTAGE AREAS, Koosh Desai*, University of Georgia, Athens, GA 30604. Georgia faces immense primary care physician (PCP) shortages, our State currently ranks 43rd in PCP supply, and with the passing of the Patient Protection and Affordable Care Act, shortages are expected to get even worse. As part of a program to increase supply of primary care providers, the Health Resources and Services Administration designates geographic areas deemed to have shortages of primary medical care as county Health Professional Shortage Areas (HPSAs). Granting HPSA status is the Health and Human Resource's first step to increase physician supply of high primary provider demand areas. Therefore, it is critical to insure HPSA status is appropriately designated to areas with the greatest need for primary care services. In this study, cause-specific mortality and morbidity data of HPSAs were compared to Georgia's rural areas and the State as whole. Using vital statistics and hospital discharge data, various negative health outcome rates were generated for ambulatory care sensitive conditions. These preventive health indicators, assumed to be lower in areas with actual PCP shortages, were shown to be similar for HPSA and rural areas; with rural areas generally showing slightly poorer health. While this data alone cannot rebuke the current system of designation, currently designated county HPSAs of Georgia do not seem to have a greater need for PCP than other areas. Additional investigation is required to further substantiate these results.

3:15 COLLEGE STUDENTS TEACHING PRE-COLLEGE STUDENTS SCIENCE AND MATH: A PROPOSAL FOR A MUTUALLY BENEFICIAL EXPERIENCE THAT PROMOTES THE LEARNING AND TEACHING OF SCIENCE AND MATH**, Juan Mora*¹, Nastassia Mondesir¹, Army Lester¹ and Alvin Harmon², ¹Kennesaw State University, Kennesaw, GA 30144 and ²Atlanta Metropolitan College, Atlanta, GA 30310. The challenge of promoting excellence in science seems to be fueled partially by a lack of quality experiences for our learners, and a lack of trained college students to become life-long teachers. This work proposes that college science students are excellent candidates to teach pre-college students science and math in an outside the classroom experience. Each semester, a group of college students could meet to develop and present a series of hands-on activities to help pre-college students understand science, math and laboratory skills. The high school students would be assisted in developing strategies to master science and math, and to understand how such principles and skills are used to shape society and to achieve academic success. Preliminary indicators suggest that the pre-college students benefit by being exposed to principles and skills that they generally do not experience until they enter college. These students also gain from the repeated exposure to a variety of connected science and math concepts, and by serving as a science teacher, which reinforces what is learned in science and math courses. The greatest benefit of this experience however, might be the impact that this experience has on showing college students that all science students have the potential to become engaged activists in promoting success in science. College students can become teachers of our next generation of learners by going into the classroom as a science teacher or by engaging in the work of the community as a servant leader in science education. It appears that all benefit when our college students are given an opportunity to sharpen their knowledge and skills by teaching others.

3:30 THE EFFECT OF A NOVEL CROSS-DISCIPLINARY LABORATORY EXPERIENCE ON SELF-REPORTED LEARNING**, Elizabeth M. Southard*, Laura M. Tarnowski*, Steven Lloyd, and Ryan Shanks, North Georgia College & State University, Dahlonega, GA 30597. Cross-discipline laboratory experiences create an opportunity for students to gain real-world analytical experience with modern research tools relevant to current scientific questions. Four freshman biology laboratory courses taught by two different instructors were used for this study. The experimental group consisted of two classes (n = 107) who engaged in a novel sequence of cross-disciplinary laboratory experiences involving hypothesis-driven, collaborative experimentation involving podcasted media. This experiment assessed the effects of methamphetamine or saline on aggressive behaviors in a resident-intruder paradigm. The control group (n = 118) participated in a standard sequence of laboratory sessions designed for undergraduate biology students using a non-hypothesis driven design. This lab included collecting, disseminating and analyzing data on yeast fermentation rates and potato cell osmosis. Baseline knowledge as well as students' attitudes toward science were captured via a 21 question modified version of the commonly used self-report instrument called the Student Assessment of Learning Gains (SALG). The SALG was also administered in the week preceding the completion of the standard laboratory sequence (control group) or the novel laboratory sequence (experimental group). Learning gains were assessed for control and experimental groups by comparing pretest to posttest scores using two-way ANOVAs in SPSS.

3:45 BEST PRACTICES FOR IMPROVING RETENTION AND INCREASING THE NUMBER OF MINORITY STEM SCHOLARS TRANSFERRING TO FOUR YEAR INSTITUTIONS, Abe Ojo, Bonita Flournoy, Alvin Harmon and Bryan Mitchell, Atlanta Metropolitan College, Atlanta, GA 30310. At Atlanta Metropolitan College (AMC) we have established the Mathematics, Engineering, Science Achievement (MESA) and the Louis Stokes Alliance for Minority Program (LSAMP) models to assist in increasing the retention of under-represented minorities majoring in STEM areas, as well as those that are transferring to four-year institutions in Georgia and across the United States. One major cornerstone of these models is the Academic Excellence Workshop (AEW). STEM majors from educationally and financially disadvantaged minorities who otherwise have low eligibility rates of going to four year universities are interviewed and selected as MESA and LSAMP scholars. These students must be registered in any of the difficult science and mathematics courses, such as college algebra, pre-calculus, calculus I, general physics I and II and general chemistry to attend the AEW. The AEW utilize peer facilitators or upper level/graduate students to lead the workshops. The MESA and LSAMP scholars must also be registered in a leadership and research course entitled "Topics in Science" (CHEM/BIO/PHYS 2246). In addition, the students must sign a participatory contract to attend the AEW and counseling sessions which are provided weekly. Between 2005 to 2010, one hundred and eight minority STEM scholars matriculated through the combined programs. For both programs, approximately fifty-eight percent of the scholars were retained and thirty-eight percent transferred to four-year institutions. This presentation will discuss the successes, challenges and areas of improvement that have been recorded with both the AMC MESA and LSAMP programs.

4:00 "SOAP" NOTES AND CASE STUDIES IN HUMAN ANATOMY AND PHYSIOLOGY, John V. Aliff, GPC Online, Georgia Perimeter College, Clarkston, GA 30021. When a patient visits medical doctor, the physician writes a SOAP note with the assistance of a nurse. Very general case studies, e.g., "A student has passed out in the hall. How do you aid the student? Explain the disease process involved and the necessary treatment." The case begins with a student request for patient information that is provided by the instructor. S = Subjective reports from the patient (symptoms and patient history): O = Objective observations made by the nurse and physician (vital signs, results of medical tests and imaging that the student determines by research): A = Assessment is a preliminary diagnosis to be confirmed by further testing: P = Plan of treatment. The SOAP note is following by a section describing the "Anatomy and Physiology of the case" and an "explanation of the treatment." Depending on the patient information given, different disease processes can be diagnosed. References follow in GA J SCI form. I have previously reported (Aliff, 2005) that students benefit from case studies.

SATURDAY PAPER PRESENTATIONS

*Denotes student presenter

**Denotes student “in progress” research

Section I: Biological Sciences

Science Building, Room 103

Shane Webb, Presiding

8:00 **AMPHIBIAN POPULATIONS AND THE INCREASE OF IMPERVIOUS SURFACE IN THE CHICOPEE WOODS AREA OF THE ELACHEE NATURE CENTER IN HALL COUNTY, GEORGIA****, Michelle Cash* and J.B. Sharma, Institute of Environmental Spatial Analysis, Gainesville State College, Gainesville, GA 30503. Human population increase has made protecting amphibians and their habitats a critical priority. This study was performed to promote recognition and protection of wetland habitats (and the amphibians they contain) in the Elachee Nature Center of Hall County, Georgia. Approximately 33 species of amphibians are thought to occur in the Hall County area, although no collection records for the actual species present exists. Here we present a spatial model of where particular amphibian species are expected to occur based on habitat and environmental factors, including water chemistry (pH, dissolved oxygen, and phosphate and nitrate levels), expected to impact amphibians. To build the spatial model, four images were classified for land cover using eCognition software. A Quickbird satellite image, and 1999, 2005 and 2007 National Agricultural Imagery Program (NAIP) images were used to establish a geo-spatial database of factors that can effect amphibian populations. Our model was enhanced by sampling and identifying amphibian species at known locations within the Chicopee Woods area. These data were plotted on the Quickbird derived map, and used to produce an expected distribution map for amphibians within the reserve. This study establishes a spatial database for the Elachee Nature Center to conduct continued counts of amphibians, and will hopefully allow analysis of the effects that impervious surfaces are having on amphibian populations.

8:15 **STREAM FISH COMMUNITIES IN IMPACTED HEADWATERS OF THE CHESTATEE RIVER****, Michael Damron*, Melissa Daigle*, Kaleigh Sims*, Chelsea Young* and Thomas A. Nelson, North Georgia College & State University, Dahlonega, GA 30597. Aquatic biodiversity is high in the streams of north Georgia, but this region is experiencing unprecedented exurban growth and urban development. To investigate the relationship between local land use and fish communities in headwater streams, we conducted a two-year study to assess species composition, community diversity, and biotic integrity in 12 headwater tributaries of the Chestatee River in Lumpkin County. Sites were classified as urban, agricultural, or forested based on the predominant land-use in each sub-watershed. We hypothesized that IBI (Index of Biological Integrity) and IWB (Index of Well Being) indices would decline from forested to urban sites. A total of 1,506 fishes of 25 species was processed during the study. Based on a composite of IBI and IWB indices, forested sites were usually scored as fair to good, agricultural sites were highly variable, and urban sites were poor to very poor. Although long-term environmental legacies impact stream communities, our data suggest that increased intensity of local land use alters the composition of stream fish communities, lowering biotic integrity.

8:30 WATER QUALITY IN THE LOWER OCONEE RIVER, GEORGIA**, Jeffrey T. Brittain*, K.M. Manoylov and S. Mutiti, Georgia College & State University, Milledgeville, GA 31061. The Oconee River plays a critical role in the water quality of the Milledgeville-Baldwin County Area. Historically a nutrient-poor river, patterns of nutrient input should be closely monitored as previous work has revealed elevated nutrient levels in the river near a wastewater treatment plant. Monitoring in this area is, therefore, of high priority in safeguarding the drinking water of the region. Twelve sites along the Oconee River and in Lake Sinclair were chemically and biologically surveyed to assess nutrient levels and gain an understanding of the ecological and biological dynamics of the study area. A water quality monitor was used in the field to record water quality parameters. Water samples were also collected for nutrient and chlorophyll testing in the laboratory. Preliminary research found elevated levels of nitrate and ammonia nitrogen being emitted from the wastewater treatment plant, which prompted further investigation into aquatic conditions further upstream and in the lake. Data revealed that there was little variation in nutrient levels among the lake and river sites above the wastewater facility up to the wastewater outfall. Research was carried out over a nine month period during 2010, and is still in progress. Funding for the project was provided by the Georgia College & State University Department of Biological and Environmental Sciences.

8:45 THE EFFECTS OF TIRE CRUMB LEACHATE ON PHAGOCYTOSIS IN TETRAHYMENA**, Jesina Elliston*, Caitin Cole*, Rachael Fairhurst* and Nancy Eufemia Dalman, North Georgia College & State University, Dahlonega, GA 30597. Recycled tire crumbs are used for playground covering and landscaping mulch. Toxic chemicals used during tire manufacturing may leach from the crumbs and enter aquatic ecosystems through rain-water runoff. *Tetrahymena pyriformis* is a ciliated protozoan found in freshwater environments. The species is a model organism for *in vitro* toxicology studies because of its short life span, ease of cultivation, sensitivity to xenobiotics, and visible phagocytosis, which can be used to quantify general health. *Tetrahymena* were exposed for 65 min to leachate made either from new tire crumbs or crumbs weathered outdoors in sunlight for 6 months, or to a saline control (120 *Tetrahymena* per treatment). The rate of phagocytosis was observed during the 65 min period by quantifying the number of fluorescent latex beads (which do not affect health) consumed by each organism at 15 min intervals. ANCOVA analysis showed that the rate of phagocytosis differed significantly among the three treatments ($P < 0.001$). Saline treated protozoans phagocytized a greater number of beads than *Tetrahymena* exposed to either weathered or new tire crumb leachate. Feeding rates of *Tetrahymena* exposed to both leachates were comparable. Our results suggest that leached materials from tire crumbs decrease the rate of phagocytosis in exposed *Tetrahymena* and warrant additional studies of tire crumb leachate effects on other aquatic organisms. Funding was provided by the NGCSU Center for Undergraduate Research & Creative Activities.

9:00 A COMPARISON OF *ESCHERICHIA COLI* LEVELS IN THE CHATTAHOOCHEE RIVER BETWEEN DROUGHT AND NON-DROUGHT YEARS, Tommy Jackson*¹, Amanda Smith*¹, George McMullan*¹, Ryan Orear*¹, Robert Fuller² and Nancy Eufemia Dalman¹, ¹Biology Department and ²Physics Department, North Georgia College & State University, Dahlonega, GA 30597. Recreational river use may increase water-borne bacteria levels by dispersion of sediment-associated bacteria. Studies have been conducted in drought and non-drought years on *Escherichia coli* levels in the Chattahoochee River before and after peak recreational use. Water samples were taken from five recreational sites in the city of Helen, GA and five non-recreational sites in the Chat-

tahoochee National Forest. Samples were collected on days known to have the highest volume of recreational users. Sites were sampled in the morning and evening, before and after peak recreational use, respectively. *E. coli* levels were quantified using the Colilert® Quanti-tray® 2000 system (IDEXX), and the results from 2009 (a non-drought year) were compared with 2007 (a drought year). *E. coli* levels were significantly higher at recreational sites than non-recreational sites for both years. Though samples collected in 2009 exhibited higher *E. coli* levels overall, *E. coli* counts were not significantly different between morning and evening collection periods. In 2007, *E. coli* levels were significantly higher in the evening, after peak recreational use, as compared to morning *E. coli* levels (prior to recreational river use). Evening sampling at recreational sites revealed a correlation between suspended sediments and water-borne *E. coli* levels in 2007, but not in 2009. This dissimilarity between drought and non-drought years suggests that sediment bacteria are more dispersed in the water due to the lower water volume and increased disruption of the sediment in drought years.

9:15 EVALUATING RELATIONSHIPS BETWEEN MERCURY CONCENTRATIONS IN AIR AND SPANISH MOSS (*TILLANDSIA USNEOIDES* L.)**, Kathryn T. Sutton* and R.A. Cohen, Georgia Southern University, Statesboro, GA 30460. Mercury is a potent neurotoxin that is transported globally in vapor form. A major source of mercury contamination to soil, water, and biota is atmospheric deposition. Therefore, comprehensive monitoring of atmospheric concentrations is important. Spanish moss (*Tillandsia usneoides* L.) is a potential bioindicator of atmospheric mercury concentration in the southeastern U.S. because it is an abundant epiphyte that accumulates atmospheric pollutants. In southeastern Georgia we tested the hypotheses that 1) mercury concentration in Spanish moss tissue is affected by atmospheric mercury concentration; and 2) Spanish moss retains mercury over a long period of time. To determine whether Spanish moss tissue mercury concentration differs with proximity to an emission source, we collected Spanish moss from existing populations in locations both near and far from mercury emission sources. In addition, to determine if Spanish moss is temporally integrative, we transplanted Spanish moss saturated with mercury vapor to a field site not impacted by mercury emissions and measured tissue concentration over time. All tissue samples were analyzed for mercury concentration using inductively-coupled plasma mass spectrometry. Preliminary data suggest Spanish moss absorbs mercury rapidly in proportion to external concentration. Thus, if Spanish moss integrates atmospheric mercury it could be a useful addition to existing mercury monitoring protocols. Funding for this project was provided by Georgia Power, Georgia Southern University, and the Irene Burt Boole Botany Scholarship.

9:30 FACTORS RELATING TO GERMINATION AND SEEDLING SUCCESS IN *BAPTISIA ARACHNIFERA*** , Timothy J. Estep*, Lissa M. Leege and John Pasarella, Georgia Southern University, Statesboro, GA 30460. *Baptisia arachnifera* is a federally-endangered plant endemic to a 16 km² range of Wayne and Brantley counties, Georgia USA. Populations of this species have declined by up to 89% in the past 20 years due to land development and forestry practices. Managed pine stands achieve canopy closure quickly, with significant litter build up, and these conditions may limit survival of *B. arachnifera*. Therefore the objectives of this study were to: 1) Determine germination rates of *B. arachnifera* under greenhouse and field conditions; 2) Determine seedling transplant survival under four conditions: a) Open; b) Litter; c) Litter and 70% Shade; d) 70% Shade. Seeds collected from six different locations within the native range were grown in a greenhouse at Georgia Southern University. Seedlings and additional seeds were transplanted into the native range according to the four treatments. Seed

germination was recorded weekly in the greenhouse and monthly elsewhere (along with plant growth). Greenhouse germination in 2010 ranged from 43-64% depending on seed source. In field plots, 8% of seeds germinated and 33% of seedlings remained green from June to October 2010. Early analysis indicates equal success under all conditions. No effects of light or litter on germination and survival were detected, therefore *B. arachnifera* has a good restoration and augmentation potential. Continued monitoring may provide more insight into the effects of shade and litter on long-term survival of reintroduced seedlings. Funding was provided by the Georgia Department of Natural Resources, U.S. Fish & Wildlife Service, Rayonier, the Nature Conservancy, and the Georgia Native Plant Society.

