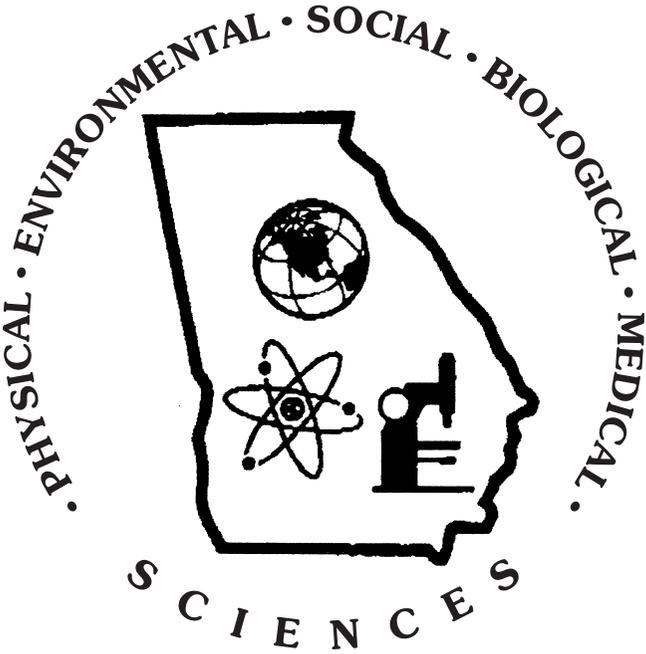


# GEORGIA JOURNAL OF SCIENCE

Peer Reviewed Publication of the Georgia Academy of Science



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

Colleagues,

Welcome to the 87th annual meeting of the Georgia Academy of Science. We will have 100 oral presentations being made and 20 posters presented. I must personally thank Dr. Timothy Mescon, President of Columbus State University, for agreeing to host our Annual Conference. Dr. Bonita Fluornoy, our local arrangements chair, has done yeoman's work to make this meeting possible by planning activities that will make this meeting very interesting. There is something for all of us. Dr. Barry Hojjatt, our Technical Program Chair, has provided a magnanimous effort in putting all of these papers together for a productive and informative meeting. John Aliff, our *Georgia Journal of Science* Editor, has done his usual unheralded excellent job in putting this copy of the journal together as well as the other issues of the *Georgia Journal of Science*. Finally, I would like to express my gratitude to the Executive Council of the Academy for their support in preparing for this meeting.

Section papers will be presented Friday from 2:00 pm through 5:00 pm. On Friday at 6:00 pm until 8:00 pm there will be a reception at the Coca Cola Space Science Center. Those attending the reception will go on a space mission via an IMAX theater presentation. Section papers will be presented Saturday from 7:45 am until 11:30 pm. During these Saturday sessions there will be a section business meeting for the election of new officers and other business concerning that section. On Saturday there will a luncheon featuring Dr. Shawn Cruzen, Director of the Coca Cola Space Center as our speaker.

Also, on Saturday there will be professional workshops for middle and secondary math and science teachers. These workshops are a good way for our Academy to make contacts with our middle school and high school colleagues.

We have an exhibition section. Please go by and visit these vendors who are helping support our efforts in making this meeting possible.

I attended the Georgia Science Teacher's Annual Meeting in Savannah, Georgia. Michael McGinnis of North Georgia College & State University and I set up an exhibitor's table for recruiting high school science teachers as members of the Georgia Junior Academy of Science. We were successful in our presentation and are hope to get more positions filled with the Junior Academy. As our Georgia Academy of Science Constitution states one of the priorities of the Senior Academy is to encourage and support the Junior Academy. Anyone who is interested in assisting in the rejuvenation of the Junior Academy can contact me at [robert.mcdonough@gpc.edu](mailto:robert.mcdonough@gpc.edu) or michael mcginnis at [mbm-cginnis@northgeorgia.edu](mailto:mbm-cginnis@northgeorgia.edu).

Please contact me, or any of our academy officers if you have any questions about the activities of the Junior or Senior Academy, or if you have any suggestions that will help us promote the development of science and science programs in the state of Georgia.

Respectfully submitted,  
Bob McDonough  
President  
The Georgia Academy of Science

*Office of the President*

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COLUMBUS STATE  
UNIVERSITY

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March 26, 2010

I'd like to take a moment to welcome the Georgia Academy of Sciences to Columbus State University for its annual meeting. This is surely an exciting time in the history of our university. As we have begun the second 50 years in our history, we have already made great strides on our strategic plan that refocuses our attention on the excellence of our academics.

Our commitment to the Sciences is paramount. We are actively pursuing and receiving NSF grant support and directly appropriations underwriting aggressive improvement of our lab facilities and equipment. With this, we will see a more vibrant student body, more widely recognized programs and even more capability to serve the growing Columbus region.

When you visit our Coca-Cola Space Science Center on our RiverPark campus in downtown Columbus, you will find a fantastic facility that not only provides instructional space for our astronomy courses, houses our Mead Observatory, but also serves as an important outreach program to K-12 students throughout our service region. The RiverPark campus is also home to our College of the Arts, the internationally heralded Schwob School of Music and some of the finest arts facilities in the country.

Meanwhile, I wish you the very best for a successful and productive conference.

Best wishes,

Timothy S. Mescon, Ph.D.  
President

TSM/pw

## GAS PROGRAM

### Friday

Registration 11:00a.m - 4:00 p.m.	Cunningham Center Lobby
Executive Council Meeting - 11:00a.m.	Cunningham Center Incubator Room
Paper Presentations and Posters - 3:00-5:00 p.m.	Cunningham Center
President's Reception - 6:00-8:00 p.m.	Coca Cola Space Science Center

*(During the Reception at Coca Cola Space Science Center, there will be an IMAX Theatre presentation and a Space Mission. Attendees will be able to participate in both.)*

### Saturday

Registration - 7:30a.m-10:00 a.m	Cunningham Center Lobby
Paper Presentations and Posters - 7:30a.m-12:00p.m	Cunningham Center
Plenary Luncheon - 12:00-2:00 p.m	Cunningham Center Room B

## GAS 2010 Room Assignments Cunningham Center

### Meeting Rooms

	Friday	Saturday
Biology	310	310
Chemistry	312	312
Earth/ Atmospheric Sciences		214
Physics/Mathematics....	209	209
Biomedical		315
Philosophy/History of Science		211
Science Education	215	215
Anthropology		1st floor Incubator Room

All Posters are scheduled in Room A

Plenary Luncheon ~ Room B

President's Reception ~ Coca Cola Space Science Center

Executive Council Meeting on Friday, 11:00 AM ~  
Cunningham Center 1st floor Incubator Room