9:45 DETECTION AND ENUMERATION OF *CHLAMYDIA MURIDARUM* IN TISSUE CULTURE**, A. Stevens*¹, G. Ananaba¹ and F. Eko^{1,2}, ¹Department of Biological Sciences, Clark Atlanta University, Atlanta, GA 30310 and ²Department of Microbiology, Biochemistry and Immunology, Morehouse School of Medicine, Atlanta, GA 30310. *Chlamydia trachomatis* is an obligate intracellular pathogen that causes preventable blindness and genital infection. *Chlamydia muridarum* (mouse pneumonitis biovar [MoPn]) is an intracellular bacterial species that at one time belonged to *Chlamydia trachomatis*. However, *C. muridarum* naturally infects only members of the family Muridae, which includes both mice and hamsters. The two strains have the same developmental cycle when they infect their host cell. *Chlamydia* elementary bodies (EBs) attach to the surface of the host cell, enter via endocytosis and become enclosed in a vacuole. The aim of this study is to detect and enumerate *Chlamydia* EBs in tissue culture using immunofluorescence. HeLa cells were grown to 80-90% confluence and infected with MoPn. After 72 hours, cells were fixed with methanol, and stained with fluorescein-conjugated murine monoclonal antibody to identify *Chlamydia* in the tissue culture. To detect and enumerate chlamydial inclusions, the cells were visualized using fluorescence microscopy. The cells containing *Chlamydia* stained and appeared round. The EBs were enumerated and the inclusion forming units were determined. These results indicate that chlamydial inclusions can be detected and enumerated by immunofluorescence. Supported by NIH grants GM08247 and A141231 and MBRS RISE Program-NIH-NIGMS Grant 5R25GM060414.

10:00 Section Business Meeting and Election of Officers

10:30 ASSESSMENT OF THE ECOLOGICAL SIGNIFICANCE OF A MALE-INDUCING PHEROMONE IN THE FERN *CERATOPTERIS RICHARDII*, Brian W. Schwartz, R. Chris Moore* and Jodi L. Bosanko*, Columbus State University, Columbus, GA 31907. The fern life cycle includes a diploid (sporophyte) phase and a haploid (gametophyte) phase. In *Ceratopteris richardii*, gametophytes emerge from haploid spores and develop as either hermaphrodites or males. Within a population, the first gametophyte to germinate will develop as a hermaphrodite in the absence of sex pheromone. The developing hermaphrodite influences neighbors to develop as males by secreting the pheromone antheridiogen. The ecological significance of antheridiogen production by hermaphrodites is not known. Hermaphrodites probably benefit by increasing the likelihood of being fertilized by a male gametophyte, thus increasing the frequency of outcrossing in the population. Alternatively, the sporophyte offspring of hermaphrodites might benefit from reduced competition in the presence of fewer neighbors because adjacent male gametophytes would produce only sperm. Here we report the results of experiments that examine the ability of gametophytes and sporophytes to produce antheridiogen. Our results indicate that young sporophytes produce antheridiogen at levels

comparable to hermaphroditic gametophytes. This result suggests that antheridiogen is used at least in part to reduce competition by reducing sporophyte numbers. On the other hand, the distance limitation of a hermaphrodite's ability to induce male development in neighbors does not exceed the distance limitations of males to fertilize hermaphrodites, suggesting that antheridiogen is also important for increasing fertilization and outcrossing.

POSTERS

ESTABLISHMENT, BREEDING, AND MAINTAINANCE OF A ZEBRAFISH (*DANIO RERIO*) COLONY**, Victor Adegbesan* and Alvin C. Harmon, Atlanta Metropolitan College, Atlanta, GA 30310. Zebrafish (*Danio rerio*) are being used in an increasing variety of research. This species provides easy access to all developmental stages, the embryos are transparent, and the larvae are useful for examining developing pathologies. Additionally, zebrafish are an economically cheaper model organism than their rodent counterparts. In the current study, we will develop, breed, maintain and examine zebrafish embryos and adults. The purpose of this study is to establish a colony for use as a research model to examine the impact of personal care products, endocrine disrupting compounds and illicit drugs on an aquatic vertebrate. This project is supported by the National Science Foundation-Georgia Louis Stokes Association for Minority Participation.

EFFICACY OF INDICATOR ORGANISMS IN PREDICTING HUMAN POLYOMAVIRUS REMOVAL IN A WASTEWATER RECLAMATION FACILITY**, A.J. Beatles*, B.O. Mitchell, A.C. Harmon, M.L. Lowder and V.L. Chivukula, Atlanta Metropolitan College, Atlanta, GA 30310. Human population increases necessitate the augmentation of natural water resources with reclaimed wastewater. Used typically for non-potable purposes, reclaimed water has a potential to cause diseases if not effectively treated. Thus, wastewater reclamation facilities should have adequate controls in place to protect the public from exposure to pathogens. Compliance of the treatment efficacy is based on determining the presence of indicator organisms (IO) as pathogen enumeration is not only laborious and time consuming but also practically impossible. Previous studies have shown poor correlation between IO and pathogenic viruses in the environment. This study will determine the correlation between IO, specifically fecal coliform and enterococci, and human polyomaviruses, pathogens that can cause diseases of the respiratory and urinary tracts, especially in immunocompromised patients. Water samples will be collected from the influent and effluent sites of an urban wastewater treatment facility. The facility used for this study includes primary treatment, secondary treatment including aeration basins and clarifiers, sand filters and UV disinfection. The samples will be filtered through a 0.45 μ m membrane filter and placed on mFC and mEI media to enumerate the fecal coliform and enterococci respectively. Water samples will be adjusted to pH 3.5, filtered through the membrane filter, processed for extraction of DNA, amplified by PCR, and the presence of human polyomaviruses will be determined using electrophoresis. The efficiency of IO to predict the presence of human polyomaviruses will be determined by statistical analysis. This study is funded by the Louis Stokes Alliance for Minority Participation and NASA.

THE VALUE OF SMALL FOREST OPENINGS TO FORAGING BATS**, Lindsay Brotherton* and Thomas A. Nelson, North Georgia College & State University, Dahlonega, GA 30597. Understanding species-habitat relationships is critical for maintaining biodiversity and conserving threatened species. Until recently, little was known about the use of foraging habitats by insectivorous bats. However, new techniques of acoustic monitoring suggest that bat communities may include closed canopy specialists, gap special-

ists, and gap incorporators. We analyzed the patterns of habitat use by foraging bats at Hurricane Creek Biological Research Station (Lumpkin County, GA) using ultrasound recorders and acoustical software. We tested two hypotheses: (1) That richer patches of prey, expected in riparian areas and forest openings, have higher overall abundance of bat foraging, and (2) That the species composition of foraging bats would differ between small forest openings and linear stream zones. We will compare the overall abundance of foraging bats, relative occurrence of each bat species, and relative abundance of insects in three habitats (stream zones, closed canopy pine plantations, and forest openings) weekly from June through September, 2010, using ANOVA and chi-square tests. Species commonly recorded during the study included red bats (*Lasiurus borealis*), eastern pipistrelles (*Perimyotis subflavis*), and several *Myotis* species.

LEAF CARBON:NITROGEN RATIOS AND CHEMICAL DEFENSE IN PLANTS, Sarah Cranston* and Mark S. Davis, North Georgia College & State University, Dahlonega, GA 30533. We investigated the relationship between nutrient level and chemical defense in plants. Forage plants might be desirable to herbivores because of higher nitrogen content, and therefore a lower carbon : nitrogen (C:N) ratio. Leaves of ten plants from each of three toxic species (butterfly weed, spotted water hemlock, dog hobble) and three non-toxic species (goldenrod, joe-pye weed, muscadine) were collected, washed, blotted, and then dried for 36 h at 50o C. Dried samples were bagged, assigned a numerical code for identification, and sent to the Stable Isotope/Soil Biology Laboratory at the University of Georgia for C:N ratio determination. Leaves from each plant were homogenized to talcum powder consistency (< 250 µm), and percent carbon and percent nitrogen levels (per mg of dried homogenized leaf tissue) were determined by blind observers using the Micro-Dumas Combustion method. C:N ratio data were analyzed using a nested (hierarchical) ANOVA with species nested within toxic and nontoxic groups. We found no significant difference in C:N ratio between toxic and nontoxic plants ($P=0.81$) and conclude that chemical defense in these plants is not associated with higher leaf nitrogen content.

ASSESSING TERATOGENIC EFFECTS OF TIRE CRUMB LEACHATES ON FROG EMBRYO DEVELOPMENT**, Rachael Fairhurst*, Jesina Elliston*, Caitlin Cole*, George Dennison* and Nancy Eufemia Dalman, North Georgia College & State University, Dahlonega, GA 30597. There is growing concern over the environmental safety of recycled tire crumb usage in playgrounds and landscapes. Rain water runoff from tire crumbs may increase the amounts of toxicants in aquatic habitats. A FETAX (Frog Embryo Tetragenesis Assay) test with *Xenopus laevis* embryos was conducted using tire crumb leachates made from black playground-grade tire mulch (non-weathered) and also in leachate made from mulch exposed to environmental conditions for 6 months (weathered). The leachates were prepared at 24°C in order to simulate typical Georgia springtime weather. Embryos exposed to the non-weathered crumb leachate had a 47.5% survival rate and a 7.5% malformation rate while embryos exposed to the weathered crumb leachate had a 37.5% survival rate and a 32.5% rate of malformations. By contrast, the control saline solution produced a 65% survival rate and a 7.5% malformation rate. In addition to a higher overall malformation frequency, embryos incubated in weathered leachate showed more serious malformations, such as eye abnormalities, blisters and stunted body structure, than embryos incubated in the non-weathered leachates or saline solution. Taken together, these results suggest that tire crumb leachates possess compounds that are teratogenic to *X. laevis* embryos.

ARGENTINE ANT (HYMENOPTERA: FORMICIDAE) MORTALITY FOLLOWING EXPOSURE TO BORIC ACID, SODIUM BICARBONATE AND SALICYLIC ACID**, Stuart Kelly*, Nathan Baker*, Megan Babb*, Cathy Lee and Mark Brinkman, Gordon College, Barnesville, GA 30204. The Argentine ant, *Linepithema humile* (Mayr), is an exotic species that has become an important pest in the United States. Safe methods of Argentine ant control are needed for household use. The mortality response of worker ants to an untreated control, boric acid, sodium bicarbonate, and salicylic acid (crushed aspirin), was evaluated by laboratory bioassay. Ants were housed in 708 ml plastic containers during the experiments. All three chemicals were tested as solids at 3.53 g/cm². Salicylic acid was also tested in 10% sucrose bait solution at 0.675, 1.25, 2.5, and 5% (pH adjusted to 4.6-4.9). Three replicates of 20 ants were used in each treatment. Mortality was measured as the percentage of worker ants that had died within 72 h post-exposure. Mortality of workers exposed to the control, boric acid, sodium bicarbonate, and salicylic acid crystals, was 14%, 33%, 0%, and 82%, respectively. Mortality of workers exposed to salicylic acid dissolved in 10% sucrose bait solution was 15, 47, 37, 22, and 87%, respectively, ranked from lowest (control) to highest exposure concentration. In future tests, internal ant pH will be measured to determine potential physiological shifts in hydrogen ion concentration as a result of exposure to salicylic acid. If salicylic acid can be developed as an effective method for controlling Argentine ants in households, it may be a safe alternative to nerve poison insecticides.

HABITAT SELECTION AND MOVEMENTS BY RACCOONS AND OPOSSUMS IN NORTH GEORGIA**, Greg Loebick* and Thomas A. Nelson, North Georgia College & State University, Dahlonega, GA 30597. Raccoons (*Procyon lotor varius*) and opossums (*Didelphis virginiana*) are sympatric and apparent competitors throughout most of the eastern U.S. Both species are nocturnal and use similar habitats, dens, and foods. During the past 20 years, raccoon populations have increased dramatically throughout their range. The competitive exclusion principle predicts this increase in raccoons should cause a displacement of opossums, and yet surveys suggest that opossum populations have changed little during this period. We are radio-tracking individuals of both species on the Hurricane Creek Biological Research Station in Lumpkin County, GA, to investigate whether habitat partitioning allows these species to coexist in a non-competitive manner. To date, six individuals of each species have been tracked and located repeatedly to quantify niche breadth and overlap in winter foraging habitat, nest site use, and movement pathways.

INITIAL ANALYSIS OF THE HUNTINGTON ASSOCIATED PROTEIN 1 PROMOTER**, Addias Mervin*¹, Natasha Dixon*¹, Claire-Anne Gutekunst² and Fran Norflus¹, ¹Clayton State University, Morrow, GA 30260 and ²Emory University, Atlanta GA 30322 (*contributed equally). Huntington disease (HD) is a polyglutamine repeat expansion disease that tends to develop in mid-life. The Huntington associated protein 1 (HAP1) gene, one of the first genes to be directly associated with HD, plays an important role in the development of the disease. The coding sequence (i.e. reading frame) of the HAP1 gene is accessible through the National Center for Biotechnology Information website. The focus of this work is to experimentally locate the HAP1 promoter. By inserting segments of DNA upstream to the HAP1 start codon into a vector (pEGFP-C1) that contains the green fluorescent protein (GFP) reporter gene, the location of the HAP1 promoter will be determined. Toward this end PCR primers will be designed to amplify potential promoter regions of various sizes. The plasmid and amplified DNA will be digested with compatible restriction enzymes, ligated, and transformed into competent *E. coli*. GFP expres-

sion levels will be quantified following transformation. Fluorescent colonies will contain a plasmid with a promoter able to drive the expression of GFP, while non-flourescent cells must lack a functional promoter. Comparisons of these two classes of outcomes will provide evidence as to the location of the HAP1 core promoter. This work was funded by a linkage fellowship from the Minorities Affairs Committee of the American Society of Cell Biology.

SERUM ACTIVATION OF MICROGLIA: EFFECTS OF METHAMPHETAMINE**, Stephen D. Milhollin*, Ryan A. Shanks and Steven A. Lloyd, North Georgia College & State University, Dahlonega, GA 30597. Methamphetamine (METH) abuse is a rapidly growing problem in today's society and is linked with a multitude of damaging effects, both physiological and behavioral. METH abuse is damaging to the central nervous system (CNS), and distinct changes are observed in localized regions of the brain. The CNS is considered an "immune privileged" structure, and is partitioned from leukocytes and inflammatory cytokines by the blood-brain barrier (BBB). Although the BBB naturally protects the CNS from infectious agents in the blood, METH is shown to increase the permeability of the BBB. The potential arises for a diverse array of molecules to infiltrate the CNS due to inflammatory responses elicited by METH both systemically and in the brain. Microglia are the CNS equivalent of systemic macrophages; however, when activated, microglia may initiate, exacerbate, and perpetuate METH neurotoxicity. Our study utilizes an *in vitro* model to assess the effects of METH on intrinsic serum factors and subsequent microglial activation from these factors. A ten-day dosing paradigm modeling chronic METH exposure was implemented using C57/B16/J mice. BV-2 cell cultures, immortalized microglia cell lines which maintain and model microglial function, were treated with sera from METH and saline treated animals. Subsequent microglial activation was evaluated by measuring phagocytic activity. We hypothesize that intrinsic serum factors in METH treated animals will directly and differentially influence the phagocytic activity of BV-2 microglia cells. These data will help further elucidate the mechanisms by which METH-induced neurotoxicity arises by considering upstream BBB breakdown and the direct serum activation of microglia.

STATISTICAL ANALYSIS OF SINGLE TRANSMEMBRANE CLUSTER OF DIFFERENTIATION PROTEINS, Ashlie K Patterson* and Jonghoon Kang, Valdosta State University, Valdosta, GA 31698. Cluster of Differentiation (CD) molecules are leukocyte cell-surface proteins that each have a specific role in the functioning immune system. There are approximately 370 CD molecules listed within the UniProt protein knowledge database. Of the proteins listed, 281 span the cell plasma membrane one time, and are termed single transmembrane proteins. Because the amino acid sequence of a protein determines its function, statistical analysis of amino acid sequences can provide insight into functional relationships among proteins. We examined the correlation between domain lengths (extracellular/transmembrane/cytoplasmic) and total length of Type I (N-terminus extracellular) and Type II (C-terminus extracellular) single transmembrane proteins in order to determine the contribution of each domain to total length. Type I and Type II proteins were found significantly different in their structural organization. Extracellular, transmembrane and cytoplasmic regions contribute differently to overall length between the two protein types as determined by Pearson correlation. In the case of Type II proteins the extracellular region was found to be the only contributor to size variation while total variation for Type I proteins is attributed to extracellular and cytoplasmic regions respectively. We expect this study to promote further quantitative research on CD proteins to identify unique amino acid sequence characteristics and relate them to the functional characteristics of the protein. This work was supported by a Valdosta State University Reassigned Time Fund grant to J. Kang.

ILLCIT DRUGS IN WASTEWATER AT AN URBAN WASTEWATER TREATMENT FACILITY AS AN INDICATOR OF DRUG USE**, Denzel Pressey* and Alvin C. Harmon, Atlanta Metropolitan College, Atlanta GA 30310. Illicit drug use is not uncommon in urban settings. One way in which illicit drug use has been indicated is by the examination of water samples from municipal water treatment facilities. A variety of illicit drugs such as cocaine, opioid metabolites, cannabis, and ecstasy have been detected in water from treatment facilities. The purpose of this study is to identify and determine the relative amount of illicit drugs in samples from a wastewater treatment facility. In the current study, samples of influent (untreated) and the effluent (treated) water from an urban waste water treatment facility will be analyzed for the detection of opioids, cannabinoids, and cocaine. Samples will be collected and sent to the Mass Spectrometry Resource facility at Georgia State University for analysis. This study will identify whether these compounds are present in wastewater at this urban treatment facility, and whether these compounds are being removed by the treatment process. The results from this study will be used to help determine the usefulness of wastewater sampling as an indicator of drug use in an additional urban community. This project is supported by the National Science Foundation-Georgia Louis Stokes Association for Minority Participation.

UNDERSTANDING ALDO-KETO REDUCTASE STEREOSELECTIVITY**, Timothy Simpson*, Brent Feske, Cliff Padgett and Scott C. Mateer, Armstrong Atlantic State University, Savannah, GA 31419. Reductases are a popular biocatalytic tool for organic chemists due to their ability to reduce ketones into stereospecific alcohols. While there have been intensive efforts to identify combinations of reductases and ketones that afford the desired stereospecific alcohol, how these enzymes regulate their stereoselectivity is not clearly understood. In order to investigate how reductases regulate stereoselectivity, we have obtained the genes of three reductases with known 3D structures. 2,5-diketo-D-gluconate reductase from *Corynebacterium*, aldose reductase from *Hordeum vulgare*, and UDP-galactose-4'-epimerase from *Trypanosoma brucei* were cloned via PCR into a sequencing vector, and subsequently sub-cloned into a glutathione S-transferase expression vector. Successful cloning was verified by restriction digest, and positive clones were selected and used for protein expression. As a first step towards understanding the molecular mechanisms that regulate enzyme stereoselectivity we are currently analyzing (by gas chromatography mass spectrometry) the ability of these enzymes to reduce various constituents of our ketone substrate library. In addition we plan to determine the ratio of enantiomeric and diastereomeric alcohols produced by these reductions. This information will be used to help us understand the molecular rationale behind enzyme stereoselectivity. Funding for this research comes from the NSF-RUI, NSF-STEP, and AASU's Research and Scholarship Grants.

Section II: Chemistry
Science Building, Room 174
Ellen W. Moomaw, Presiding

8:30 SYNTHESIS OF CHIRAL IMINES AND AMINES ON SILICA GEL, Antonija Tangar*, Siddhi Shah and John T. Barbas, Valdosta State University, Valdosta, GA 31698. During the last few years we have been investigating the synthesis of imines on silica surfaces, molecular sieves, and anhydrous sodium sulfate. We then discovered a one pot synthesis of secondary amines on silica surfaces starting with primary amines and aldehydes or ketones. We would now like to report a facile, efficient, and greener

method for the synthesis of chiral secondary amines starting with chiral primary amines and aldehydes. Typically, 2 g of activated silica, were introduced into a dry round bottomed flask equipped with a stirring bar and a drying tube. To this were added 20 mL of dry ether, 1.0×10^{-3} mol of an aldehyde and 1.0×10^{-3} mol of a chiral amine such as L(-)- α -Methylbenzylamine. The mixture was stirred for about 30 minutes to produce quantitatively the imine intermediate. To this mixture were then introduced 0.15 g of sodium borohydride and stirred briefly. The flask was then cooled in an ice bath and a few drops of water were added periodically to initiate reduction. This was followed by filtration and subsequent washing of the silica with three 5 mL aliquots of ether. The ether extracts were combined, dried over anhydrous sodium sulfate, and the ether removed under vacuum. The chiral amines were obtained in near quantitative yields. They were analyzed by IR, GC-MS, and proton and C-13 NMR.

8:45 NOVEL MACROMOLECULAR-INORGANIC HYBRID SYSTEMS WITH POTENTIAL MULTIFUNCTIONAL FIRE-RESISTANT ACTIVITY, Joshua A. Valencia*, Sergey A. Isarov* and Gregory J. Gabriel, Kennesaw State University, Kennesaw, GA 30144. Char formation, oxygen dilution, and endothermic decomposition are the three most popular modes of action of effective flame retardants (FR). Our group has developed novel phosphonated polymers as potential FR additives. These polymers have excellent char forming properties and do not possess the biological and environmental toxicity inherent in halogenated FR. We will report the synthesis and thermal decomposition analysis of our polymers as well as results from controlled burn studies of polymer-treated paper strips. Recently, we have initiated a program to develop similar macromolecules that can modify the surface of $Mg(OH)_2$, a popular, multifunctional FR filler which acts in all three ways described above. Thus we hope to construct further improved FR systems that safely slow or otherwise prevent flame formation and effectively reduce the need for typically-high $Mg(OH)_2$ loading levels (20% - 60% by mass) in materials applications.

9:00 COMPUTER MODELING OF AN INHIBITOR BOUND TO IMPDH**, Alexandra K. Lowery* and Robert W. Zurales, Middle Georgia College, Cochran, GA 31014. The infectious dengue fever and dengue hemorrhagic fever are caused by a flavivirus carried by mosquitoes. This viral infection is endemic to Southeast Asia and India, with an estimated 100 million cases reported every year. Recently, only one of two very similar drugs was found to be active. It was shown that the active drug could bind to the enzyme inosine monophosphate dehydrogenase (IMPDH) in place of NAD^+ , preventing the conversion of IMP to XMP, ultimately limiting the amount of guanine available to the virus. It was suggested that the loss of a single hydrogen bond to the enzyme due to the replacement of a nitrogen atom with a carbon atom reduced the binding of the second drug. We suggest that an additional possibility is the conformational change induced in the drug itself. A hydrogen atom attached to the carbon appears to cause a benzylic side chain to twist, which might also explain the reduced activity. To test these hypotheses, we constructed a small model of the enzyme and optimized the binding of each drug using AM1 theory. We then used density functional theory to estimate the loss of binding energy due to the change in hydrogen bonding and due to the change in conformation. We hope that our results will lead to a better understanding of inhibitor binding in the enzyme IMPDH.

9:15 SYNTHESIS OF BORONIC ESTERS ON SILICA, MOLECULAR SIEVES, AND ANHYDROUS SODIUM SULFATE, Vidushi Gupta*, Zach Capland and John T. Barbas, Valdosta State University, Valdosta, Ga 31698. Boronic esters are important

intermediates in coupling reactions using the Suzuki reaction. We have devised a simple, facile, and greener method in achieving these syntheses. Typically, 2.0 g of activated silica, activated molecular sieves, or anhydrous sodium sulfate, were added to 10 mL of an ethereal solution of equimolar quantities (1.0×10^{-3} mol) of boronic acids and pinacol in a dry round bottomed flask. The flask was equipped with a stirring bar and a drying tube. The mixture was stirred for 15 minutes to half an hour at room temperature. It was then filtered, and the silica (molecular sieves, or sodium sulfate) was washed three times with 5 mL aliquots of ether. The ether extracts were then combined and the ether removed under vacuum. Yields of the boronic esters were quantitative. No byproducts were observed in any of the reactions we tried and no further purification was necessary. Products were analyzed by GC-MS, and proton and C-13 NMR.

9:30 PHOTOCURRENT PRODUCTION OF SURFACE-MODIFIED TITANIUM DIOXIDE FILMS**, Jonathan L. Davis*, Olivia R. Law* and Linda de la Garza, Valdosta State University, Valdosta, GA 31698. Titanium dioxide (TiO₂) thin nanocrystalline films have become highly desirable for the fabrication of efficient solar cells due to the possibility of efficient energy conversion but must be modified to increase absorbance in the visible range of the electromagnetic spectrum. Samples of nanocrystalline TiO₂ (5 nm) are mixed with a polymer to increase the porosity of the films. Indium doped tin oxide (ITO) on aluminosilicate glass is used as a substrate for films of TiO₂ nanoparticles (TiO₂/ITO) obtained through deposition using a dip-coating method. The TiO₂/ITO slides are heated after each coating and later annealed in an atmosphere saturated with oxygen. The absorbance spectra of the TiO₂/ITO slides are measured before and after deposition, annealing and surface modification with enediol ligands. The photocurrents are measured in a standard three-electrode cell before and after surface modification. Authors would like to acknowledge the Faculty Research Seed Grant from Valdosta State University for making funds available for this project.

9:45 PARAMETERS OF EXPLICIT WATER MOLECULES INCLUDED IN A HYBRID SOLVATION MODEL**, Vishwa Ravleker* and Robert W. Zurales, Middle Georgia College, Cochran, GA 31014. In the polarized continuum model, the solvation free energy of a molecule is estimated by placing the molecule in a cavity surrounded by a continuum with an appropriate dielectric constant. The cavity is determined by placing a sphere around each atom (or at least each heavy atom). The radii of the spheres are chosen to match experimental values for a small set of molecules. In the case of hydration, to improve the model, it has been suggested that a few explicit water molecules could be included. Inclusion of more explicit water molecules should make the calculation less dependent on the size of the spheres but more dependent on the parameters of the explicit water molecules. A complication is that minimizing the energy of a cluster of water molecules would seem to model ice more than liquid water. To better understand this phenomenon, we have applied the continuum model to both pure ice and liquid water, and examined how the parameters would be different in several models: fitting the free energy, the enthalpy or the electronic energy change upon sublimation and upon condensation. To test these different parameters, we have calculated the pK_a of formic acid and acetic using the hybrid solvation model with up to five explicit water molecules. All calculation used a 6-311G++(2d,2p) basis set and the B3LYP level of density functional theory.

10:00 **Section Business Meeting and Election of Officers**

10:30 SYNTHESIS OF 1,13-DICHOLO-5,6,8,9 TETRAAZADIBENZOANTHRA-CENE, HELICAL CONSIDERATIONS, Ayunna Epps, Tonya Horne and Ghislain Mandouma, Ph.D., Albany State University, Albany, GA 31705. Helix-shaped aromatic molecules or helicenes play an important role as building blocks of helical conjugated polymers and other compounds with unique material properties. Since helicenes are chiral conjugated molecules, they are useful as chiral derivatizing agents and as enantioselective complexing agents. [N]helicenes, in which N is the number of benzene rings, exhibit unusual chiro-optical, electro-optical and fluorescence properties which constitute the cornerstone in many modern devices, from optic fibers to liquid-crystal displays (LCD) and light-emitting diodes (LED). These modern devices are found in most medical sensors such as biomedical spectroscopic sensors. Given that the liquid crystal phase requires that the molecule is rigid in its central position and flexible at the extremities, a novel helix-shaped molecule was designed using diazaanthracene as the central core. Advantage was taken of the fact that a facile ring-forming diazotization reaction was to follow a straight forward novel Ullmann coupling triarylation. Using these steps, a helicene-like compound 1,13-dichloro 5,6,8,9-tetraaza dibenzo anthracene was synthesized. Nuclear Magnetic Resonance (NMR) of the compound synthesized has shown the presence of the titled compound and is undergoing further characterizations.

10:45 BIOTRANSFORMATION STUDIES OF ORGANOARSENICALS, Abe A. Ojo, Atlanta Metropolitan College, Atlanta, GA 30310. The biotransformation studies of "hidden" organoarsenicals in *F. distichus* were carried out using anaerobic decomposition conditions in "open" and "closed" systems. Two arsenic species, 2-dimethylarsinyethanol (DMAE) and dimethylarsinic acid (DMAA) were identified from the "open" system decomposition products by using the High Performance Liquid Chromatography-Inductively Coupled Plasma Mass Spectrometry (HPLC-ICPMS) technique. In the "closed" system, DMAE was characterized as a major decomposition product and DMAA was observed as another main component. Other minor arsenic species were found in the decomposition products; however, these were not identified.

POSTERS

COMPARISON OF ANTIOXIDANT CAPACITY OF VARIOUS COMMERCIAL TEA PRODUCTS, Maria Guzman*, Tyler O'Malley*, Emily Gray* and Chulsung Kim, Georgia Gwinnett College, Lawrenceville, GA 30043. Studies have been performed to compare the antioxidant capacity among six commercial tea samples such as Green, White, Black, Maté, Rooibos, and Oolong teas. An appropriate amount of tea leaves was measured and placed in a container with boiled water for three minutes followed by air cooling to room temperature before analyzing the antioxidant strength. The ratio of mass of tea leaves to volume of boiled water was 22 g/L. Antioxidant capacities of the prepared tea samples were determined by measuring the amount of reduced ABTS radical monocation (2,2'-azinobis(3-ethylbenzothiazoline-6-sulfonic acid)). The stock ABTS^{•+} solution was prepared by mixing ABTS and potassium persulfate solutions followed by dilution with distilled water until the absorbance at 735 nm was approximately 0.7. The absorbance of a mixture of 100 ml of each tea sample with 2.9 mL of ABTS^{•+} stock solution after 6 minutes reaction period was also measured to determine the reduced ABTS^{•+} amount. All the experiments were duplicated. According to the experimental data, Maté and White teas showed significantly higher antioxidant capacities than those for others and Rooibos showed the least antioxidant capacity which has approximately 8 and 6.5 times less antioxidant capacity than those for White and Maté's, respectively.

ENDOCRINE DISRUPTING COMPOUNDS IN WASTEWATER AT AN URBAN WASTEWATER TREATMENT FACILITY**, Khallil Johnson* and Alvin C. Harmon, PhD., Atlanta Metropolitan College, Atlanta GA 30310. Endocrine disrupting compounds are being detected at greater frequency in municipal water. Further it has been reported that removal of these compounds is becoming increasingly difficult. Endocrine disrupting compounds are chemicals that can disrupt the endocrine system of humans and animals, including aquatic organisms. These compounds may derive from plant sources, they are excreted by human and animals, and they may be found in some household products. In the current study, samples of influent (untreated) and the effluent (treated) water, from an urban waste water treatment facility will be analyzed for the detection of classes of endocrine disrupting compounds such as estrone (E1), 17 β -estradiol (E2), and 17 α -ethinylestradiol (EE2) as well as surfactant. Samples will be collected and sent to The Mass Spectrometry Resource facility at Georgia State University for analysis. The results from this study will identify whether these compounds are present in wastewater at this urban treatment facility and whether these compounds are being removed after water has been treated. The results from this study will be used to select specific endocrine disrupting compounds to examine their impact on aquatic organisms. This project is supported by the National Science Foundation (NSF)-Georgia Louis Stokes Association for Minority Participation (Georgia-LSAMP)

PERSONAL CARE PRODUCTS IN WASTEWATER AT AN URBAN WASTEWATER TREATMENT FACILITY**, Wesley Johnson* and Alvin C. Harmon, PhD., Atlanta Metropolitan College, Atlanta GA 30310. Organic micro-pollutants are being reported in aquatic environments. Personal care products, endocrine disrupting compounds, and pharmaceuticals identification in wastewater is increasing concern on what impact these chemicals may have on aquatic organisms. In the current study, samples of influent (untreated) and the effluent (treated) water, from an urban waste water treatment facility will be analyzed for the detection of classes of PCP such as steroids, nonprescription drugs and disinfectants. Samples will be collected and sent to The Mass Spectrometry Resource facility at Georgia State University for analysis. The results from this study will identify whether these compounds are present in wastewater at this urban treatment facility and whether these compounds are being removed after water has been treated. The results from this study will be used to select specific personal care products to examine the impact on aquatic organisms. This project is supported by the National Science Foundation (NSF)-Georgia Louis Stokes Association for Minority Participation (Georgia-LSAMP)

AN EXPLORATION INTO THE SOLUBILITY AND DISSOLUTION PROFILE OF CAFFEINE AS DEFINED BY pH AND SOLVENT AT 37°C USING HPLC AND UV-VIS SPECTROSCOPY**, H. Khan*, K.C. Uberto* and M.C. Koether, Kennesaw State University, Kennesaw, GA 30144. A study into the solubility and dissolution profile of caffeine in water, acetic acid/acetate buffer, HCl, HNO₃ and NaOH solutions of various concentrations was conducted. Caffeine is a base with a pK_b of 10.4 and thus is ionized at low pH. Ionized species should have higher solubility at the lower pH's than the unionized form at the higher pH's. Saturated solutions were created and placed in a 37°C water bath for 1 day. These solutions were immediately filtered through 0.45 micron filters and diluted with the appropriate solvent for analysis by either HPLC or UV-VIS. A Dionex HPLC instrument using a C-18 column was used to quantify the caffeine in the diluted solutions using a 30% ethanol/70% (1.5% v/v) glacial acetic acid/ water mobile phase and detection at 254 nm. Results do indicate that solubility increases with temperature. Results differ based on solvent according to preliminary data for HCl and HNO₃

solutions. Quantification for the solubility and dissolution study was also accomplished by UV-Vis at 273 nm on a Cary 50 instrument. Dissolution studies in a dissolution tester involve using 6 vessels with 500 mL of media and stirring at 50 rpm at 37°C. Dissolution profiles using store-bought caffeine tablets indicate that caffeine is immediately released within 15 minutes. No statistical difference was found in the profiles based on solvent (HCl, water and acetic acid/acetate buffer). These solutions are far from saturated indicating that no solvent effects should be seen for rapidly releasing tablets.