**FRIDAY PAPER PRESENTATIONS**

\*Denotes student presenter

\*\*Denotes student research in progress

**Section I: Biological Sciences  
Cunningham Center, Room 310  
Shane A. Webb, Presiding**

- 3:00 A PRELIMINARY ANALYSIS OF ONTOGENETIC CHANGES IN CRANIAL ARCHITECTURE AND MANDIBULAR GEOMETRY DURING THE LARVAL DEVELOPMENT OF *DYTISCUS CAROLINUS* AUBÉ (COLEOPTERA: DYTISCIDAE: DYTISCINAE), Kent T. Mathias\*, E.H. Barman and W.P. Wall
- 3:15 A SURVEY OF SPECIES COMPOSITION OF CARRION VISITING BEETLES (COLEOPTERA) DURING WINTER AND SUMMER IN SOUTHWEST GEORGIA, Rodger K. Wagoner\* and I. Brown
- 3:30 THE EFFECTS OF 17-ALLYLAMINO-DEMETHOXYGELDANAMYCIN (17-AAG) ON THE APOPTOTIC CELL SIGNALING PATHWAYS IN PC-3 CELLS\*\*, Joseph Parsi-Graciani\* and Monica Frazier
- 3:45 **Break**
- 4:00 FACTORS AFFECTING DEPTH PERCEPTION IN HUMANS, Minh N. Mai\* and Mark A. Schlueter
- 4:15 THE ROLE OF ANTENNAE IN MATE DETECTION IN THE BEAN BEETLE, *CALLOSOBRUCHUS MACULATUS*, Rabia S. Malik\* and Mark A. Schlueter
- 4:30 **Posters (Posters will be displayed through 5:00)**

**Section II: Chemistry  
Cunningham Center, Room 312  
Ellen W. Moomaw, Presiding**

- 2:00 PHOTODYNAMIC PROPERTIES OF 3,4-DIFLUOROTETRAPHENYL PORPHYRIN\*\*, Adegboye Adeyemo, Jonathan Bookout\*, Benjamin Callahan, Donovan Tucker and James LoBue
- 2:20 POLYMORPHISM OF 1-METHYLIMIDAZOLIUM 4-NITROPHENOLATE CRYSTALS, Tabitha M. Callaway\* and Kenneth L. Martin
- 2:40 EXPRESSION AND PURIFICATION OF OXALATE OXIDASE FROM *CERIPORIOPSIS SUBVERMISPORA*, Patricia Mousatchie and Ellen W. Moomaw

- 3:00            **Break**
- 3:20            PRELIMINARY BIOCHEMICAL CHARACTERIZATION OF OXALATE OXIDASE FROM *CERIPORIOPSIS SUBVERMISPORA*\*\*  
Daniel Sledge\*, Crystal Bruce\* and Ellen W. Moomaw
- 3:40            THE USE OF FLAME ATOMIC ABSORPTION SPECTROSCOPY (FAAS) TO DETERMINE THE AMOUNT OF MANGANESE PRESENT IN OXALATEOXIDASE FROM *CERIPORIOPSIS SUBVERMISPORA*\*\*, Christopher Brooks\* and Ellen W. Moomaw
- 4:00            RAMAN SPECTROSCOPIC STUDY OF VARIOUS BIOFUEL SAMPLES\*\*, Kyle Mascariolo\* and James LoBue
- 4:20            CONTROL STUDIES OF PHOTODYNAMIC ACTIVITY OF 2,3,4-TRIFLUOROTETRAPHENYL PORPHYRIN\*\*, Adegboye Adeyemo, Donovan Tucker, Benjamin Callahan, Jonathan Bookout and James LoBue
- 4:40            **Posters (Posters will be displayed through 5:00)**

**Section IV: Physics, Mathematics, Computer Science and Technology**  
**Cunningham Center, Room 209**  
**Andreas Lazari, Presiding**

- 2:00            TEMPERATURE DEPENDANCE OF SOIL SAND PENETRABILITY,  
Peter Lauzon\* and Ben de Mayo
- 2:15            AN ANALYSIS OF THE PENETRABILITY OF ATHABASCA OIL SANDS\*\*, Austin Kerlin\*, J.E. Hasbun, Ben de Mayo and Peter Lauzon
- 2:30            A STUDY OF RESONANCE IN A PLANAR MATERIAL\*\*, Anton Hud\* and Javier E. Hasbun
- 2:45            ACCURATE MEASUREMENTS VARIOUS DYNAMICS OF SOUND USING PASCO EQUIPMENT\*\*, William I. Floyd IV and J.E. Hasbun
- 3:00            STUDYING STELLAR BINARY ORBITAL PARAMETERS: A STUDENT PROJECT, Ben Jenkins, Robert Moore, Jr., Benjamin Team and Bob Powell
- 3:15            HIGH-PRESSURE-HIGH-TEMPERATURE X-RAY DIFFRACTION STUDIES ON ELEMENTAL CERIUM\*\*, Matthew M. Bishop\*, Gary N. Chesnut and Nenad Velisavljevic
- 3:30            SEARCHING FOR NEW ASTEROIDS: A STUDENT PROJECT, Amanda Brock, Jacob Hewells, Robert Moore Jr., Benjamin Team and Bob Powell

- 3:45 USING LABVIEW TO MEASURE THE LIGHT INTENSITY OF A TWO-SLIT INTERFERENCE PATTERN\*\*, Nathaniel R. Sonderman\* and Julie L Talbot
- 4:00 AN EXAMINATION OF RENEWABLE ENERGY SOURCES: DO USED AND NEW COOKING OILS HAVE THE SAME AMOUNT OF ENERGY?, Sabir N. Siddique\* and Mark A. Schlueter
- 4:15 AN EXAMINATION OF ENERGY POTENTIAL IN USED MOTOR OILS, Christopher Tran\* and Mark A. Schlueter
- 4:30 PHASE SYNCHRONIZATION EFFECTS IN A LATTICE OF CHAOTIC OSCILLATORS\*\*, Philip Javernick\* and Trinanjan Datta
- 4:45 MAKING A HOME-OWNER DEVICE FOR PRODUCING BIO-CHAR FROM PLANT WASTE AND CALCULATING IF THIS METHOD IS VIABLE FOR CARBON SEQUESTRATION\*\*, Alexander Bauer\*
- 4:30 **Posters (Posters will be displayed through 5:00)**

**Section VII: Science Education  
Cunningham Center, Room 215  
Anil Banerjee, Presiding**

- 3:00 PERFORMING INQUIRY-BASED LABS USING BEAN BEETLES HELPS STUDENTS UNDERSTAND THE SCIENTIFIC METHOD, Mark Schlueter and Allison D'Costa
- 3:20 QUALITATIVE ASSESSMENT OF AN INTRODUCTORY SCIENCE COURSE, Randal L. N. Mandock
- 3:40 INCORPORATION OF ONLINE LABORATORY SUPPLEMENTAL MATERIAL FOR A NON-MAJORS CHEMISTRY COURSE, Maureen Burkhart, Jose Gonzalez- Roman, Teresita Lampe, Vivian A. Mativo, Ken Moss, Michael Sakuta, Melissa Schoene, Howard Silverstein and Luise E. Strange de Soria
- 4:00 **Break**
- 4:15 STUDENT SURVEY RESULTS FROM AN INTEGRATED LECTURE AND LABORATORY EARTHQUAKE PROJECT, Randal L. N. Mandock
- 4:35 GUIDED INQUIRY TO DEVELOP CONCEPTS OF ACID STRENGTH AND BUFFER IN INTRODUCTORY COLLEGE CHEMISTRY, Anil C. Banerjee
- 4:55 PROMOTING INSTRUCTIONAL IMMEDIACY IN AN ONLINE COURSE, Ollie Manley