THE EFFECTS OF REFRIGERATION ON THE ANTIOXIDANT CAPACITY OF THREE DIFFERENT BERRIES, Sana Shah*, Jason Lee*, Katelyn Bell* and Chulsung Kim, Georgia Gwinnett College, Lawrenceville, GA 30043. Berries have been considered as great sources for antioxidants providing positive health benefits. Three different berries including blackberries, blueberries, and raspberries were analyzed to determine amounts of antioxidant which is extractable by ethyl alcohol and water. The extracted slurry was centrifuges followed by filtration to separate solids from the solution. Part of the filtrate was placed in a refrigerator under 4°C to study the effects of refrigeration on the antioxidant capacity. Antioxidant capacities of the prepared berry solutions were compared by measuring the amount of reduced ABTS radical monocations (ABTS·+, 2,2'-azinobis-(3-ethylbenzothiazoline-6-sulfonic acid)). The stock ABTS·+ solution was prepared by mixing ABTS and potassium persulfate solutions followed by dilution with distilled water until the absorbance of the stock solution at 735 nm was placed in between 0.7 and 1.0. The absorbance of a mixture of 100 ml of properly diluted berry solution with 2.9 mL of ABTS·+ stock solution after 6 minutes reaction period was measured to determine the reduced ABTS·+ amount. The results show that blackberries have higher antioxidant capacity than those for two other berries. One gram of blackberries has same antioxidant capacity as approximately 2.7 g of blueberries and 2.3 g of raspberries, respectively. It was also observed that 30 minutes storage of the extracted filtrate in a refrigerator significantly lost their antioxidant capacity; blackberries ($18.12 \pm 2.12\%$), raspberries (18.91 ± 6.39), and blueberries (23.91 ± 6.51).

THE STRENGTH OF REDUCING 2,2'-AZINOBIS-(3-ETHYLBENZOTHIA-ZOLINE-6-SULFONIC ACID (ABTS) RADICALS BY VARIOUS COMMERCIAL WINES, Tookie Stalker*, Franco Cavalier*, Rijo Ooman*, Krishan Patel* and Chulsung Kim, Georgia Gwinnett College, Lawrenceville, GA 30043. Red wines have been considered as strong antioxidants but white wines have not been fully evaluated. In order to investigate the reduction capacity of wines, four different wine samples including two red wines and two white wines were analyzed to measure the strength of reducing pre-formed ABTS radical monocations (ABTS·+, 2,2'-azinobis-(3-ethylbenzothiazoline-6-sulfonic acid)). The reducing capacities of wines were analyzed by comparing the relative reduced amount of ABTS·+ after 6 minutes of reaction between appropriate amount of wine and ABTS·+ solution. The pre-formed ABTS·+ solution was prepared by mixing ABTS and potassium persulfate solutions followed by dilution with distilled water until the absorbance of the ABTS·+ stock solution at 735 nm was placed in between 0.7 and 1.0. All experiments were duplicated. The results confirmed that red wines have strong ABTS·+ reduction capacity which are consistent with previous researches and both red wines in this research show very similar ABTS·+ reduction capacity. The results also confirmed that white wine has significantly less powerful to reduce ABTS·+ than those for red wines. It was not successful to observe any ABTS·+ reduction capacity within 6 minutes for one white wine which made of Pinot Gris. The other white wine made of Sauvignon Blanc shows ABTS·+ reduction capacity which is approximately 2.5 times less effective than both red wines.

Section III: Earth & Atmospheric Sciences
Science Building, Room 201
Donald Thieme, Presiding

9:00 THE INFLUENCE OF ABIOTIC FACTORS ON THE TEMPORAL AND SPATIAL PHYTOPLANKTON DISTRIBUTION IN COASTAL GEORGIA, S. Holcomb*, M. Gillespie*, J. Brian, R. Etzel and C. Belin, Department of Biology, Armstrong Atlantic State University, Savannah, GA 31419. A three-year study of the chemical and physical characteristics of three coastal water habitats has provided unique insight into the seasonal distribution and variations of phytoplankton in coastal Georgia (USA). Sampling sites included a coastal location at North Beach, Tybee Island, Georgia, and two brackish water sites at the Isle of Hope Marina and Rose Dhu Creek Bridge, all located in Chatham County, Georgia. Monthly water chemistry data from each of these three sites were monitored and analyzed utilizing standard water quality sampling practices. Phytoplankton samples were also obtained and identified in the laboratory. Shannon-Weiner Indices were prepared for each collection date for each site and compilation of all data was examined for seasonal water parameter and phytoplankton specimen trends. This study should assist the fishing and recreation industries to better understand what food sources will be at various locations along the Georgia coast.

9:15 REMOTE SENSING ANALYSIS OF LAND COVER CHANGE THROUGH TIME FOR MEXICO CITY, Alejandro Schwedhelm*, Gainesville State College, Gainesville, GA 30566. The analysis shows how land cover features (Urban, agriculture, shrubland, forest, and water) have changed in the valley where Mexico City is located over the past 25 years. I will show how the software “eCognition” is used to analyze and classify “Landsat 5” multispectral imagery. In this study, 4 images taken at different times (between 1984 and 2010) that represent the same area are classified the same way through a process of multispectral segmentation (grouping of pixel areas that share similar spectral signatures). The results indicate that there has been a rapid growth in urbanized area taking over the dominant vegetation type (open shrubland). This analysis also includes a study of the history of Mexico City. The building and development of the city on top of a body of water are relevant elements when it comes to understanding how the city is developing and functioning today. Because the city lies on top of the center of a large watershed, frequent flooding, sinking of large urban structures, and problems with sewage systems have been tough challenges. A study of disease trends in the city over the past 50 years is also shown. This demonstrates correlations between increases in heart and lung diseases, and population and urban growth.

9:30 GPR INVESTIGATIONS OF BURIED KARST FEATURES ALONG THE WITHLACOOCHEE RIVER, Jesse Haag*, Can Denizman and Donald M. Thieme, Department of Physics, Astronomy, and Geosciences, Valdosta State University, Valdosta, GA 31698. Ground-penetrating radar (GPR) was used to investigate buried karst features along the Withlacoochee River near Valdosta, Georgia. We used a Malå 100 MHz GPR system to collect data on a 2 x 2 m grid from an area of 3700 square meters in the floor of one large depression. ArcGIS was used to create a point shapefile from the grid X and Y coordinates in decimal latitude and longitude. The shapefile datum was NAD (North American Datum) 1983, and we used UTM Zone 17 to project the coordinates to a mappable surface in ArcGIS. Depth values were then input at specified distances using the GPR profiles. Once we input all of the points with their corresponding depth values, Arc-

GIS Spatial Analyst was used to convert the shapefile from vector format to raster format. The raster file was then imported into ArcScene in order to develop a three dimensional model of the buried karst features from the GPR data.

9:45 GPR INVESTIGATION OF POSSIBLE UNMARKED GRAVES IN SUNSET HILL CEMETERY, VALDOSTA**, Jason Giddens* and Donald M. Thieme, Department of Physics, Astronomy, and Geosciences, Valdosta State University, Valdosta, GA 31698. Ground-penetrating radar (GPR) was used to investigate possible unmarked graves in an historic cemetery which abuts the Valdosta State University campus. We used a Malå 250 MHz GPR system to collect data on a 0.5 x 0.5 m grid from an area of 400 square meters in an area rumored to contain graves of slaves or other undocumented individuals. The data will be processed in "time slices" to develop three dimensional models of subsurface anomalies thought to represent grave shafts or mass interments. Field GPR profiles show features with dimensions on the order of 1-10 m² as well as smaller and shallower features resulting from disturbance by tree roots, fire ants, and other natural causes.

10:00 Section Business Meeting and Election of Officers

10:30 AN ANALYSIS OF EXTREME TEMPERATURES IN MILLEDGEVILLE, GEORGIA (1910-2009)**, John J. Boncek and Sigfried B. Harden, Troy University - Montgomery Campus, Montgomery, AL 36103. Extreme temperature days can have significant impact on a community, increasing demand for electricity consumption, posing threats to agriculture, and threatening the health of both humans and animals. Extremes can also signal the impact of global warming on a specific environment. In this study, we analyze extreme temperature events that occurred in Milledgeville, Georgia during the period 1910-2009. Included in this analysis is a thorough description of temperature data for Milledgeville, comparing daily temperatures against the average temperature for each day. From this we identify the extreme days (+/- 2 standard deviations from the daily average). We examine the pattern of extremely high high temperatures, extremely low high temperatures, extremely high low temperatures, and extremely low low temperatures. From this analysis of daily temperatures we extract monthly, seasonal, and annual trends to determine patterns in extreme temperature distribution. Of special interest is to see if the number of extreme days is changing over time.

10:45 LATE 20TH CENTURY SOIL EROSION ESTIMATED FROM SHORT CORES IN A SMALL ARTIFICIAL LAKE**, Donald M. Thieme and Michael Burton*, Department of Physics, Astronomy, and Geosciences, Valdosta State University, Valdosta, GA 31698. Mission Lake is a small (0.12 km²) artificial lake constructed in 1941 as fill was removed from the valley of a small unnamed drainage to construct the airstrip on Moody Air Force Base. Bathymetric contours measured with a portable sonar instrument from a boat identify local areas with relatively thick accumulations of sediment as well as areas which are being scoured by waves. Four short cores extracted from the sediments sampled maximum accumulations of no more than 30 cm of lacustrine mud. Sedimentation rates range from 1 to 4 cm per decade, somewhat lower than the rates measured for a sinkhole lake less than 30 km to the south. Laboratory measurements of grain size, organic matter, nitrogen, and phosphorus compare favorably between the two lakes indicating that soil erosion is the source for most of the lake mud in both cases.

**Section IV: Physics, Mathematics, Computer Science,
Engineering and Technology
Science Building, Room 104
Andreas Lazari, Presiding**

8:00 DETERMINING PLANCK'S CONSTANT FROM THE PHOTOELECTRIC EFFECT USING LEDs AND LASERS AS LIGHT SOURCES, Max F. Heres*, Bob Powell and Robert Moore, Jr., Department of Physics, University of West Georgia, Carrollton, GA 30118. A widely-used experiment for upper level laboratory experiments is the determination of Planck's constant via the photoelectric effect. The Daedalon EP-05 Photoelectric Effect Apparatus was used for the required measurements of the stopping voltage versus wavelength using selected wavelengths of light from various sources. In this study, six light emitting diodes (LEDs) (660nm, 605nm, 595nm, 524nm, 470nm, 400nm) and four lasers (633nm, 612nm, 594nm, 544nm) were used as light sources. Planck's constant determined with the LED sources had an average percent error of less than 0.3% compared to 1.3% for the laser sources, for which there were fewer sources and no sources at the short wavelengths. While LED's do not have as narrow a spectral profile as do lasers, they are still excellent sources for discrete wavelengths, yield excellent results for the photoelectric effect, and much less expensive than lasers.

8:15 EFFICIENCY INVESTIGATION ON ELECTROLYTIC GEOMETRY AS A FUNCTION OF FLUIDITY FOR PUMP-ABLE BATTERIES**, Max F. Heres*, Matthew Bishop*, Bob Powell and Robert Moore, Jr., Department of Physics, University of West Georgia, Carrollton, GA 30118. Conventional battery technologies have limited geometric configurations and require multiple hours for recharging. The pump-able exchange of the electrolytic materials as a means of near instantaneous recharging is the basis of this investigation. The efficiency investigation was conducted by placing uniform electrolytic particulates in a containment chamber with a chemically permeable membrane as the dividing barrier between the anode and cathode, all of which were set in an ion transfer solution. A co-investigation was conducted using MatLab computational software to analysis the optimal geometry of the electrolytic materials as a function of the fluidity of the system in pump exchange.

8:30 EXPLORING HUMAN ENERGY AND POWER OUTPUT DURING WALKING RUNNING USING GEO-SPATIAL TECHNOLOGY**, Shay A. Dickerson* and J.B. Sharma, Gainesville State College, Oakwood, GA 30503. The purpose of this study is to capture positional data of a human while walking or running on various terrains with a GPS device and explore the power and energy expended. This investigation of human energetics takes two different approaches. One is modeling human energy consumption using empirical relations call the American College of Sports Medicine (ACSM) metabolic equations. The other approach is from first principles in which the mass of the human body and the time varying position vector is used to calculate the net power and energy expended in incurring the motion. This method factors in the human body being a thermodynamic engine. Graphical Analysis software is used for the calculations for both of these two approaches. Results from these investigations will be compared to validate the ACSM equations from first principles. Interactive animations with dynamic vector diagrams of the human movement displayed on Google Earth will also be presented.

8:45 THREE DIMENSIONAL WAVE GRADIOMETRY**, Tammy Dencker* and Christian Poppeliers, Augusta State University, Augusta, GA 30904. Wave gradiometry

uses spatial gradients of the displacement wavefield to determine vector slowness, geometrical spreading, and radiation pattern. A gradiometer is an array that is optimized to perform wave gradiometry, and typically has an aperture of less than 10% of the wavefield's central wavelength. This is in contrast to a traditional phased array which can have an aperture of ten to one hundred times the wavefield's central wavelength. There have been significant developments in one- and two-dimensional wave gradiometry using seismic arrays. In this work, we extend gradiometry into three dimensions using acoustic sensors. We constructed a three dimensional lattice and attached off-the-shelf microphones at specific points on the lattice structure. Using the National Instruments Labview hardware and software, the acoustic sensors become a phased, three dimensional array. As proof-of-concept, we recorded a broadband acoustic source and then analyze the resulting data using a three-dimensional implementation of wave gradiometry.

9:00 EFFECTS OF PRESSURE ON SOUND WAVES**, William I. Floyd IV and J.E. Hasbun, Department of Physics, University of West Georgia, Carrollton, GA 30118. For acoustic waves travelling through a gaseous medium, characteristics of the wave are affected by the initial equilibrium pressure of the gas. We have designed and constructed a sound chamber apparatus that allows for the observation and measurement of the effects on sound waves due to the variation in pressure. We varied the pressure in our chamber over a range between 0.07 and about 2.0 bar. The chamber is a 1.74 m long cylinder with an inner radius of 12 cm. A PASCO speaker and sound sensor are housed within the chamber and controlled by an external computer. The sound sensor is connected to a PASCO 500 Interface and controlled by the computer program Data Studio. We generate a pulse wave from the speaker that is then recorded by the sensor positioned nearby at one end of the chamber. The wave travels the length of the tube and is reflected by a wall at the opposite end. The echo's return time is also recorded by the sensor. The sensor measures the acoustic pressure variations produced by the sound wave, converts the mechanical energy into electrical energy and outputs a proportional voltage. We will present our analyzed collected data and the observed pressure's influence on the speed of sound, frequency, acoustic amplitude, and intensity. Our preliminary results indicate that the amplitude of the sound wave decreases with pressure in a fashion that can be explained theoretically.

9:15 ANALYSIS OF MULTI-TEMPORAL LAND USE CHANGE IN JONES COUNTY, GEORGIA FOR PROPER LAND-USE PLANNING DECISIONMAKING**, Zack Phillips, Sudhanshu S Panda and J. B. Sharma, Institute of Environmental Spatial Analysis, Gainesville State College, Gainesville, GA 30566. One of the biggest hazards that we are facing today, is loss of habitats due to urban sprawl. It can be continuously monitored using advanced land use analysis and planning techniques. Jones County, GA has had improper or poor environmental/land cover management practices followed for long. The objective of this study was to use advanced geospatial and land-use management techniques to study the environmental degradation area and propose mitigation measures for the improvement of the county. Medium resolution Landsat (30 m) data were obtained for years between 1985 and 2010 in five year intervals. The county imageries were collected through GLOVIS (<http://glovis.usgs.gov/>). Advanced, object-based segmentation technique (Multiresolution) in eCognition was used followed by Brightness Threshold classification algorithm to obtain information about land-use land cover types in the county in the 25 year period. The county is a farming town that has used improper land use practices that has created constant decrease in the water quality. Although, we found increase in urban growth in the county, it was also observed that the land-use change over these 25 years period encountered a positive change due to the reduction in

exposed soil (bare soil and open land). Positive and prudent land-use planning mechanism was developed and communicated to the County officials to upkeep the environmental quality of the farming county.