**SATURDAY PAPER PRESENTATIONS**

\*Denotes student presenter

\*\*Denotes student research in progress

**Section I: Biological Sciences  
Cunningham Center, Room 310  
Shane A. Webb, Presiding**

- 8:15 THE CONSTITUTIVE NATURE OF LYSOZYME IN HOUSEFLIES\*\*, Christopher Evett\*, Dana Nayduch and Ashika Patel\*
- 8:30 A PRELIMINARY ASSESSMENT OF THE PRIMARY LARVAL MORPHOLOGY OF *MATUS OVATUS* LEECH (DYTISCIDAE: COLEOPTERA), Brandi Dent\*, J.W. Ammons\*, E.H. Barman, T.A. Shepley-James and B.P. White
- 8:45 THE EFFECTS OF PRESCRIBED BURNING AND POPULATION FRAGMENTATION ON THE DEMOGRAPHY OF THE FEDERALLY ENDANGERED HERB, *TRILLIUM PERSISTENS*, AND ITS COMMUNITY\*\*, Cassandra M. Plank\* and Lissa M. Leege
- 9:00 **Break**
- 9:15 A PHYLOGENETIC COMPARISON OF UNICELLULAR SUBAERIAL GREEN ALGAE FROM SOUTH GEORGIA\*\*, J. D. Griner\* and J. A. Nienow
- 9:30 CYANOBACTERIA ASSOCIATED WITH MICROBIALITES FROM PAVILION LAKE, CANADA\*\*, J. Trull\* and J. A. Nienow
- 9:45 CHARACTERIZATION OF WATER QUALITY PARAMETERS ALONG A NORTH TO SOUTH TRANSECT IN FRENCHMAN BAY, MAINE\*\*, Demi Brett Rabeneck\* and James B. Claiborne
- 10:00 **Break and Section Business Meeting**

**POSTERS**

MOVEMENTS OF SOUTHERN FLYING SQUIRRELS (*GLAUCOMYS VOLANS*) IN A FRAGMENTED FOREST\*\*, Jamie Adams\*, Lindsay Brotherton\*, Paul Smith\* and Thomas Nelson

INFLUENCE OF WATERSHED LAND-USE ON STREAM FISH COMMUNITIES IN NORTH GEORGIA\*\*, Michael Damron\*, Kyle Stowe\*, Wade Holcomb\*, Lindsay Brotherton\* and Thomas Nelson

SURVIVABILITY OF GFP-EXPRESSING *ESCHERICHIA COLI* IN THE DIGESTIVE TRACT OF HOUSE FLIES (*MUSCA DOMESTICA*)\*\*, Naveen Kumar H.V\* and Dr. Dana Nayduch

REPRODUCTIVE BIOLOGY OF THE ENDANGERED HERB *TRILLIUM PERSIS-  
TENS* IN NATURAL CONDITIONS, Chase H. Patrick\* and Dr. Lissa M. Leege

DIATOM ASSEMBLAGES ASSOCIATED WITH MICROBIALITES FROM PAVILION  
LAKE, CANADA\*\*, A. J. Williams\* and J. A. Nienow

**Section II: Chemistry**  
**Cunningham Center, Room 312**  
**Ellen W. Moomaw, presiding**

8:00 A COMPARISON OF THE N-TERMINAL MANGANESE BINDING  
SITE OF OXALATE DECARBOXYLASE (PDB CODE: 1UW8)  
WITH A MINIMIZED STRUCTURE OF THE SAME ATOMS\*\*, Crys-  
tal Bruce\* and Ellen W. Moomaw

8:20 SYNTHESIS AND THERMAL ANALYSIS OF NEW PHOSPHONAT-  
ED NORBORNENE HOMO- AND COPOLYMERS\*\*, Sergey A. Isa-  
rov\*, Michelle J. Razumov\*, Jacob L. Hicks\* and Gregory J. Gabriel

8:40 PHOTODYNAMIC PROPERTIES OF 2,4-DIFLUOROTETRAPHE-  
NYL PORPHYRIN\*\*, Adegboye Adeyemo, Jonathan Bookout, Benja-  
min Callahan\*, Donovan Tucker and James LoBue

9:00 **Break**

9:20 HYDROTHERMAL SYNTHESIS OF METAL ORGANIC FRAME-  
WORK MATERIALS (MOFs) TOWARDS HYDROGEN STORAGE,  
Stephanie N. Patterson\* and T. O. Salami

9:40 SYNTHESIS OF IMINES AND AMINES ON SILICA, MOLECULAR  
SIEVES, AND ANHYDROUS SODIUM SULFATE, Michael Quinif\*,  
Sung-Taek Kim and John T. Barbas

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

10:30 DETERMINATION OF MERCURY IN BIOLOGICAL AND ENVI-  
RONMENTALSAMPLES: A COMPARISON BETWEEN SAMPLE  
PREPARATION TECHNIQUES, Samuel Abegaz, Ilse Gelaude, Frank  
Vanhaecke, Luc Moens and Richard Dams

**POSTERS**

NEW INDICATORS FOR ACID-BASE VOLUMETRIC TITRATIONS, Yousef Ahmadi  
Beni

IMPROVEMENT OF CONDUCTIVITY IN POLYPYRROLE HOMOPOLYMERS\*\*,  
Yousef Ahmadi Beni and Wendell Grainger

IMPROVEMENT OF CONDUCTIVITY IN POLYPYRROLE HOMOPOLYMERS\*\*,  
Yousef Ahmadi Beni and Wendell Grainger

SYNTHESIS, CHARACTERIZATION AND LUMINESCENCE STUDIES OF EUROPIUM (III) COMPLEXES\*\*, Zewdu Gebeyehu, Lee Whitworth\*, Joseph Rugutt and Rajeev Dabke

LAYERED MATERIALS IN SENSOR TECHNOLOGY\*\*, Victoria D. Jones\* and T. O. Salami

NOVEL DENSITY FUNCTIONAL THEORY STUDIES ON THE INTERACTION BETWEEN ELECTRON DONATING/WITHDRAWING MOLECULE AND GRAPHENE LAYER \*\*, Yin Moe\*, Xinye Monica Wang and Yixuan Wang

COMPARISON OF SOLUTION AND BIOLOGICAL PROPERTIES OF AMINO AND GUANIDINO AMPHIPHILIC CATIONIC POLYMERS\*\*, Michelle J. Razumov\* and Gregory J. Gabriel

POLYMER NETS AS TEMPLATES FOR INORGANIC MORPHOLOGIES\*\*, Siddhi Shah\* and T. O Salami

**Section III: Earth and Atmospheric Sciences**  
**Cunningham Center, Room 214**  
**Donald Thieme, Presiding**

- 7:30 COPROLITES OF DEINOSUCHUS: LATE CRETACEOUS ESTUARINE CROCODYLIAN FECES FROM WEST GEORGIA, Samantha D. Harrell\* and David R. Schwimmer
- 7:45 A PRELIMINARY DESCRIPTION OF THE PLEISTOCENE RODENTS FROM CLARK QUARRY, BRUNSWICK, GEORGIA\*\*, Ray J. Cornay\* and Alfred J. Mead
- 8:00 TEXTURAL RELATIONSHIPS AMONG TI- AND ZR-BEARING ACCESSORY PHASES IN A BANDED AMPHIBOLITE: CARROLL COUNTY, GA, Lindsey Elise Hunt\* and Christopher Berg
- 8:15 HIGH RESOLUTION, GROUND BASED MAGNETIC DATA AT DAGGER MOUNTAIN, BIG BEND NATIONAL PARK, TX, Christopher Parham\* and Christian Poppeliers
- 8:30 CONSTRUCTING A CORRELATION ANALYSIS BETWEEN THE RADIAL GROWTH OF LOBLOLLY PINE *PINUS TAEDA* (L.) WITH PRECIPITATION RATES AND TEMPERATURE AVERAGES IN THE UNIVERSITY OF WEST GEORGIA AREA\*\*, S. Michael Edwards\*, Katie M. Williams\* and Georgina G. DeWeese
- 8:45 PATHOGENS TODAY, PANDEMICS TOMORROW: A MODERN STUDY OF DISEASE DIFFUSION\*\*, Clint Thompson\* and Michael G. Noll

- 9:00 GROUNDWATER CHEMISTRY WITHIN ALLUVIUM BENEATH A GEORGIA PIEDMONT FLOODPLAIN\*\*, Parna Bhattji\* and James Mayer
- 9:15 ARSENIC LEVELS IN GROUNDWATER IN WEST GEORGIA\*\*, K. Hope Ayash\* and Curtis L. Hollabaugh
- 9:30 GEOLOGIC AND GEOMORPHIC CONTROLS ON DAMAGE IN PUERTO RICO FROM HURRICANE GEORGES (1998), Rochelle F. Petrucci\*
- 9:45 COASTAL HAZARDS ASSESSMENT AND RECOMMENDATIONS FOR A SEVERELY ERODING TROPICAL SHORELINE: PALO SECO, PUERTO RICO, Andrew J. Maloof\* and Rochelle F. Petrucci\*
- 10:00 **Break and Section Business Meeting**
- 10:30 HISTORICAL STORM SURGE TABLES: ONE-STOP SHOPPING FOR ALL YOUR STORM SURGE DATA NEEDS, Jacques R. Johnson\*, Andrew J. Maloof\* and Rochelle F. Petrucci\*
- 10:45 EFFECT OF AN IN-SITU TREATMENT BMP ON ECOSYSTEM SERVICES IN AN IMPAIRED, URBAN STREAM, Megan Wheeler\* and Troy A. Keller
- 11:00 HOLOCENE PALEOCHANNEL AND MEANDER SCAR DEPOSITS ON UPATOI CREEK, WEST-CENTRAL GEORGIA, William J. Frazier and Roger W. Brown
- 11:15 MULTI-SENSOR SHALLOW GEOPHYSICAL STUDY OF TWO URBAN LOTS IN VALDOSTA, GEORGIA, Donald M. Thieme, Christian Poppeliers, Dan Elliott, Marvin Smith and Can Denizman

### POSTERS

- DIGITAL GEOLOGIC MAP OF THE FORTSON AND MIDLAND, GEORGIA, 7.5 MINUTE QUADRANGLES, Anna M. Menser\*, Thomas B. Hanley and Clinton I. Barineau
- GROUNDWATER QUALITY IN WEST GEORGIA WITH A FOCUS ON LEAD AND COPPER\*\*, Tina M. Skinner\*, K. Hope Ayash\* and Curtis L. Hollabaugh
- ANTHROPOGENIC ALTERATION OF STREAMFLOW THROUGH INTRODUCTION OF TREATED WASTEWATER EFFLUENT\*\*, Michael R. Johnson\*

**Section IV: Physics, Mathematics, Computer Science and Technology**  
**Cunningham Center, Room 209**  
**Andreas Lazari, Presiding**

- 8:00            CONVERSION OF A PETROLEUM COMBUSTION ENGINE TO HYDROGEN FUEL\*\*, Jeremy Robinson\*, Phil Hines\*, Alexander Bauer\* and Richard Gamble\*
- 8:15            DYNAMIC PHASE TRANSITION IN THE NEXT-NEAREST NEIGHBOR KINETIC ISING MODEL, William D. Baez\* and Trinanjan Datta
- 8:30            P WAVES SLOWNESS ANOMALIES ACROSS USARRAY AS MEASURED BY LIMITED APERTURE BEAM FORMING, Rebecca Sawyer\* and C. Poppeliers
- 8:45            IN SEARCH OF CONDITIONAL PROBABILITY DENSITY FUNCTIONS, Remigio Padilla-Hernandez, Andreas Lazari and Jemal Mohammed-Awel
- 9:00            SIZING OF DEFECTS AND DAMAGED REGIONS IN THE POROELASTIC COMPOSITE MATERIALS, Hasson M. Tavossi
- 9:15            DIMENSIONAL INSTABILITY ANALYSIS OF POROUS MATERIAL-USING CAD AND FINITE ELEMENT METHODS\*\*, Barry Hojjatie and C. Hearn
- 9:30            SOLVING THE TIME EVOLUTION OF A WAVEPACKET, Javier E. Hasbun
- 9:45            A SELF-GENERATING RECURSIVE UNIVERSE, Dennis W. Marks
- 10:00           Break and Section Business Meeting
- 10:30           A MODIFIED LOKTA-VOLTERRA PREDATOR-PREY, 'Kale Oyedeji
- 10:45           EVAPORATIVE DEPOSITION UNDER GEOMETRIC CONSTRAINT, K. C. Chan
- 11:00           COMET LULIN, Richard W. Schmude

**POSTERS**

ENHANCED PERMITTIVITY OF ARTIFICIAL MATERIAL: A MACROSCOPIC VIEW, Arun Kumar Saha

**Section V: Biomedical Sciences**  
**Cunningham Center, Room 315**  
**Seyed H. Hosseini, Presiding**

- 8:15 PRELIMINARY DATA ON THE LONG-TERM SURVIVAL AND FUNCTION OF EMBRYONIC CHICK HEARTS MAINTAINED *IN VITRO*\*\* , Lindsey Parks\* , Terry Archer-Liefde-Chance and Army Lester
- 8:30 IS OBESITY A PROBLEM IN COLLEGE STUDENTS?\*\*, Katie Rousseau and Deepa Arora
- 8:45 DECREASED PRESSURE AND INCREASED DEHYDRATION AS INDICATORS OF THE PROBLEMS ASSOCIATED WITH SHELL-LESS CHICK CULTURES\*\* , Terry Archer-Liefde-Chance\* , Lindsey Parks and Army Lester
- 9:00 **Break**
- 9:15 TARGETING *TRYPANOSOMA BRUCEI* CALCIUM ATPASES AND CHANNELS: A POTENTIAL STRATEGY FOR DISRUPTING CALCIUM HOMEOSTASIS, Kiantra Ramey\* , Zuzana Kucerova, Winston Thompson and Jonathan K. Stiles
- 9:30 *CHLAMYDIA TRACHOMATIS* CRYPTIC PLASMID ANTIGENS IN RECOMBINANT pGKVAX *CHLAMYDIA* VACCINE DEVELOPMENT\*\* , A. Campbell\* , E. Ekong, G. Ifere, K. Joseph, T. Belay, E. Barr, F. Eko, C. Black, J. Igietseme and G. Ananaba
- 10:00 **Break and Section Business Meeting**
- 10:30 *ENTEROCOCCUS* ISOLATES FROM COMMERCIAL MEATS, Michael W. Reeves
- 10:45 *PLASMODIUM BERGHEI* ANKA INFECTION UP REGULATES FOXP3 AND IL-10, AND DOWN REGULATES TGF-B1 IN IP-10 DEFICIENT C57BL/6 MICE, Bismark Sarfo, Nana Wilson\* , Danielle Whittaker\* , Vincent Bond and Jonathan Stiles