9:30 **WEB-BASED TOOL FOR MAPPING COURSE LEARNING OUTCOMES TO PROGRAM LEARNING OUTCOMES****, Arvind Shah, Boris Peltsverger and Durgesh Vishen, Georgia Southwestern State University, Americus, GA 31709. Mapping course learning outcomes to program learning outcomes is an important part of the academic program assessment, since mapping allows the monitoring of student progress throughout a program's curricula, and keeps faculty aware of how courses they teach fit into the program. Mapping a number of learning outcomes in each course (say, 5-6) to a number of learning outcomes (say, 7-8) in the undergraduate programs with 35 to 40 courses and 10-12 courses in the graduate programs can be difficult without automation. The first step in the assessment process is to map each course learning outcome to one or more program learning outcomes. The learning outcomes assessment is done based on the evidences collected from each course. The Mapping Tool is a web-based application and allows capturing data, processing data, generating reports, and store artifacts (student work). The tool can be accessed via secured login to enter data, update data and upload the artifacts to the server. If desired, artifacts can be saved on a local server and provide link to the artifacts. The tool is developed in .NET framework and SQL Server Reporting Services.

9:45 **"LAWS OF NATURE" ARE DESCRIPTIVE, NOT PRESCRIPTIVE**, Dennis W. Marks, Valdosta State University, Valdosta, GA 31698. The universe is "lawful" to the extent that the information stream of experience is compressible. That we can describe experience with so few "laws" implies that the universe contains many repeated parts. Emmy Noether introduced the idea that conservation of momentum-energy is a consequence of the symmetry of space-time (nature's indifference as to where and when an action occurs). In turn, symmetry of space-time is a consequence of the recursive generation of space and time. Momentum (action/length) and energy (action/time) are conjugate to space and time, respectively, which leads to the Heisenberg Uncertainty Principle. Similarly, indifference to orientation leads to the spins of individual particles being random and to the spins of entangled pairs being both random and strictly anti-correlated. The uncertainty principle applied to the spin of a particle implies that determining one component renders the other components indeterminate. The Greenberger-Horne-Zeilinger formulation of Bell's Theorem implies that quantum mechanics is as complete as possible without violating the uncertainty principle. Likewise, Oppenheim and Wehner have shown that quantum mechanics cannot be more non-local without violating the uncertainty principle. Although the uncertainty principle limits what can be determined, only an indeterminate universe could have made a quantum transition into existence. The "laws of nature" are thus not preconditions for the universe to exist; rather they are descriptions of a universe capable of tunneling into existence and growing recursively.

10:00 **Section Business Meeting and Election of Officers**

10:30 **COMPUTATIONAL MODELS FOR ANALYSIS OF THERMAL CONDITIONING OF LAYERED STRUCTURAL MATERIALS****, Barry Hojjatie¹, Mathew Vining¹ and Hamid Garmestani², ¹Valdosta State University, Valdosta, GA 31698 and ²Georgia Institute of Technology, Atlanta, GA 30332. Flaws, cracks and imperfections at the surface of the materials when coupled with tensile stresses induced during functional loads may result in premature failure of structural materials. Development of compressive

stresses on the surface of materials such as ceramic and steel will improve resistance to crack initiation and propagation in these materials. We have been working on development of computational models in MATLAB and ANSYS to predict temperature and stress distributions in these materials as a function of material properties and thermal conditioning parameters used to optimize cooling profiles and stress distributions in these materials. In this initial study we will present the results obtained from numerical solution of a transient heat transfer problem to determine the cooling profiles of a ceramic disk. A computational model was developed in MATLAB to determine the cooling profile of the disk subjected to various rate of cooling by free and forced convection from various initial temperatures above its glass transition temperature. The results of this study shows that the geometric dimension of the disk and the rate of cooling have a significant influence on the transient temperature distribution of the material.

10:45 CONVECTION AND EVAPORATION DRIVEN PATTERN FORMATION OF SOLID DEPOSITION CONTROLLED BY A CURVED SURFACE, K. C. Chan, Albany State University, Albany GA 31705. Deposition of evaporated surfactant SDS (sodium dodecyl sulfate) droplet forms wheel-like and spoke pattern when it is subjected to a curved surface imposed from the top. However, it's noted the patterns are not highly reproducible; often some of these radial spokes develop arc-like extensions on the outermost edge. This puzzling phenomena can finally be explained by the hypothesis that the fluid inside the droplet enjoys angular momentum while it is evaporating. The motion of fluid can be revealed by a sizable particle introduced to the fluid under the microscope. The angular convection of the fluid creates another degree of control for pattern formation of evaporated deposition.

11:00 ANALYSIS OF A FRACTIONAL POWER DAMPED OSCILLATOR, Kale Oyedeji¹ and Ronald Mickens², ¹Morehouse College, Atlanta, GA 30314-3773 and ²Clark Atlanta University, Atlanta, GA 30314. The linear harmonic oscillator has all periodic solutions. However, the inclusion of positive damping forces the solutions to become oscillatory with decreasing (in time) amplitudes. We have investigated the properties of the solutions for the case where the damping force is

$$f(x, \ddot{x}) = -2\epsilon |x| \dot{x}^{1/3},$$

where ϵ is a positive parameter, and $\dot{x} = dx/dt$. If ϵ is small, then the method of averaging (Mickens, 2010) can be used to calculate a first order approximation to the solution. Our major result is that the oscillations vanish after a finite time, t^* . In addition to estimating, t^* , we compare our analytical result to a numerical solution obtained from a fourth-order Runge-Kunta method. Further details regarding the solutions come from an examination of the corresponding phase-space and the application of an energy procedure.

11:15 BRIGHTNESS MEASUREMENTS OF JUPITER MADE IN LATE 2010, Richard W. Schmude, Jr., Gordon College, Barnesville, GA 30204. Brightness measurements of Jupiter were carried out between August 12 and November 13, 2010. The brightness measurements were made through filters transformed to the Johnson B, V, R and I system. It is concluded that Jupiter was about 0.06 magnitudes (or 6%) brighter in late 2010 compared to its average brightness between 1999 and 2010. This brightening is probably due to the disappearance of the dark South Equatorial Belt during 2010. Jupiter's brightness will be measured once the South Equatorial Belt returns to its normal appearance.

11:30 DEFECT DETECTION BY ULTRASOUND IN THE POROUS STRUCTURES, APPLICATION TO BIOLOGICAL ORGANS, Hasson Tavossi¹ and Kojo Agyabeng-Dadzie², ¹Valdosta State University, Physics, Astronomy & Geosciences, Valdosta, GA 31698 and ²Valdosta State University, Biology, Valdosta, GA 31698. The goal of this project is to use ultrasonic waves to determine the relationship between structure and function of porous model medium, and detect any damage zone inside a porous sample. Porous model media have been used to simulate biological organs such as; lung and kidney. Data on ultrasonic wave through model samples can characterize the biological organ micro-structures and their function in the living organisms. The results of this project can be applied to detect abnormalities and malfunctions. Experimental through transmission method is used and data analyses are performed by a high-performance 500-MHz digital phosphor oscilloscope. Signal analysis performed by this oscilloscope provides data on the signal spectrum, phase, dispersion, and attenuation as a function of frequency of the transmitted waves. Data acquired can be applied to defect detection and performance evaluation of the porous biological organs and tissues.

POSTERS

CONTROL OF EFFECTIVE PERMITTIVITY OF ARTIFICIAL MATERIAL COMPOSED OF METAL BARS, Arun K. Saha, Albany State University, Albany, GA 31705. Effective permittivity of artificial material composed of metal balls periodically embedded in a host dielectric medium in 3 dimensional spaces has been calculated and verified by simulation. Metal balls have free electrons which are polarized under the influence of external electric field and give rise to net polarization and contribute to the permittivity. This is the microscopic explanation of the evolution of effective permittivity of artificial material composed of metal particles. In this research, effective permittivity of an artificial material, composed of metal rods embedded in a host dielectric medium, is calculated theoretically to predict the role of constituent particles on overall effective permittivity. The theory predicts that effective permittivity can be controlled by (a) changing filling factor of the particle and (b) slicing the unit particle into several pieces in the direction of exciting electric field. These theoretical prediction have been verified by modeling the proposed artificial material in commercially available 3D electromagnetic simulation software HFSS. It is reported that effective permittivity decreases if the filling factor is decreased and unit particle is sliced into several pieces. From the reported result, it can be concluded that the due to change in filling factor or due to the slicing of the particle, total cell capacitance inside the cell is changed and hence affects the effective permittivity.

Section V: Biomedical Sciences Science Building, Room 202 Seyed H. Hosseini, Presiding

8:30 THE EFFECT OF PRENATAL METHYLPHENIDATE EXPOSURE ON 5CSRTT PERFORMANCE, Heather N. Ivester, Hillary H. Doyle, Kayla M. Fann, Brian K. Phillips, Ryan A. Shanks, Ph.D. and Steven A. Lloyd, Ph.D., North Georgia College & State University, Dahlonega, GA. Methylphenidate, an addictive psychostimulant commonly known as Ritalin[®], is becoming a growing problem due to a rising trend of ADHD misdiagnosis and prescription and recreational abuse, especially for student populations, many of whom are of child-bearing age. Immediate study of this abundant drug is crucial because the long-term effects of prenatal exposure are poorly understood. Due to the

structural and functional similarities between methamphetamine and methylphenidate, we expect to find behavioral alterations in adult mice exposed to prenatal methylphenidate indicative of frontal brain deficits such as impulsivity and compulsivity. Training using a Five Choice Serial Reward Time Task (5CSRTT) paradigm began at three months of age and was used to measure differences in general executive functions, impulsivity, compulsivity, general accuracy, and other behavior and cognitive arenas. The training consisted of 4 different programs, which differed only in the amount of time the stimulus hole was illuminated. The last day of training, reached after the criteria of at least eighty percent correct was met for the other programs, consisted of a pseudo-randomized the inter-interval time duration. Preliminary data shows a treatment affect for false alarms, a measure which indicates impulsivity. If a significant difference in any aspect is found after prenatal methylphenidate exposure, it will implicate the drug as a perpetrator of permanent neurological damage that may persists into adulthood.

8:45 **PRENATAL METHAMPHETAMINE EXPOSURE ALTERS EXECUTIVE FUNCTIONS IN ADULT MICE**, Corina I. Oltean*, H.N. Ivester*, H.H. Doyle*, K.M. Fann*, R.A. Shanks, Ph.D. and S.A. Lloyd, Ph.D., North Georgia College & State University, Dahlonega, GA 30533. Methamphetamine (METH) is a commonly abused stimulant with unknown teratogenic potential that is abused by women of childbearing age. METH effects fetal and maternal neurotransmitter levels, especially dopamine, which are involved in the division, migration and patterning of neurons during development. We hypothesized that prenatal METH exposure will alter frontal brain development resulting in developmental defects in cognitive functioning. Mice were exposed to METH or saline from embryonic day 8.5 until birth. The exposed offspring were assessed at three months of age for subtle cognitive deficits using the 5-choice serial reaction time task to measure working memory, attention and inhibitory control. We found a significant treatment effect for various measures of executive functioning in adult mice prenatally exposed to METH. Data suggests that prenatal methamphetamine exposure results in long-term alterations of frontal brain executive functions in mice, including a decrease in inhibitory control. Low levels of inhibitory control are associated with psychiatric disorders, such as attention deficit hyperactivity disorder. Prenatal psychostimulant exposures may be a risk factor for this growing social, educational, and medical concern. This data has important implications for the understanding of and treatment for the effects of prenatal stimulant exposures.

9:00 **Break**

9:15 **CXCL4 AND CXCL10 PREDICT RISK OF FATAL CEREBRAL MALARIA**, Nana Wilson*¹, Vidhan Jain², Christina Roberts*³, Naomi Lucchi⁴, Pradeep Joel⁵, Mrigendra P. Singh², Avinash Nagpal⁵, Aditya Dash⁶, Venkatachalam Udhayakumar⁴, Neeru Singh^{2,7} and Jonathan K. Stiles¹, ¹Morehouse School of Medicine, Department of Microbiology, Biochemistry and Immunology, Atlanta, Georgia, ²National Institute of Malaria Research Field Unit (ICMR), Jabalpur, Madhya Pradesh, India, ³Spelman College, Biology Department, Atlanta, Georgia, ⁴Malaria Branch, Division of Parasitic Diseases and Malaria, Center for Global Health, Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, ⁵Nethaji Subhash Chandra Bose Medical College Hospital, Jabalpur, Madhya Pradesh, India, ⁶National Institute of Malaria Research (ICMR), New Delhi, India, and ⁷Regional Medical Research Center for Tribals (ICMR), Jabalpur, Madhya Pradesh, India. *Plasmodium falciparum* in a subset of patients can lead to a diffuse encephalopathy known as cerebral malaria (CM). Despite treatment, mortality caused by CM can be as high as 30% while 10% of survivors of the disease may experience short- and long-term

neurological complications. The pathogenesis of CM involves alterations in cytokine and chemokine expression, local inflammation, vascular injury and repair processes. These diverse factors have limited the rate of discovery of prognostic predictors of fatal CM. Identification of reliable early predictors of CM severity will enable clinicians to adjust this risk with appropriate management of CM. The rationale for the study was that recent studies revealed elevated levels of CXCL10 expression in cerebrospinal fluid and peripheral blood plasma as independent predictor of severe and fatal CM. However, CXCR3, a promiscuous receptor of CXCL10, plays an important role in pathogenesis of mouse model of CM. Since CXCR3 shares multiple ligands (CXCL4, CXCL9, CXCL10 and CXCL11), the goal of this study was to determine the key role of CXCR3 ligands associated with fatal CM in order to facilitate their development as biomarker(s) of CM severity. We hypothesize that CXCR3 ligands are associated with fatal or severe CM. In this study the role of corresponding CXCR3 ligands in fatal or severe CM was evaluated by comparing their levels in 16 healthy control (HC), 26 mild malaria (MM), 26 cerebral malaria survivors (CMS) and 12 non-survivors (CMNS) using enzyme linked immunosorbent assay (ELISA). Levels of CXCL4 and CXCL10 were significantly elevated in CMNS patients ($p < 0.05$) when compared with HC, MM and CMS. Elevated plasma levels of CXCL10 and CXCL4 were tightly associated with CM mortality. Receiver Operating Characteristic (ROC) curve analysis revealed that CXCL4 and CXCL10 can discriminate CMNS from MM ($p < 0.0001$) and CMS ($p < 0.0001$) with an area under the curve (AUC) = 1. These results suggest that CXCL4 and CXCL10 play a prominent role in pathogenesis of CM associated death and may be used as functional or surrogate biomarkers for predicting CM severity. This investigation received financial support from WHO/UNDP/TDR Collaborative Research Grant (A00524) and National Institutes of Health grant numbers NIH-FIC (R21TW006804-01), NIH-RCMI (RR03034).

9:30 BEHAVIORAL SENSITIZATION IN ADOLESCENT MICE**, Hillary H. Doyle*, Brittany N. Picou*, Ryan Shanks PhD. and Steven Lloyd PhD., North Georgia College & State University, Dahlonega, GA 30597. Adderall, is one of the most commonly prescribed drugs to treat Attention Deficit Hyperactivity Disorder (ADHD), and abuse, as well as misdiagnosis, is common among adolescents. Adderall consists of various amphetamine salts, including dextro-amphetamine, which is considered by the American Medical Association to be analogous to Methamphetamine (METH) in their effects on the central nervous system. This experiment will determine if mice treated with dextro-amphetamine during adolescence will have increased locomotor activity in adulthood when challenged with a sub-acute dose of METH (0.5 mg/kg). This process is referred to as cross-sensitization and occurs due to relatively permanent changes in neural activity in the dopamine pathways affecting locomotor activity and reward salience. We will be measuring sensitization based on locomotor activity of adult mice (male and female) to discover whether adolescent exposure to dextro-amphetamine in abusive (10mg/kg) and therapeutic (1mg/kg) doses will cross-sensitize mice to a sub-acute dose of METH when compared to a saline control. Data will be obtained using two Kinder Scientific Open Field Chambers with Rearing Option. Two square panels of photobeams on an X and Y axis will count beam-breaks in order to measure horizontal and vertical locomotor activity. We hypothesize that mice treated with dextro-amphetamine during adolescence will have increased locomotor activity in comparison with saline-treated mice. If this hypothesis is supported, it will suggest that children who are taking dextro-amphetamine to treat ADHD, but do not actually have the disorder, as well as adolescents using dextro-amphetamine at abusive levels, are at risk to sensitization to methamphetamine in adulthood.