**POSTERS**

EPIGENOMIC REGULATION OF VEGFR2 BY LEPTIN-OTCH SIGNALING CROSSTALK IN MAMMARY CANCER CELLS, Shanchun Guo\* , Yanbo Xu, Miles Fuller and Ruben R. Gonzalez-Perez

MUTUAL EXCITATION AMONG OLFACTORY BULB MITRAL CELLS REVEALED BY RECURRENCE TIME HISTORY MAPPING (RTHM)\*\* , Alexandra Radu\* , Maame Boateng\* , Hena Razzak\* and Barry K. Rhoades

A SURVEY OF THE ANTIBIOTIC RESISTANCE OF BACTERIAL SPECIES IN THE EAR OF *CANIS FAMILIARIS*, Kristin S. Timmons\* , Christopher S. Bates and Richard D. Griner

**Section VI: Philosophy and History of Science**  
**Cunningham Center, Room 211**  
**Vivian Rogers-Price, Presiding**

- 8:00 ONLINE TEACHING AND LEARNING OF “FUNDAMENTALS OF EVOLUTION”, William A. Said and Ollie I. Manley
- 8:30 ARE SOCIAL MEDIA USEFUL TOOLS FOR PUBLIC ENGAGEMENT IN THE SCIENCES?, Laura Seifert
- 9:00 INTERPRETING THE INTERPRETATION: TOURING CLERMONT LEE’S HISTORICAL SAVANNAH LANDSCAPES IN THE TWENTY-FIRST CENTURY, Christy M. Crisp
- 9:30 DARWIN’S SCIENCE, Tom McMullen
- 10:00 **Break and Section Business Meeting**
- 10:30 PHYSICS VERSUS PURE MATHEMATICS, Ronald E. Mickens
- 11:00 A *DICERANDRA* (LAMIACEAE) INSIDE THE ANDERSONVILLE STOCKADE, Robin B. Huck
- 11:30 WILLIAM BARTRAM – AMERICA’S SECOND NATURALIST, MADE SIGNIFICANT CONTRIBUTIONS TO THE SCIENCE OF MALACOBIOLOGY AND FOSSILS, Elliott O. Edwards, Jr.

**Section VII: Science Education**  
**Cunningham Center, Room 215**  
**Anil Banerjee, Presiding**

- 7:40 USING WRITTEN COMMENTARY TO SUPPORT BUBBLE STUDENT ACHIEVEMENT IN SCIENCE, Jane Blair Gilbert\*
- 8:00 IMPROVING HIGH SCHOOL CHEMISTRY STUDENTS’ PERFORMANCE USING STUDY SKILLS TECHNIQUES, Jeffrey Klotz\* and Bonita Flournoy
- 8:20 EFFECTIVE FIFTH GRADE SCIENCE ASSESSMENTS – PERFORMANCE TASKS OF TRADITIONAL TESTS, Ryan Sweeney\*
- 8:40 MAKING THE *DAPHNIA* HEART RATE LAB WORK: A PRACTICAL WAY TO REDUCE HEART RATE SO THE EFFECTS OF TEST AGENTS CAN EASILY BE DETERMINED, Stephanie Bond\* and Frank Corotto
- 9:00 **Break**
- 9:20 CURRENT AWARENESS REGARDING THE H1N1 FLU VIRUS IN COLUMBUS, GEORGIA, Koosh Desai\*

- 9:40 MAKING THE DAPHNIA HEART RATE LAB WORK: OPTIMIZING THE USE OF CLUB SODA AND ISOPROPYL ALCOHOL, Cassandra Major\*, Diana Diaz\* and Frank Corotto
- 10:00 **Break and Section Business Meeting**
- 10:30 TEACHER TRAINING IN PHYSICS AND PHYSICAL SCIENCE, Bob Powell, Sharon Kirby and Ann Robinson
- 10:50 ADDITION OF ONLINE LABORATORY SUPPLEMENTAL MATERIAL FOR ORGANIC CHEMISTRY, Jose Gonzalez Roman, Vivian A. Mativo, Michael R. Nelson, Melissa Schoene, Howard Silverstein, Luise E. Strange de Soria and Jose J. Soria
- 11:10 ASSIGNING COLLABORATIVE LEARNING PAIRS BASED ON PERSONALITY TESTING, Jane E. Humble and R. Penwell-Cooper
- 11:30 STUDENT SURVEY RESULTS FROM AN INTERACTIVE ENERGY BALANCE PROJECT, Randal L. N. Mandock

**Section VIII: Anthropology**  
**1st Floor Incubator Room**  
**Terry G. Powis, Presiding**

- 7:45 PRELIMINARY PERSPECTIVES ON THE MIDDLE WOODLAND GEORGE SMITH SITE: APPLYING SURFACE SURVEY APPLICATIONS, Jennifer Weber\*, Terry Powis and Kong Cheong
- 8:00 POTTERY ANALYSIS OF BURNT VILLAGE SITE (9TP9), Vanessa N. Hanvey\*
- 8:15 CLEANERS AND SOCIALIZING, Stephanie Blocker\*
- 8:30 IDENTIFYING SHELL WORKSHOPS IN THE MAYA LOWLANDS: A VIEW FROM THE PRECLASSIC SITE OF PACBITUN, BELIZE, Terry Powis, Stephany Valdez\*, Jason Lee\* and Catherine McBee\*
- 8:45 THE ORIGINS OF AGRICULTURE IN NORTH AMERICA: USING GEOGRAPHIC INFORMATION SYSTEMS (GIS) TECHNOLOGY TO MODEL FOOD PRODUCTION DEVELOPMENT, Vicki Ina F. Gloer\*
- 9:00 EDWARDS' 1952 EXCAVATION AT TUGALO, 9ST1: A CLASSIFICATION AND ANALYSIS OF THE ARTIFACTS, Benjamin M. Storey\*
- 9:15 DIFFERENT PERSPECTIVES ON POWER: USING VIEWSHED ANALYSIS TO ASSESS EMERGING SOCIAL INEQUALITY IN THE YALAHAU REGION, QUINTANA ROO, MEXICO, Jennifer Weber\* and Dr. Jeffrey B. Glover

- 9:30 GEOCHEMICAL ANALYSIS OF THE COPELAN SITE (9GE18), GREENE COUNTY, GEORGIA, Mark Williams and M. Jared Wood
- 9:45 AUTOPSY OF AN ANOMALY: HUMAN DEMOGRAPHIC PROCESSES IN THE CHACHAPOYAS CLOUD FORESTS OF PERU, Warren B. Church
- 10:00 **Break and Section Business Meeting**

### **POSTERS**

GIS VISUALIZATION OF ARCHAEOLOGICAL SETTLEMENT PATTERNS IN SPATIAL, TEMPORAL AND PALEOECOLOGICAL CONTEXTS IN THE RIO ABISEO NATIONAL PARK, NORTHERN PERU, Jennifer Collins\*

## **FRIDAY PAPER PRESENTATIONS**

\*Denotes student presenter

\*\*Denotes student "in progress" research

### **Section I: Biological Sciences Cunningham Center, Room 310 Shane Webb, Presiding**

3:00     A PRELIMINARY ANALYSIS OF ONTOGENETIC CHANGES IN CRANIAL ARCHITECTURE AND MANDIBULAR GEOMETRY DURING THE LARVAL DEVELOPMENT OF *DYTISCUS CAROLINUS* AUBÉ (COLEOPTERA: DYTISCIDAE: DYTISCINAE), Kent T. Mathias\*, E.H. Barman and W.P. Wall, Georgia College & State University, Milledgeville, GA 31061. Changes in prey regimes exploited during larval dytiscid development should be reflected in the morphology of the cranium and cranial appendages, particularly the mandibles. When dorsal views of first, second and third instar crania of *Dytiscus carolinus* Aubé are compared, significant and progressive differences in cranial architecture are evident. A geometric analysis of mandibles reveals developmental variation in mandibular geometry. These data were obtained using a WILD M5A dissecting microscope equipped with a camera lucida and a Canon D60 digital camera attached to a Meiji RZ trinocular scope. Ontogenetic variation in mandibular geometry includes changes in angles of attack and in mandibular length/mandibular base ratios during larval development. Changes in cranial architecture and mandibular geometry, along with the corresponding biomechanical consequences of these changes, indicate that at least first instars of *D. carolinus* are exploiting a prey regime with characteristics different from that utilized later in larval development. This project was supported in part by a Faculty Research Grant, Office of Research Services, Georgia College & State University. Aquatic Coleoptera Laboratory Contribution No.78.

3:15     A SURVEY OF SPECIES COMPOSITION OF CARRION VISITING BEETLES (COLEOPTERA) DURING WINTER AND SUMMER IN SOUTHWEST GEORGIA, Rodger K. Wagoner\* and I. Brown, Department of Biology, Georgia Southwestern State University, Americus, GA 31709. The impact of temperature on carrion visiting beetles in southwest Georgia was recorded. Two surveys were completed during winter and summer to compare species diversity and abundance visiting carrion. Eight baited traps were used to collect 608 beetles from the families Silphidae, Staphylinidae, Scarabaeidae, and Histeridae. Increases in average daily low temperatures corresponded with increased beetle capture rates, indicating that low temperatures do suppress species diversity and abundance. *Silpha inaequalis* was captured most often during the winter and *Onthophagus hecate* was captured most often during the summer.

3:30     THE EFFECTS OF 17-ALLYLAMINO-DEMETHOXYGELDANAMYCIN (17-AAG) ON THE APOPTOTIC CELL SIGNALING PATHWAYS IN PC-3 CELLS\*\*, Joseph Parsi-Graciani\* and Monica Frazier, Columbus State University, Columbus, GA 31907. Prostate cancer is the second leading cause of cancer-related deaths in males. Men with prostate cancer can undergo androgen deprivation treatments which usually results in the cancer becoming a metastatic hormone-refractory prostate cancer (HRPC). Individuals with HRPC have limited treatment options and poor survival rates (~16 months). To explore treatment options that selectively kill cancer cells, a study of tumor necrosis factor-related apoptosis inducing ligand (TRAIL) was proposed. TRAIL is a cell surface protein that selectively kills tumor cells but not normal cells. PC-3, a well-studied HRPC

cell line, shows decreased sensitivity to TRAIL due to overexpression of prosurvival protein, HSP 90. Studies show that inhibiting HSP 90 with the antitumor agent 17-AAG increases sensitivity of cells to TRAIL. We therefore hypothesize that inhibition of HSP 90 via 17-AAG would increase sensitivity of PC-3 cells to TRAIL, resulting in an increase in PC-3 cell death. To test this hypothesis, PC-3 cells pre-treated with 0, 50, and 100 nmol/L of 17-AAG for 48 hrs will be exposed to 0, 100, and 1000 ng/mL of TRAIL. Following treatment, changes in sensitivity of cells to TRAIL will be determined. A trypan blue assay will be used to test viability. Initiation of apoptosis via activation of PARP and caspases 3 and 9 will be determined using western blot.

4:00 FACTORS AFFECTING DEPTH PERCEPTION IN HUMANS, Minh N. Mai\* and Mark A. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Depth perception is the ability to judge the relative spatial distance between objects. This feature is observed in predators and primates as a necessary means to view the world in three-dimensions. In this study we investigated how age, gender, ethnicity, and pupillary distance (PD) correlate with depth perception in humans. It was hypothesized that PD would influence depth perception. Each test subject (N=100) answered a survey about their optical lifestyle, had their PD measured, and was given a depth perception test with a specially-constructed apparatus. Statistically significant gender differences were detected in PD, with the pupils of males farther apart than those of females ( $p=0.0093$ ). Ethnic differences in PD were also detected ( $p=0.030$ ). However, results showed that there is no statistical difference in depth perception between males and females ( $p=0.2926$ ). In addition, there is no relationship between depth perception and either age or ethnicity. Individual differences in visual acuity are one possible source of error in our test. Results of an additional study indicate that good visual acuity is important in achieving a high depth perception score when using the depth perception apparatus. It is also possible that humans use additional factors to judge distance such as color vision, binocular cues, occlusion, elevation, and texture gradients. These data enable us to better understand how depth perception varies among humans.

4:15 THE ROLE OF ANTENNAE IN MATE DETECTION IN THE BEAN BEETLE, *CALLOSOBRUCHUS MACULATUS*, Rabia S. Malik\* and Mark A. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Bean beetles, also known as southern cowpea weevils (*Callosobruchus maculatus*), are agricultural pests found in the tropics and subtropics of Africa and Asia. Their larvae feed and develop exclusively inside the seeds of legumes (Fabaceae). They have a rapid life cycle that includes a brief 10-14 day adult stage during which mating occurs. The main purpose of this study was to determine if antennae are the key sensory organ used in mate detection in *C. maculatus*. We hypothesized that the antennae play the key role in mate detection since these beetles live in dark, cluttered environments. To test this hypothesis 60 virgin females were mated to 60 virgin male beetles. Males were divided into three equally-sized groups: those with no antennae removed, those with one antenna removed, and those with both antennae removed. Males with no antennae removed, one antenna removed and both antennae removed found a female and attempted reproduction 70%, 65% and 40% of the time, respectively. In subsequent experiments, mating attempts declined to 30% when both males and females had both their antennae cut. Interestingly, male beetles with no antennae removed attempted to mate with each other 45% of the time. Our data support the hypothesis that the antennae of *C. maculatus* are beneficial to mate recognition. This study contributes to our understanding of the reproductive biology of this agricultural pest.