10:30 **ROLE OF CHOLESTEROL AND APOE GENOTYPES IN THE PATHOGENESIS OF PROSTATE CANCER AMONG DIFFERENT POPULATIONS**, Godwin O. Ifere*¹, A. Cobb¹, A. Campbell¹, A. Amouzou² and G. A. Ananaba¹, ¹Clark Atlanta University, Atlanta, GA 30314 and ²Georgia Perimeter College, Atlanta, GA 30021. Current evidence indicates that certain genetic variants of the meat adaptive gene, apolipoprotein E (Apo E), are implicated in peripheral cholesterol efflux. Deregulated cholesterol efflux by a specific Apo E variant might reduce membrane cholesterol clearance, and activate cancer-driven signaling processes. We hypothesize that, ethnic disparity in prostate cancer incidence is based on the differences in resolution of membrane cholesterol by different ApoE phenotypes. Using genotyping procedures we evaluated the ApoE genotypes of African American (MDA PCa 2a/2b), and Caucasian prostate cancer cell lines (LNCap, PC-3 and DU145), and also assayed for membrane cholesterol levels in these cell lines. This result shows an association between different malignancies and ApoE variants. Evaluation of ApoE phenotypes and cholesterol status of adequate prostate cancer tissues from these groups will facilitate the elucidation of whether lifestyle and genetic factors interact to drive prostate cancer among different populations. Results will lead to future understanding of the molecular mechanisms for initiation and progression of prostate cancer, and behavioral changes that favor reduced incidence of the disease. Acknowledgements: NIH Grants #GM08247; A141231.

10:45 **CHLAMYDIA TRACHOMATIS CRYPTIC PLASMID ANTIGENS IN CHLAMYDIA VACCINE DEVELOPMENT****, A. Campbell¹, G. Ifere¹, E. Ekong⁵, K. Joseph⁵, F. Eko², L. Damelin³, G. Zhong⁴, J. Igietseme⁵ and G. Ananaba¹, ¹Clark Atlanta University, Atlanta, GA, ²Morehouse School of Medicine, Atlanta, GA, ³National Institute of Communicable Diseases, South Africa, ⁴University of Texas Health Science Center, San Antonio, TX and ⁵Centers for Disease Control and Prevention, Atlanta, GA. Pelvic inflammatory disease (PID) has deleterious effects on female reproductive organs that result in infertility. It occurs when *Chlamydia trachomatis* (CT) migrates through the uterus to the upper genital tract. CT possesses a cryptic 7.5-kb plasmid of unknown function. We hypothesize that CT cryptic plasmid antigens drive Chlamydia pathology. Our goal is to produce an efficacious vaccine that would confer immunity against genital chlamydial infection and eliminate chlamydial pathology. Our strategy is to develop of a vaccine scheme that utilizes commensal bacteria as a live delivery vehicle of CT antigens. To investigate the feasibility of this approach, we have transformed JM109 competent cells with pGK12 expression constructs and confirmed transformation by antibiotic selection and polymerase chain reaction analysis. Cryptic plasmid proteins have been expressed as GST fusion proteins and confirmed by western blot analysis. These promising results premise the development of prophylactic vaccine against chlamydial genital infection and its pathology. Supported by NIH grants GM08247 and A141231 and MBRS RISE Program-NIH-NIGMS Grant #5R25GM060414.

11:00 **ANTIMICROBIAL EFFECTS OF HEN EGG ROTATION AND ITS IMPLICATION ON THE BENEFICIAL EFFECTS OF CONTINUOUS LATERAL ROTATION THERAPY****, Chris Wallace*¹, Chanel French, Army Lester¹ and Virlin Lester², ¹Kennesaw State University, Kennesaw, GA 30144 and ²SHEAR, Riverdale, GA 30296. The benefits of hen egg rotation have been reported for many years. While the most widely accepted benefit of this practice suggests that egg rotation prevents blood vessels from sticking to the inner shell membrane and rupturing, evidence suggests that antimicrobial effects of redistributed egg albumen (egg white) may be equally significant. This study hypothesizes that rotating the egg distributes antimicrobial lysozyme of egg albumen over

the surface of the inner shell membrane. Rotation is predicted to result in the trapping and destruction of microbes and enhancing survival of embryos. Egg albumen was taken from fresh chicken eggs and mixed with varying amounts of *E. coli* that had been transformed with a plasmid containing an ampicillin resistant gene and a gene for a green fluorescence protein for identification. Results indicate that albumen exposed bacteria experience inhibited growth when mixed with appropriate volumes of egg albumen. Not only do fewer bacteria colonies develop in the presence of albumen, but also colonies that developed appeared smaller in size than those not exposed to albumen. Chick embryos exposed to an albumen/bacteria mix appeared to survive with no increase in bacterial caused defects. These results suggest that rotating the egg allows the albumen to trap and/or destroy microbes thus protecting the developing embryo. A similar function may be hypothesized for the benefit of rotating long-term immobile patients who suffer from respiratory diseases. Lysozyme-containing mucus of the lungs may trap and destroy microbes of the lungs much like albumen does in eggs. If this were so, then it would seem logical that continuous lateral rotation therapy would help to keep pathogen growth at bay.

POSTERS

LEPTIN PRO-ANGIOGENIC SIGNATURE IN BREAST CANCER COULD BE LINKED TO IL-1 SIGNALING, Weiqiang Zhou^{1,2}, Shanchun Guo¹, Corey Gillespie¹ and Ruben R. Gonzalez-Perez¹, ¹Microbiology, Biochemistry & Immunology, Morehouse School of Medicine, Atlanta, GA 30310 and ²Clinic Medicine & Pharmacy College of China Medical University, Shenyang City, Liaoning Province 110002, People's Republic of China. Leptin and IL-1 are inflammatory cytokines promoting breast cancer angiogenesis that are often linked to worse prognosis. We hypothesize that leptin angiogenic effects in mammary tumor (MT) may be linked to, or regulated, in part by IL-1 signaling, therefore, leptin and IL-1 may have synergistic functions in MT progression. To test this hypothesis leptin-dose (0-6.2 nM) and time-course (0-48h) effects on levels of IL-1 system components (IL-1 α , IL-1 β , IL-1Ra and IL-1R tl) were investigated in mouse MT-4T1 cells. To determine the contribution of specific leptin-activated signaling pathways on IL-1 regulation several kinase inhibitors AG490 (JAK2/STAT3), PD98059 (MEK/MAPK/ERK1/2), Wortmannin (PI-3K/AKT1), Rapamycin (mTOR), Go6976 (PKC-Ca dependent), SB203580 (p38 MAP kinase) and SP600125 (JNK) were used and IL-1 system component levels were determined by ELISA and Western blot. To determine if leptin could regulate its own receptor (long isoform, OB-Rb and all isoforms) flow cytometry was used. Our results show that basal levels of IL-1 α were 14 fold higher than IL-1 β . Remarkably, leptin up-regulates all IL-1 system components and all OB-R isoforms showing the highest effects at 1.2nM/24h. Table I shows the relative contribution of leptin-induced signaling on the up-regulation of IL-1 system components. JAK2/STAT3 and MAPK/ERK 1/2 were essential for leptin up-regulation of IL-1 system. In contrast, PI-3K/AKT1, PKC and p38 kinases were mainly linked to leptin regulation of IL-1 receptor-related proteins (IL-1R tl and IL-1Ra). JNK and mTOR were related to leptin-induction of IL-1R tl but were not involved on IL-1 α or IL-1Ra regulation. Interestingly, leptin-mediated activation of mTOR appears to be a negative regulator of IL-1 α but an inductor of IL-1Ra. Interestingly, leptin upregulation of VEGF/VEGFR2 was partially mediated by IL-1/IL-1R tl signaling. In conclusion, we show for the first time that leptin induces several signaling pathways to upregulate the translational and transcriptional expression of IL-1 system in breast cancer cells. Moreover, leptin upregulation of VEGF/VEGFR2 was impaired by IL-1 signaling blockade. In turns, IL-1 signaling can promote VEGF expression and tumor macrophage recruitment that could indirectly enhance leptin-mediated angiogenic effects

and MT growth. These data suggest leptin pro-angiogenic signature in breast cancer is linked to, or regulated, in part by IL-1 signaling. This work was supported in part by NIH/NCI 1SC1CA138658-02; NIH/UAB Breast SPORE Career Development Award and the Georgia Cancer Coalition Distinguished Cancer Scholar Award (to RRG).

CHEMOPREVENTION OF DMBA-INDUCED MAMMARY TUMORS IN LEAN AND DIET-INDUCED-OBESITY (DIO) MICE BY LEPTIN SIGNALING INHIBITION, Gillespie C¹, Guo S¹, Zhou W² and Gonzalez-Perez RR¹, ¹Microbiology, Biochemistry & Immunology, Morehouse School of Medicine, Atlanta, GA 30310 and ²Clinic Medicine & Pharmacy College of China Medical University, Shenyang City, Liaoning Province 110002, People's Republic of China. Leptin, the major adipokine released by adipose tissue, is one of the key players involved in the link between obesity and cancer incidence. Leptin and its receptor (OB-R) are overexpressed in breast cancer tissues and their signals induce the expression of pro-angiogenic, pro-proliferation and pro-inflammatory factors and growth of breast cancer. We have previously shown that inhibition of leptin signaling with pegylated leptin peptide receptor antagonist 2 (PEG-LPrA2) negatively impacted on the growth of mouse syngeneic and human breast cancer xenografts hosted by SCID mice. PEG-LPrA2 effects paralleled a significant reduction of VEGF/VEGFR2 levels. It is known that higher body weight is associated with increased incidence of spontaneous and chemically induced mammary tumors (MT) in rodents. However, leptin involvement in 7,12-dimethylbenz[*a*]anthracene (DMBA)-MT is unknown. Methods: In the present paper, we investigated the potential of PEG-LPrA2 to prevent MT development in lean and diet-induced-obesity (DIO)-C57BL/6J female mice treated with 1 mg/dose/weekly for 6 weeks of DMBA. Obesity was induced by feeding the DIO-mice (95% obese mice after 5 weeks) with a high fat diet (PDI-1; 45% Kcal from fat). Lean mice were fed with a normal diet (PDI-1; 5% Kcal from fat). DMBA challenge was initiated two weeks after PEG-LPrA2 treatment. Lean and DIO-mice were allocated (week 7 of study) into two chemoprevention treatment subgroups receiving either one or two PEG-LPrA2 dose/weekly (i.v.; 50 µl/0.1 mM) for 32 weeks. Lean and DIO-control mice received saline injections. Results: Obesity was positively correlated to the development of DMBA-MT in mice. DMBA-MT were found in 17% of lean control and 69% of DIO-control mice. Remarkably, PEG-LPrA2 prevented the onset of DMBA-MT in lean (one and two doses: 0% tumor-bearing mice) and DIO-mice (one dose, 29% and two doses 0% tumor-bearing mice). PEG-LPrA2 treatment did not change body weight or food intake in lean or DIO-mice. Strikingly, the expression of VEGF in DMBA-MT from DIO-control mice was significantly higher (32 fold) than in DIO-mice treated with PEG-LPrA2. Inhibition of leptin signaling decreased tumor levels of Notch ligands, receptors and activated NICD together with Notch targeted genes: survivin and Hey2. Moreover, PEG-LPrA2 treatment reduced the levels of several leptin-induced molecules within DMBA-MT: OB-R, IL-1R tI, VEGF/VEGFR2, bcl-2, HIF-1a and NFκB (p50 and p105). Conclusions: Present data strongly suggest that obesity is an acceleration factor for DMBA tumorigenesis and that leptin signaling is essential for DMBA-induced MT. Overall, the effective chemoprevention of DMBA-MT by PEG-LPrA2 treatment in lean and, particularly, in DIO-mice reinforces the potential use of leptin signaling inhibition for breast cancer prevention. These observations are relevant, especially for obese populations showing higher levels of leptin and incidence of breast cancer. [This work was supported in part by NIH/NCI1SC1CA138658-02; NIH/ARRA/3SC1CA138658-02S1 and the Georgia Cancer Coalition Distinguished Cancer Scholar Award (to RRG)].

COMPARISON OF MICROARRAY AND MULTIBLOT ANALYSES OF GENE EXPRESSION IN CD77-POSITIVE AND CD77-DEFICIENT BURKITT LYMPHOMA CELLS**,

Shayla Thomas^{*1}, Leonard Anderson², Marisela DeLeon Mancía¹ and Mark Maloney¹, ¹Spelman College, Atlanta, GA 30314 and ²Morehouse School of Medicine, Atlanta, GA 30310. Previously, we have shown that Daudi cells, CD77-positive Burkitt lymphoma cells, are more susceptible to apoptosis inducers than VT500 cells, Daudi-derived CD77-deficient mutants. Numerous studies have identified gene pathways related to apoptosis. Determining the specific gene and subsequent protein expression related to apoptosis pathways in these cell lines will provide insight into pathways that involve CD77. For microarray analysis, total RNA was isolated, labeled with Cy3, and hybridized to Agilent Human Whole Genome microarrays. Bioinformatic analysis for significant fold changes and relevant pathways was performed using Genespring GX10 and Ingenuity Pathways Analysis (IPA) software. Multiblot analysis was performed to determine expression of proteins related to known apoptosis pathways using Kinetix multi-immunoblotting services (Kinexus, Vancouver, B.C.). In our preliminary microarray analysis, pro-caspase 3, pro-caspase 4 and pro-caspase 5 genes were all up-regulated in Daudi versus VT500 cells. Similarly, multiblot analysis indicated that the corresponding caspase proteins were also expressed to a higher degree in Daudi cells versus VT500 cells. Funding was provided by the following grants: NIH/MBRS/SCORE GM 08241 and NIH/RIMI MD00215.

METHAMPHETAMINE'S EFFECT ON AGGRESSION IN ADULT MALE MICE USING THE RESIDENT-INTRUDER MODEL**, Laura M. Tarnowski*, Elizabeth M. Southard*, Ryan Shanks, Ph.D. and Steven Lloyd, Ph.D., North Georgia College & State University, Dahlonega, GA 30597. Behavioral changes following methamphetamine (meth) exposure are well documented and include behavioral sensitization and tolerance, which are readily observed using behavioral assays. We have found that chronic exposure to meth results in significant increases in serum testosterone levels in adult male mice. Since high testosterone levels are positively correlated with increases in aggressive behavior we hypothesized that chronic exposure to meth in male mice would cause changes in the neuroendocrine system causing an increase in aggressive behaviors. To test this we used a resident-intruder paradigm. Adult male mice were singly housed and given a 10 day course of interperitoneal meth or an equal volume of sterile saline, and allowed to establish territorial boundaries. An age and weight matched intruder male mouse was introduced into each of the resident's home cages 24 hours after the final injection. Interactions were recorded for 10 minutes using a digital camera, and behaviors were coded upon video playback based on established criteria using well developed operational definitions. The data will be analyzed using independent design t-tests in SPSS. We anticipate that we will find significant increases in the aggressive behavior of resident mice exposed to chronic meth compared to saline controls.

LEPTIN REGULATES VEGF/VEGFR2 IN BREAST CANCER THROUGH STAT3-Rac1 CROSSTALK**, Miles Fuller¹, Manzy Byrd¹, Shanchun Guo² and Ruben R Gonzalez-Peréz², ¹Morehouse College, Atlanta, GA and ²Microbiology, Biochemistry & Immunology, Morehouse School of Medicine, Atlanta, GA 30310. Lepton and its receptor, OB-R, are over expressed in cancer cells and their levels correlate to worse prognosis. Lepton is an important inducer of VEGF/VEGFR2 in breast cancer under normoxia through the activation of several signaling pathways and HIF-1a/NFkB/SP1. However, in the specific mechanisms of lepton mediated regulation of VEGF/VEGFR2 genes are still partially unknown. VEGF/ VEGFR2 directly regulates tumor angiogenesis and also works as an essential autocrine/paracrine process for cancer cell novel antagonists, PEG-LPrAs, significantly impaired the growth of breast tumors and reduced the levels of VEGF/VEGFR2. We hypothesize that lepton regulation of VEGF/VEGFR2 in breast cancer involves the activation of Src and Gbr2/Gab2/STAT3 and crosstalk to Rho-GTPases. To test

the hypothesis, VEGF/VEGFR2 expression and activation of signaling intermediaries were determined in mouse (E0771) and human cells (MD-MBA231 and MCF-7) breast cancer cells challenged with leptin as well as genetic and pharmacologic kinase inhibitors. Inhibition of JAK2 partially reduced Leptin-induced pSTAT3 levels but increased VEGF protein in mRNA. Moreover, VEGFR2 and promotes a negative feedback. Which downregulates leptin activation of its a high and Rac1 are needed for the induction of VEGFR2. This data suggests a high complexity of signaling crosstalk is involved in leptin upregulation of pro-angiogenic factors and breast cancer growth. Therefore, PEG-LPrAs combined with inhibitors for leptin-sensitive regulatory signaling partners could provide novel multiple target therapies for breast cancer. This could be of paramount importance for the higher risk patients; obese and post-menopausal women who show the highest leptin levels. Our proposed studies could also be relevant to patients having the aggressive and the triple negative breast cancer, which is difficult to treat.