**Section II: Chemistry**  
**Cunningham Center, Room 312**  
**Ellen Moomaw, Presiding**

2:00 PHOTODYNAMIC PROPERTIES OF 3,4-DIFLUOROTETRAPHENYL PORPHYRIN\*\*, Adegboye Adeyemo<sup>1</sup>, Jonathan Bookout\*<sup>2</sup>, Benjamin Callahan<sup>2</sup>, Donovan Tucker<sup>2</sup> and James LoBue<sup>2</sup>, <sup>1</sup>Savannah State University Department of Natural Science and Mathematics, Savannah, GA 31404 and <sup>2</sup>Department of Chemistry Georgia Southern University, Statesboro, GA 30460. The use of electromagnetic radiation to promote chemical reactions can be observed in the variation in the UV-Vis absorption of the target chemical compound. In this experiment, photolysis was carried out on mixtures of *diphenylanthracene* (DPA) and *3,4-difluorotetraphenylporphyrin* (*3,4-DFTPP*) by exposing the chemical compound to electromagnetic radiation at the wavelengths of 488nm and 670nm. The resulting change in absorption was observed over time and was quantified using Beer's law. Photolysis of these mixtures at 670nm (from a Lasiris 7 mW diode laser for 1 hour) produces very dramatic decrease in absorption of both *3,4-DFTPP* and *DPA*, of 51% and 30% respectively. For photolysis at 488nm (Coherent Innova90 Argon Ion laser at 50 mW for 1 hour) on average the observed decrease in absorption of *DFTPP* and *DPA* was 8% and 39% respectively. A discussion of these results will be presented.

2:20 POLYMORPHISM OF 1-METHYLIMIDAZOLIUM 4-NITROPHENOLATE CRYSTALS, Tabitha M. Callaway\* and Kenneth L. Martin, Berry College, Mt. Berry, GA 30149. Two different syntheses of 1-methylimidazolium 4-nitrophenolate were carried out by addition of equal moles of *1-methylimidazole* and *4-nitrophenol* (dissolved in acetone for one synthesis, in ethanol for the other). Both syntheses resulted in yellow monoclinic crystals, and Cu-K $\alpha$  diffraction data sets were collected at 173 K. For a crystalline needle grown from the acetone solution, 9967 X-ray reflections were measured, and a unit cell with  $a = 7.3273(4)$  Å,  $b = 21.217(1)$  Å,  $c = 11.0567(5)$  Å,  $\beta = 107.272(4)$  °,  $Z = 4$ , and  $P2_1/a$  space group was found with  $R(\text{int}) = 0.041$ . For a crystalline block grown from the ethanol solution, 4954 X-ray reflections were measured, and a unit cell with  $a = 3.8298(3)$  Å,  $b = 10.1445(7)$  Å,  $c = 21.236(1)$  Å,  $\beta = 92.525(5)$  °,  $Z = 4$ , and  $P2_1$  space group was found with  $R(\text{int}) = 0.024$ . The crystals obtained from acetone solution actually have within the asymmetric unit one *1-methylimidazolium* cation and two *4-nitrophenol* moieties, which share a disordered hydrogen cation. The proton that was transferred to the *1-methylimidazole* is involved in a hydrogen bond to one of the two *4-nitrophenol* moieties. The crystals obtained from ethanol solution have within the asymmetric unit one *1-methylimidazolium* cation, one *4-nitrophenolate* anion, and one *4-nitrophenol* molecule.

2:40 EXPRESSION AND PURIFICATION OF OXALATE OXIDASE FROM *CERIPORIOPSIS SUBVERMISPORA*, Patricia Mousatchie<sup>1</sup> and Ellen W. Moomaw<sup>2</sup>, <sup>1</sup>University of Florida, Gainesville, FL 32611 and <sup>2</sup>Gainesville State College, Oakwood, GA 30566. Oxalate oxidase catalyzes the carbon-carbon bond cleavage of oxalate to yield carbon dioxide and hydrogen peroxide. Although there is currently no structural information available for oxalate oxidase from *Ceriporiopsis subvermispora* (CsOxOx), sequence data and homology modeling indicate that it is the first manganese-containing bicupin enzyme identified that catalyzes this reaction. The best characterized oxalate oxidases are from barley and wheat. These enzymes, also known as germins, contain a single cupin domain and are therefore classified as monocupins. Interestingly, CsOxOx shares greatest sequence homology with the bicupin microbial oxalate decarboxylases.

We report here the expression of oxalate oxidase from *Ceriporiopsis subvermispora* by *Pichia pastoris* and its subsequent purification. (This project was supported by NSF Grant # MCB-0919908.)

### 3:00 **Break**

3:20 A PRELIMINARY BIOCHEMICAL CHARACTERIZATION OF OXALATE OXIDASE FROM *CERIPORIOPSIS SUBVERMISPORA*\*\*<sup>†</sup>, Daniel Sledge\*, Crystal Bruce\* and Ellen W. Moomaw, Gainesville State College, Oakwood, GA 30566. Oxalate degrading enzymes have either actual or potential commercial significance with applications in medicine, agriculture, and industry. Oxalate oxidase and oxalate decarboxylase are used in clinical assays of oxalate in blood and urine. Transgenic plants have been engineered to express oxalate degrading enzymes as a means of protection against pathogens and to reduce the amount of oxalate present. Other applications include the bioremediation of oxalate waste, the production of hydrogen peroxide, and pulping in the paper industry. These uses and the desire to elucidate the novel chemistry that these enzymes catalyze, make them worthy subjects of study. Since recombinant oxalate oxidase from *Ceriporiopsis subvermispora* (CsOxOx) has not been previously purified beyond 40%, no steady-state kinetic analyses have been previously performed. The native enzyme is reported to possess optimal activity at pH 3.5 and 45°C. Km and kcat values were reported to be 0.1 mM and 88 s<sup>-1</sup>, respectively. Our procedure with the purified recombinant enzyme is to carry out OX assay reactions containing specific substrate concentrations in triplicate and the initial rate data is analyzed to obtain the values of kinetic constants by curve fitting using standard computer-based methods. (This project was supported by NSF Grant # MCB-0919908.)

3:40 THE USE OF FLAME ATOMIC ABSORPTION SPECTROSCOPY (FAAS) TO DETERMINE THE AMOUNT OF MANGANESE PRESENT IN OXALATE OXIDASE FROM *CERIPORIOPSIS SUBVERMISPORA*\*\*<sup>†</sup>, Christopher Brooks\* and Ellen W. Moomaw, Gainesville State College, Oakwood, GA 30566. Two pieces of indirect evidence support the idea that oxalate oxidase activity from *Ceriporiopsis subvermispora* (CsOxOx) is Mn-dependent. First, Mn(II) is present in the resting form of recombinant, wild type CsOxOx as observed by electron paramagnetic spectroscopy. Second, the successful expression of soluble and active CsOxOx requires the presence of Mn(II) in the growth medium. On the other hand, other enzymes in the bicupin family appear to be able to employ a variety of metals in catalysis. Characterizing the manganese dependence of CsOxOx is significant to place this enzyme in the context of other oxalate degrading enzymes and that of other cupin proteins. In order to characterize the manganese dependence of CsOxOx, we use FAAS to determine the amount of manganese present in purified samples. (This project was supported by NSF Grant # MCB-0919908.)