**Section VI: Philosophy and History of Science
Science Building, Room 136
Vivian Rogers-Price, Presiding**

9:00 THE SOCIAL, ECONOMIC AND ENVIRONMENTAL RAMIFICATIONS OF THE STRIP MINING OF COAL IN CENTRAL APPALACHIA, John V. Aliff, GPC Online, Georgia Perimeter College, Clarkston, GA 30021. The effects of the mining of coal in Central Appalachia can be historically divided into largely pre-strip mining (to 1960) and post-strip mining periods. The pre-strip mining period was characterized by 1.) A tradition of poor working conditions for many deep miners in order to keep coal cheap. 2.) Benefits passing to non-resident owners, railroad and steel workers. 3.) The heavily mined areas remaining in poverty. 4.) Families of miners moving out as mechanization reduced the work force. The post-strip mining period is characterized by 1.) Streams and flood plains are polluted for 50 years or more as water seeps through the valley "fills." 2.) Homes cannot be built on the fills for some time because of "subsidence" settling. 3.) Bridges and roads are broken by huge coal hauling trucks. 4.) Operating costs of coal extraction and use are passed off to county and state residents. Resident taxpayers pay for road repair, bridge repair, health costs, and municipal water cleanup. 5.) Heavily mined areas remain in poverty. 6.) More people move out. 7.) Non-resident owners and workers mostly benefit. 8) This keeps "the lights on" in Georgia. In an era of global warming, is this a moral enterprise when alternative energy sources are available to be developed? At the present time, only 11% of the strip mined lands are "reclaimed." Wind, geothermal and solar energies are truly clean and not nearly as destructive. The U.S. Department of Energy has stated that more jobs will be created in alternative energy development and use than in the extraction of coal.

9:30 THE ROLE OF PRE-THEORY IN THE CONSTRUCTION OF THEORIES, Ronald E. Mickens, Clark Atlanta University, Atlanta, GA 30314. Pre-theories are not theories themselves but consist of all the prior activities (heuristics, preliminary calculations, discussions with colleagues, etc.) that aid in the eventual construction of a coherent, and physical and/or mathematical consistent theory or theoretical methodology. Two "principles" that have been used to guide pre-theory pursuits are dimensional analysis (DA) (Pankhurst, 1969) and the principle of dynamic consistency (DC) (Mickens, 2005). We illustrate the use of these two principles by considering the case of quantum mechanics.

10:00 **Section Business Meeting and Election of Officers**

10:30 THE EARLY EVOLUTION OF EVOLUTION: DARWIN, HAECKEL AND HUXLEY, Emerson Thomas McMullen, Georgia Southern University, Statesboro, GA 30460. Charles Darwin had a dilemma. It was that his evidences for descent from one common ancestor could just as well apply to the Biblical view of origin from a common designer with descent from several ancestors. Darwin had alluded to a Creator several times in *The Origin of Species* (1859) but seems to have preferred descent from one common ancestor. The only diagram in *The Origin of Species* could support either descent from one common ancestor or descent from several common ancestors. Ernst Haeckel provided false evidence that the evolutionary history of the species is repeated during the development of the individual embryo. His “proofs” were fraudulent drawings of several animal embryos in different stages of development. This “data” influenced Darwin to write *The Descent of Man* (1871). However, Biblical Christians believe that in the beginning God created different “kinds” including humankind from whom we descended. Writing against Christians who had accepted evolution, agnostic Thomas H. Huxley quoted Jesus who said, referring to the first two humans, that at “the beginning of creation God created them male and female.” (*Mark* 10:6; also see *Matthew* 19:4.) Huxley used this quotation and others to discredit the idea that Darwinism and the Biblical account could coexist. He emphasized that, from a Biblical standpoint, humans did not evolve from primates. Thus, he and Haeckel helped Darwin resolve his dilemma and give us the Darwinism we have today.

11:00 TWENTIETH CENTURY TRENDS IN MIDWIFE TRAINING: SAVANNAH, GEORGIA, Christy M. Crisp, Georgia Historical Society, Savannah, GA 31401. As in cities across the nation during the early decades of the twentieth century, Savannah, Georgia saw increasing efforts by established medical societies and city officials to impose professional training and regulation on traditional medical practices such as midwifery. In Chatham County a certification program was begun to provide training and supervision of midwives by public health nurses. Based on the records of the Savannah City Health Officer and others, the imposition of midwife controls resulted in dramatic decreases in infant mortality and maternal death following delivery. However, scholarship of the last several decades reveals the conflict between traditional and professional practitioners during this period and has questioned the overall effectiveness of the new methods – even in the face of dramatic statistics showing rapid reductions in infant and maternal death following the adoption of regulations and training programs. This paper examines the Chatham County example in light of the broader regional and nationwide context, but also in relation to other trends in women’s healthcare locally. For example Savannah, as elsewhere in the nation at this time, saw a significant decrease not only in the number of midwife-attended births, but an even more drastic reduction in the number of births that occurred in the home rather than in a hospital, marking another great shift – the increased emphasis on hospital care.

11:30 THE LOBLOLLY BAY GORDONIA – A SURVIVOR, Elliott O. Edwards, Jr., Bartram Trail Conference, Savannah, Georgia, 31406. A lone Loblolly Bay Gordonia (*Gordonia lasianthus*) was discovered in early 2006 by the author growing on the property of Bethesda Boys Home in Savannah, Georgia. The tree is growing in an area where its present environment challenges its future. Preliminary data was collected and it was studied to try and determine how it is surviving in its present habitat and how it got there. The Gordonia is a wetland tree and normally grows in low swampy, wetland areas where it has an adequate water source and well-drained soils. The tree is a member of the *Theaceae* family and is one of the three native bays common to Georgia. The tree

is growing in popularity because of its striking appearance of white flowers made known by William Bartram in 1775. Horticulturists are propagating it where they plant them domestically and commercially. However, the tree is temperamental and prone to disease by way of the root system. It needs a constant water source and requires a lot of attention in its early years to sustain it. If not, it can die at an early age. The Gordonia has a rare and colorful history, the only cousin to the *Franklinia alatamaha* which has not been found in the wilds since it was discovered in 1764 by John & William Bartram. The existing habitat of this tree at Bethesda is partly wetland, moderately drained soils and receives full sun when the sun rotates to the west. Until now, the tree has not received enough interest to provide labor for its maintenance. Minimal maintenance has been performed in an attempt to protect it from the adjacent, evasive vines Smilax that can destroy the tree by their persistent intertwining vines and slow reduction of sun. The rarity of this tree justifies protection of it and it is hoped that a preservation program at Bethesda Boys Home will be found to preserve it for its long-term survival.

12:00 THE BEGINNINGS OF MODERN SCIENCE, Emerson Thomas McMullen, Georgia Southern University, Statesboro, GA 30460. Historians of science have argued that modern science had its beginnings either with the Presocratic Philosophers, the Condemnation of 1277, or the Reformation. Considering the Reformation, the late Richard H. Popkin (1923-2005) had contended that the rise of skepticism during the Reformation laid the basis of modern science. More recently Peter Harrison, the Andreas Ireos Professor of Science and Religion at Oxford University, has proposed two theses. The first is that a straightforward reading of the Bible legitimized the study of nature and so this was a basis for the emergence of modern science. He presented this in *The Bible, Protestantism, and the Rise of Natural Science* (Cambridge University Press, 1998). Harrison's second thesis is that the Reformers revived Saint Augustine's position that the Biblical Fall affected mankind's reason. This is opposed to the influential teaching of Saint Thomas Aquinas that the Fall left mankind's reasoning intact. The reformers' revival of Augustinian thought was influential in bringing on the Scientific Revolution. Harrison presents his ideas on this subject in *The Fall of Man and the Foundations of Science* (Cambridge University Press, 2007). I report that my own research is against either the Presocratic Philosophers or the Condemnation of 1277 as an explanation for the beginnings of modern science. Rather, my studies are supportive of the views of Popkin and Harrison.

Section VII: Science Education
Science Building, Room 173
Anil Banerjee, Presiding

8:15 AUTHENTIC RESEARCH PROJECTS: PRE-COLLEGE STUDENTS' PERSPECTIVES, Warren Bernard, Northgate High School, Newnan, GA 30265. The purpose of this study was to examine high school students' perceptions of an authentic research project. The context for this study was a local Science and Engineering Fair (SEF) and involved students from a Metro-Atlanta public high school. Authentic research projects such as the SEF are considered to be inquiry activities and are core components in science education reform movements. In this qualitative study, fourteen students were selected from volunteers to participate in an examination of students' perceptions of a research project. Some of the participants were experienced with SEF projects, some novices; some students were intending science majors in college, while others were not. Data for this descriptive ethnography were collected via an open-ended survey, three

individual interviews, a web log, and a group interview. Interviews were audio taped and transcribed. Transcripts were coded and analyzed and for the purposes of describing the students' perceptions of their research project. Students perceptions were grouped organized into 6 assertions: 1) Students may be reluctant to undertake authentic research projects, 2) Students may have difficulty with choosing a topic of research and designing a study, 3) Students may develop a sense of ownership of their research topic, 4) Students may develop an increase in interest in their research topic, 5) Students may recognize benefits to the authentic research experience, 6) Students may reflect on their research and offer advice to others. By knowing more about students' perceptions, science teachers understand more of the support and direction their students need and Science Educators may include more research strands in science teacher preparation programs to provide prospective teachers experience with research.

8:30 **DYKNOW AND STREAMING AUDIO AND VIDEO: MAKING A COLLABORATIVE CLASSROOM ENVIRONMENT IN CLASS AND OUT**, Ken Moss and Luise E. Strange de Soria, Georgia Perimeter College, Clarkston, GA 30021. DyKnow is a PC based system that allows for interaction between the instructor and students during lecture. Real Player is used in conjunction with the DyKnow program to audio and video record the lesson to be posted on the instructors' website for students to view after class. The combination of the two tools allows for maximum interaction between instructors and students both in and out of class, as students can log in remotely from home should the need arise. Access to the streaming media also obviously allows the student to listen to the lecture (potentially more than once) should they choose to do so. The talk will briefly cover the polling and panel submission processes (panel submissions allow the instructor to see what students have drawn on their own PCs in the computer classroom and provide immediate feedback). The talk will also briefly touch on the types of questions are typically beneficial for those types of processes. Student access to the audio and video streaming media will be demonstrated. Student feedback from the past 5-6 years will be presented and discussed to show how successful the combination of DyKnow and streaming media has been for the Organic classes.

8:45 **GENERAL BIOLOGY AS AN INDICATOR OF STUDENT SUCCESS IN HUMAN ANATOMY AND PHYSIOLOGY I AT A COMMUNITY COLLEGE**, Alvin C. Harmon, Atlanta Metropolitan College, Atlanta, GA 30310. A pre-requisite for acceptance into allied health programs is the successful completion of Anatomy and Physiology (A&P) I and II. A&P is an upper level biology course requiring a strong foundation and understanding of general biology concepts. At Atlanta Metropolitan College, students have the option to enroll in A&P Biol 2241 without the prior completion of Principles of Biology (BIOL 1107). An investigation was done to determine the effect BIOL 1107 may have on student success in A&P I. A comparison was done on the performance in A&P I course in the spring and summer semester 2010, of students that enrolled and completed BIOL 1107, with students that had not completed BIOL 1107. Seventy-nine percent (79%) of the DWF's in BIOL 2241 were made by students that had not taken BIOL 1107 as compared to twenty-one percent (21%) DWF's for students that had taken BIOL 1107. Further, forty-four percent (44%) of the grade of B or better were made by students that had not taken BIOL 1107 as compared to fifty-six percent (56%) grade of B or better for students that had taken BIOL 1107. These results indicate that students, who successfully complete BIOL 1107 prior to enrolling in BIOL 2241, perform better in BIOL 2241 than students who have not completed BIOL 1107.

9:00 **Break**

9:15 CONDUCTING A SIMULTANEOUS ONLINE AND FACE TO FACE PRESENTATION WITH WIMBA BY EXAMPLE OF THE POPULAR STEM TALKS, Ulrike G. Lahaise, Georgia Perimeter College, Clarkston, GA 30023. The series of Popular STEM Talks is part of Georgia Perimeter College's STEM Initiative. These talks are given by GPC's STEM faculty on STEM issues that are currently in the news, affect people's everyday life, and that are of professional interest to the speaker beyond the two year college curriculum. The talks are geared to GPC's students and employees at large with no prior scientific training. With the advent of video conferencing technology, podcasting, etc. these talks are now set up to accommodate a face to face audience as well as a simultaneous live audience online through the use of Wimba. The functionality of Wimba from the perspective of the participants, presenter, and administrator will be demonstrated. Finally, the benefit of allowing Wimba presentations to be archived for asynchronous viewing at a later time in terms of co-curricular learning opportunities for students and additional instructor resources will be discussed.

9:30 THE EFFECTIVENESS OF A SRA CORRECTIVE READING PROGRAM ON THE CRCT SCORES FOR THE MIDDLE GRADES STUDENTS, Andreas Lazari, Valdosta State University, Valdosta, GA 31698. This study is an assessment of Middle Schools SRA Corrective Reading Program. The SRA Corrective Reading Program was implemented at a Middle School during a school term. The purpose of this study was to determine if there is a statistically significant difference in the overall reading ability of the participants in the study, which encompasses comprehension, decoding and fluency. The results from the 2006-2010 Georgia Criterion Referenced Competency Test (CRCT) were used to conduct a statistical analysis to determine the effectiveness of the SRA Corrective Reading Program. A total of 50 eighth grade students participated in the study. The data collected consisted of four variables. The CRCT scores for the fifth grade before the SRA Corrective Reading Program was used, the CRCT scores for the sixth, seventh, and eighth grades while the intervention SRA Corrective Reading Program was used. SPSS was utilized to run an ANOVA test. The analysis of variance results clearly show that the SRA Corrective Reading Program intervention had a great impact on the reading accuracy level and reading comprehension level of the students.

10:00 **Section Business Meeting and Election of Officers**

10:30 FACULTY PERCEPTIONS OF TEACHING IN A GRADUATE ONLINE DEGREE PROGRAM, Ollie Manley and Gladys Yarbrough, Georgia State University, Atlanta, GA 30303. Today, more and more colleges and universities have made online education a mainstay at their institutions. Whether the delivery model is synchronous, asynchronous, or hybrid, schools of higher learning have strongly embraced alternative technological representations of teaching and learning for their students. The primary question for this study was: Will faculty support online education as a delivery method in a graduate degree program? A survey was designed and sent to faculty members from a public university in a southeastern state. Participants were asked to complete an electronic survey created by Survey Monkey. The survey analyzed faculty perceptions of approval or disapproval of online courses/degrees, resources available for instructional design, content knowledge, student achievement/performance, and time required for designing and teaching, commitment to teaching, and providing leadership for online education. The independent variables are gender, race, years of teaching experiences, and faculty rank. Several Pearson's Correlations were done, but none of them showed a statistically significant correlation between the dependent and independent variables ($p < .05$).

10:45 TEACHER TRAINING IN PHYSICS AND PHYSICAL SCIENCE, SECOND GRANT, Bob Powell¹, Sharon Kirby² and Ann Robinson³, ¹University of West Georgia, Carrollton, GA 30118, ²Cherokee County Schools, Canton, GA 30114 and ³University of West Georgia and Paulding County Schools, Dallas, GA 30132 (Retired). The Department of Physics at the University of West Georgia received a second Math Science Partnership Grant in 2009 to provide professional development for in-service teachers in physics and physical science. The curriculum developed by the American Association of Physics Teachers (AAPT) and the Physics Teacher Resource Agents (PTRA) has been used for this training. The workshops (one week in the summer) and two follow-up sessions (on a Friday and a Saturday) are held on the campus of the University of West Georgia. "Electricity and Magnetism" during 2009-2010 and "Waves and Geometric Optics" during 2010-2011 were offered to 36 participants. Content is taught by the inquiry method and small group activities. Some of the activities are "make and take" so that the participants have materials to use in their own classrooms. Evaluation was done using the required MOSART tests and a test developed by PTRA, which has been given to 664 other participants at similar workshops across the United States. The participants showed little gain in content knowledge on the MOSART tests but showed significant increases in content knowledge on the PTRA post-test compared to the pre-test, as reported by the external evaluator. This project was funded by a grant from the Georgia Math Science Partnership.

11:00 LACTOSE INTOLERANCE: AN ENGAGING CHEMISTRY LAB FOR NON-CHEMISTRY MAJORS, Michael Sakuta¹, Teresita Lampe², Vivian Mativo² and Melissa Schoene³, ¹Georgia Perimeter College–Newton Campus, Covington, GA 30014, ²Georgia Perimeter College–Clarkston Campus, Clarkston, GA 30021 and ³Georgia Perimeter College–Decatur Campus, Decatur, GA 30034. At Georgia Perimeter College (GPC), students (mainly pre-nursing and pre-dental hygiene) participate in introductory organic chemistry lab classes geared to non-majors. Previous labs dealing with enzyme activity were either qualitative and nebulous or semi-quantitative (slightly less ambiguous) but very complex to set up. Both drawbacks resulted in less engaged students. Here we present our new improved lactose intolerance lab that is highly quantitative, easy to set up, and engages students most of whom have already heard of lactose intolerance and are already curious about it. Specifically, students monitor the hydrolysis of o-nitrophenyl- β -D-galactopyranoside (ONPG), a substitute for lactose, by lactase (obtained from Lactaid Fast Act[®] tablets). Using a spectrophotometer, students plot the enzyme activity (absorbance) versus a factor affecting enzyme activity in Microsoft Excel. With their data, the students are able to obtain the expected graphs of enzyme activity versus enzyme concentration, pH, and substrate concentration. A majority of students said that this lab was interesting and that they learned a lot, making them want to learn more about lactose intolerance. Thus, they were more engaged. This work was funded by a Georgia Perimeter College, University System of Georgia STEM mini-grant.

11:15 A COMPARISON OF FMCE RESULTS FOR INTRODUCTORY PHYSICS STUDENTS WITH THE USE OF ILLD'S VERSUS COMPUTER-BASED PHYSICS LABS, Julie L. Talbot, University of West Georgia, Carrollton, GA 30117. The use of computers and sensors in the physics laboratory setting allows students to investigate physics concepts in real time. Interactive Lecture Demonstrations (ILLD's) are commonly used to demonstrate physics concepts, especially when enough computer-based equipment is not available for all students to perform these activities in the laboratory environment. Having used both ILLD's and computer-based laboratory activities, I have examined

the Force and Motion Concept Evaluation (FMCE) scores for students in both groups. The students who performed the laboratory activities had a 32.8% overall gain on the FMCE, compared with the students who saw the ILD's, who had a 11.8% gain.

**Section VIII: Anthropology
Science Building, Room 203
Terry G. Powis, Presiding**

8:30 MODERN SKELETAL POPULATIONS, SECULAR INCREASE IN STATURE, AND PROPORTIONS OF THE LONG BONES OF THE LOWER LIMBS**, Tony Fitzpatrick* and Frank L. Williams, Georgia State University, Atlanta, GA 30303. Donated skeletal collections have grown at an increasing rate over the past decade. These collections provide information on modern populations which can be compared to earlier samples such as those in the Terry collection to assess secular changes, such as increase in stature. Males in the Terry collection (n = 417), born before 1943, were compared to those at the University of New Mexico and the University of Tennessee (n = 84), born after 1940. Average stature in males has increased around 8 cm. Bicondylar length of the femur has increased 1.95 cm on average, while the maximum length of the fibula has increased 1.6 cm. The ratio of fibula to femur length shows that there was a significant change in upper versus lower limb length ($p < .000$). This result is similar to previous research on change in female lower limb proportions.

8:45 SPATIAL AND TEMPORAL ANALYSIS OF THE CERAMICS AND LITHICS AT THE BURNT VILLAGE, 9TP9**, Vanessa N. Hanvey*, The University of Georgia, Athens, GA 30602. The Burnt Village, also known as Okfuskenena, is located three miles west of LaGrange, Georgia. On September 21, 1793, white colonist burnt this Creek town and either killed or kidnapped the inhabitants. Harold Huscher of The University of Georgia excavated the site during the field seasons of 1966-69. No final report was published. Over the past year and a half I have analyzed pottery and lithics from the Burnt Village. Using GIS-based computer programs, I will specifically look at differing geographical distribution of pottery by time periods. In this paper I will present the latest findings concerning spatial and temporal analysis of this data. This research will make an important contribution to the final report for the Burnt Village.

9:00 EXAMINING TWO METHODS FOR DETERMINING SEASONALITY OF ARCHAEOFAUNAL DEPOSITS FROM THE GEORGIA COAST, USA**, Kathy E. Wiggins*¹, Carol Colaninno-Meeks² and Terry G. Powis¹, ¹Kennesaw State University, Kennesaw, GA 30144 and ²University of Georgia, Athens, GA 30601. Research of two archaeological sites on the Georgia coast is based on different methods for determining seasonality. Incised odostomes, parasitic gastropods that infest oysters, were studied at Wallys Leg, a Ceramic Late Archaic site on St. Simons Island. Measurements of archaeological odostomes were compared to modern growth rates to pinpoint seasonal oyster collection. At McQueen Shell Rings, a Late Archaic site on St. Catherines Island, archaeological and modern otoliths were studied using regression formulae to determine seasonal change in fish growth. A comparison of these studies determines whether incised odostomes or otoliths are more informative for determining seasonal procurement. It also reveals the advantages and disadvantages of each method and the merit of using both methods to determine site seasonality.

9:15 A PROJECTILE TRAUMA: A STUDY OF THE EFFECTS OF BULLETS ON CRANIAL BONE**, Donald Michael Weaver*, Kennesaw State University, GA 30144. Firearms are used in the majority of homicide and suicide cases due to their devastating effects on the body and their lethality. Many forensic anthropologists have studied the effects of bullets on skeletal remains. This research reports on the effects of gunshot wounds on bone using various caliber firearms. I fired three handguns using different caliber munitions (.22LR cal., 9mm, and .40 cal.) and one 12-gauge shotgun at four stationary targets. In order to accurately examine the effects of firearms on bone, I used the heads of four domesticated pigs due to the soft tissue/bone thickness that is similar to that of humans. Upon removing the flesh from each skull I was able to examine the effects from each firearm. The four skulls showed an extremely wide range of variation in wound types. By completing this experiment I have shown that it is possible for a forensic anthropologist to accurately examine and classify various types of gunshot wounds on skeletal remains based on the type of firearm used.

9:30 A CRITICAL ASSESSMENT OF THE HISTORIC EVIDENCE OF BISON IN GEORGIA, Wayne Van Horne, Kennesaw State University, Kennesaw, GA 30144. Various researchers have concluded that the range of historic Bison (*Bison bison*) includes Georgia. This conclusion has been based solely on anecdotal historic reports of animals described as 'buffalo' ranging throughout south Georgia during the early eighteenth century. Investigation of the historic use of the term buffalo reveals that it was used by English settlers in disparate areas of the world to describe various species of bovines they encountered that did not resemble English domesticated cattle. Additionally, records from seventeenth- and eighteenth-century colonial Spanish Florida clearly document the existence of extensive herds of feral Spanish black cattle in north Florida and south Georgia during that time period. The evidence suggests that English settlers were encountering Spanish cattle, which differed markedly in appearance from English breeds of cattle, and they assumed that these were a bovine species indigenous to the New World and accordingly applied the generic term 'buffalo' to describe them. Nineteenth- and twentieth-century American researchers have uncritically equated the term buffalo with *Bison bison* and have erroneously concluded that the historic range of bison included Georgia. The absence of historic bison in Georgia is supported by a complete lack of any archaeological evidence of bison remains in Native American sites within Georgia. It is also supported by historic Spanish descriptions of herds of feral cattle in Georgia in the same areas where English settlers reported buffalo. The conclusion drawn from a critical assessment of the evidence is that bison did not range throughout Georgia in the historic period.

9:45 CHERT HUNTING: MODELING PREHISTORIC LITHIC RESOURCE RANGES IN THE NORTHWEST GEORGIA RIDGE AND VALLEY GEOLOGICAL PROVINCE USING GEOGRAPHIC INFORMATION SYSTEMS (GIS)** , Vicki Ina F. Glover*, Jonathon B. Bruce*, Terry G. Powis and Mario Giraldo, Kennesaw State University, Kennesaw, GA 30144. Chert sources throughout Georgia were documented by Goad in 1979 to determine the origins of raw material used in prehistoric indigenous artifacts found near the Wallace Reservoir in east central Georgia (Greene, Morgan, and Putnam Counties). This study enlarges upon Goad's work by documenting chert sources in the northwest Georgia ridge and valley geological province. The current researchers hypothesized that raw lithic materials, such as chert, were used locally within a resource range of less than a hundred miles. This project sampled chert from numerous locations within six counties of northwest Georgia (Catoosa, Chattooga, Dade, Murray, Walker, and Whitfield

Counties). Global Positioning System (GPS) and Geographic Information Systems (GIS) technology were used to compare source locations to archaeological sites in and around the sample area. Funding for this research was provided by the Division of Student Success, Student Assistance for Leadership in Teaching (SALT) Program, Kennesaw State University.

10:00 **Section Business Meeting and Election of Officers**

10:30 PREDICTING THE PAST: USING PREDICTIVE MODELLING TECHNIQUES TO ASSESS PILGRIMAGE ROUTES IN THE ANCIENT MAYA LANDSCAPE**, Jennifer Weber*, Georgia State University, Atlanta, GA 30302. At the ancient Maya site of Pacbitun, located in the foothills of the Maya Mountains in the Cayo District, Belize, archaeologists are presented with the unique opportunity to investigate the relationship between the site core and the various caves, located in within its nine square kilometer periphery. Caves played a vital role in the religious thought of the ancient Maya and were seen as entries to the underworld and homes to deities. Pilgrimages to these sacred places influenced and were influenced by settlement patterns and socio-political relations. Through the application of predictive modeling techniques, for example ArcGIS's least cost path analysis tool, we will systematically test and discuss to what extent testable predictions can be made about the possible pilgrimage routes in the Pacbitun periphery. By conducting this analysis, we hope to explore how predictive modeling techniques can contribute to archaeological investigations and gain insights about the ritual landscape surrounding this ancient Maya site.

10:45 USING TETRACYCLINE TO MEASURE HAVERSIAN SYSTEM FORMATION RATES IN A NUBIAN POPULATION**, Amanda A. Winburn* and George J. Armelagos, Emory University, Atlanta, GA 30307. Tetracycline, a modern-day antibiotic, is a fluorophor that binds with calcium during the mineralization phase of osteon production. Tetracycline's fluorescent nature allows it to be the basis for a method of determining Haversian system production rates in individuals when ingested. The remains of the Nubian NAX-Group population (350 C.E. to 550 C.E.), have been found to have tetracycline markers bound into the cement of their osteons, thereby making it theoretically possible to use modern tetracycline-based methods on ancient remains to determine Haversian system production rates for the Nubian individuals. This study develops a hybrid method, incorporating both the modern-day tetracycline-based measuring methods and histology-based archaeological methods, to measure the Haversian system formation rates of the NAX-Group. To the author's knowledge, this is the first time tetracycline has been used as a basis for calculating Haversian system formation rates in an archaeological population. The results are forthcoming, but will provide valuable insight into bone formation rates of the NAX-Group and the role of tetracycline in inhibiting bone loss among the elderly.

11:00 AN ANALYSIS OF CHERT DEBITAGE AT THE CHARLES HOLLAND SITE IN PAULDING COUNTY, GEORGIA**, R. J. Gibbs Thompson* and William J. Wilson*, Kennesaw State University, Kennesaw, GA 30144. As a result of Phase I and II archaeological excavations at the Charles Holland site (9PA7), a multi-component prehistoric campsite along the west fork of the Pumpkinvine Creek in Paulding County, Georgia, a substantial (n=6000+) quantity of lithic flakes were recovered. The non-quartz portion of these flakes was analyzed by the authors using a modified version of Sullivan and Rozen's 1985 "non-technological" theoretical classification scheme. It is shown that

within the theoretical framework of Sullivan and Rozen's method, our results seem to indicate relatively intense but small-scale, late-stage biface reduction occurring at the site, strengthening the hypothesis of 9PA7 as a seasonally occupied "hunting camp" where hunters would finish and refinish their weapons, while exploiting the local game resources.

11:15 COMPARISON OF AGE-AT-DEATH ESTIMATION METHODS USING DATA FROM A GEORGIA BUREAU OF INVESTIGATION SAMPLE AND THE WILLIAM M. BASS DONATED SKELETAL COLLECTION**, Alice E. Fazlollah*, University of Georgia, Athens, GA 30602. The most commonly employed methods for forensic age-at-death estimation focus on the gross morphological changes of the pubic symphysis, the auricular surface, and the sternal end of the fourth rib. Due to their frequency of use, these methods should be subjected to continued accuracy of use assessments. The first aim of the project is to develop a complete biological profile, consisting of the sex, ancestry, stature, and a trauma evaluation for each of the individuals in the study. Included within this biological profile is the estimation of the age at death, which highlights the second, and more complex, goal of the project. The researcher will compare the current aging methods, attempting to identify the differences in more traditional methods as compared to newly published ones. In order to accomplish this, the researcher will use various osteometric tools to measure and analyze the skeletal elements of the individuals from the two sample groups. This project will also address other questions relevant to the current discourse in forensic aging. For instance, how do age-at-death estimation techniques account for damaged remains? Additionally, how do newer techniques compare with the standard methodology, and more importantly with other emerging techniques for age estimation? While it is not anticipated that this analysis will point to one method as superior to others, it will provide a validation to previous studies using a modern sample and posit new questions for further research.

11:30 THE LACY HOTEL SITE: AN EXAMINATION OF A NINETEETH –CENTURY FAMILY IN A RURAL BOARDING HOUSE SETTING**, Melissa Scharffenberg*, Georgia State University, Georgia State University, Atlanta, GA 30302. The Lacy Hotel was a part of the "Great Locomotive Chase", a significant historical event in Kennesaw, Georgia during the Civil War (1861-1864), yet little is known of this site. It was built in the 1850s by the W&ARR and was established as a hotel/eating house to serve the community and those traveling up the rail line between Atlanta and Chattanooga. The hotel was managed by the Lacy family from 1859 until June 9, 1864 when they were removed for the purpose of General Sherman using the establishment as a military headquarters during the Battle of Kennesaw. The hotel was later burned by Union forces in November of 1864, leaving speculation to its exact location. This research centers on investigating the historical records along with the archaeological fieldwork in order to provide a more detailed analysis of civilian life associated with hotels during the Civil War period in Georgia.

11:45 EXCAVATIONS OF STRUCTURE 36 AT PACBITUN, BELIZE: RESULTS OF THE 2010 FIELD SEASON**, Robert B. Reece*¹ and Kong Cheong*², ¹Kennesaw State University, Kennesaw, GA 30144 and ²Trent University, Peterborough, Ontario, K9J 7B8. Pacbitun is an ancient Maya site located on the southern rim of the upper Belize River Valley north of the pine ridge at the edge of the northern Maya Mountains. Recent fieldwork at Pacbitun has revealed an occupational history starting as late as Middle Preclassic (900-300 BC) with continual occupation into the Terminal Classic (AD 800-925). Structure 36 is part of the seven structures that make up the North Group

on the Eastern Court, which is located directly northeast of Plaza A the main ceremonial plaza. This structure is the northern most structure of the North Group. Excavations this summer revealed multiple building phases which consisted of multiple plaster floors, and boulders of limestone mixed with ceramics and marl. Ceramic analysis from the ceramic material using the type-variety method will be the data used to establish the chronology of this structure and date its sequential building phases.

POSTERS

CONTEXTUAL HEAVY ALCOHOL USE AMONGST HOMELESS INDIVIDUALS, VETERANS WITH POST TRAUMATIC STRESS DISORDER AND NOTRE DAME STUDENTS**, Mark W. Flanagan, University of Notre Dame, Notre Dame, IN 46556 and Georgia State University, Atlanta, GA 30302. This project aims to compare social and individual aspects of heavy drinking as presented in three unique populations: the Notre Dame male student body, a local homeless population, and a local population of PTSD veterans. Although drinking differences and stigmas are typically recognized by quantity of alcohol consumed (light social drinkers versus heavier imbibers), heavy, and often more dangerous, drinking habits are generally lumped together as “problematic”. Data was gathered on social aspects of drinking using a combination of surveys, participant observation, and life histories. Data was gathered on perceived conscious or individual experiences using informant-rendered intoxication graphs. While Notre Dame students differed significantly from homeless and PTSD drinkers in almost all 7 identified areas of social context, PTSD and homeless drinkers showed discrepancy from each other in the areas of sociality, violence, law, and poly-drug use. All groups showed differences in perceived altered-consciousness. These findings could have potential usefulness in defining alcohol typologies or creating novel and more effective ways of treating alcoholism/addiction.

SMALL FINDS FROM THE CHOOGHA GAVANEH SITE IN THE ISLAMABAD PLAIN, CENTRAL ZAGROS MOUNTAINS, IRAN**, Firoozeh Forouzan*, Georgia State University, Atlanta, GA 30302. This study examines small finds from the site of Chogha Gavaneh, Iran, including zoomorphic clay figurines, geometric-shaped objects, and sling bullets in order to determine if they served an economic function during the Early Chalcolithic period (ca. 5000-4000 B.C.E.). A total of 104 animal figurines, sling bullets, and geometric-shaped objects have been found at Chogha Gavaneh. This research challenges previous archaeological interpretations of animal figurines that have interpreted them as being magical or lucky objects for hunting and religious rituals, or for use as game pieces, educational objects, or toys. Through the use of XRF (x-ray fluorescence spectrometry) analysis and the *chaine opératoire* approach, I suggest, contrary to the conventional wisdom, that some of these clay objects might represent another kind of social practice and may have had an economic function.

THE GEORGIA ACADEMY OF SCIENCE

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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.

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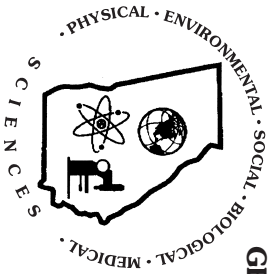
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3. Lipton JM and Nathan DG: The role of T lymphocytes in human erythropoiesis. In The Lymphocyte (Self and Miller, Eds) New York: Alan R. Liss, p57, 1981.

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