4:00 RAMAN SPECTROSCOPIC STUDY OF VARIOUS BIOFUEL SAMPLES\*\*<sup>†</sup>, Kyle Mascaritolo\* and James LoBue, Department of Chemistry Georgia Southern University, Statesboro, GA 30460. Raman spectroscopy of various biodiesels was measured to explore its potential as a general diagnostic technique. Raman spectra of canola, peanut, and corn biodiesels and ethyl acetate were generated with an Ar ion gas laser (Coherent Innova 90) at 514 nm and compared with normal mode frequencies computed at the ab-initio 6-31g\* level for ethyl acetate. Spectra were detected with an Ocean Optics USB-4000 Spectrometer. Stoke peaks for the biodiesels matched to a high degree with ethyl acetate features in the range of 1000 to 3100 cm<sup>-1</sup>. Unexplained broad fluorescence was observed for all biodiesels but was not observed for ethyl acetate.

Relative peak intensities were compared between 450 polarized light and unpolarized light yielding different intensities for C-H stretching modes. Fluorescence intensity variations caused dramatic shifts in baseline.

4:20 CONTROL STUDIES OF PHOTODYNAMIC ACTIVITY OF 2,3,4-TRIFLUOROTETRAPHENYL PORPHYRIN \*\*, Adegboye Adeyemo<sup>1</sup>, Donovan Tucker<sup>\*2</sup>, Benjamin Callahan<sup>2</sup>, Jonathan Bookout<sup>2</sup> and James LoBue<sup>2</sup>, <sup>1</sup>Savannah State University Department of Natural Science and Mathematics, Savannah, GA 31404 and <sup>2</sup>Department of Chemistry, Georgia Southern University, Statesboro, GA 30460. To measure photodynamic activity of 2,3,4-trifluoro tetraphenyl porphyrin (TPP) a mixture of TPP and 9,10-diphenylanthracene (DPA) was exposed to laser light at 488 nm and 50mW. Change in UV-VIS absorption indicated change in concentration of DPA and TPP. DPA acted as a sacrificial molecule to simulate biological molecules. Previous studies showed a 55%-65% decrease in DPA with 5%-10% decrease in TPP. To validate previous studies, control experiments were run. Chloroform as a solvent could be responsible for our photolysis rates, so photolysis solutions were prepared in methylene chloride and irradiated under the same conditions as previous experiments. A 65% decrease in DPA was observed, eliminating a solvent connection to observed photolyses. A concentration study was performed by decreasing the concentration of porphyrin by half. A 50% decrease in DPA decomposition was observed which appears to be a higher rate of photolysis than expected. Currently, experiments are being done to remove oxygen from the solutions to confirm the role of oxygen in the reactions.

**Section IV: Physics, Mathematics, Computer Science,  
Engineering and Technology  
Cunningham Center, Room 209  
Andreas Lazari, Presiding**

2:00 TEMPERATURE DEPENDENCE OF OIL SAND PENETRABILITY, Peter Lauzon\* and Ben de Mayo, University of West Georgia, Carrollton, GA 30118. The Athabasca oil sand deposits of Alberta, Canada, contain perhaps the largest deposit of petroleum in the world. The commercial extraction of this resource is highly dependent on the mechanical properties of the oil sands. One potentially important measure of these properties is the temperature dependence of the penetrability factor of the sands (Durgunoglu and J. K. Mitchell, Static Penetration Resistance of Soils, April 1973, Space Science Laboratory, Series 14, Issue 24, University of California, Berkeley). We have experimentally measured this factor by recording the force necessary to insert a 0.625 cm rod into oil sand at different temperatures. Vernier Software equipment was used to record the temperature, the force and the penetration depth at a rate of 2 times per second. The results were plotted and analyzed using Microsoft Excel and Deltagraph software. A power function  $PF(T) = 0.2585 * T^{(-0.826)}$  N/mm provided a good fit to the data, where PF is the penetration factor and T is the temperature in C. Acceptably pliant oil sand is found to be achievable at modest temperatures, a fact of benefit to the oil sand extraction companies. Work supported by the Georgia Space Grant Consortium-NASA.

2:15 AN ANALYSIS OF THE PENETRABILITY OF ATHABASCA OIL SANDS\*\*, Austin Kerlin\*, J.E. Hasbun, Ben de Mayo and Peter Lauzon\*, University of West Georgia, Carrollton, GA 30118. Given the vast amount of crude oil which exists in Alberta's oil sands, we studied a sample from Athabasca in order to characterize the relationship between applied force, penetration depth, and temperature. From the

collected data the force was modeled as a function of temperature and depth. Using this information, an analysis of the energy associated with the amount of work in penetrating the oil sand to a particular depth was made. We, thereby, obtained an analytic behavior of the energy as a function of temperature. This, in turn, is related to the cost of mining the oil sand and it is found that it takes more energy to achieve penetration at lower temperature. Additionally, by the nature of the system, we relate our applied force to a viscous force similar to Stokes' Law, and calculate an effective viscosity of the oil sand as a function of temperature. Work supported by the Georgia Space Grant Consortium-NASA.

2:30 A STUDY OF RESONANCE IN A PLANAR MATERIAL\*\*, Anton Hud\*, and Javier E. Hasbun, University of West Georgia, Carrollton, GA 30118. There already exist resonant boxes aimed at demonstrating the vibrational properties of glass sheets. The idea is to vary the frequency of speakers inside the box until the material begins to resonate; however, this tool has not been thoroughly explained or explored. With the box we built, the resonant frequency of any planar material (of appropriate dimensions) can be determined experimentally. Each material has a different frequency based on the physical properties of the material down to the atomic structure. The inner workings of the box are also seldom explained. The ability of the speakers to produce a density wave along the length of the material stimulates a certain vibrational mode. Thus, a formula can be derived to model such vibration and the box can be used to test the formula. Preliminary results on plexiglass and glass demonstrate that glass resonates at a higher frequency. Work supported by the Georgia Space Grant Consortium-NASA.

2:45 ACCURATE MEASUREMENTS VARIOUS DYNAMICS OF SOUND USING PASCO EQUIPMENT\*\*, William I. Floyd IV and J.E. Hasbun, Department of Physics, University of West Georgia, Carrollton, GA 30118. By analyzing the pressure fluctuations initialized by sound vibrations, we can measure the speed of sound and the intensity of the sound wave. The experiment consists of a cylindrical tube of length 2.445 m with a speaker positioned at one end, an interchangeable barrier at the other end with a PASCO sound sensor placed directly in front of the speaker. A short pulse, sounded by the speaker, passes by the sensor thus activating its data collection. The initial wave passes the sensor, travels the length of the tube, is reflected by the barrier, and it triggers the sensor on its return. The time of flight is determined as the waves travels a distance twice that of the length between the sensor and barrier. Knowing the distance and time of flight, the speed of sound can be calculated. By changing the reflective barrier to various materials, and comparing the results, we can show the different materials' ability to reflect and absorb a sound wave of given frequency and amplitude. The data is read and recorded through a Science Workshop 500 interface by PASCO Scientific that is controlled by a computer program called Data Studio. The PASCO interface controlling the sound sensor uses a controllable sampling rate that enables time measurements of a small fraction of a second, thus increasing accuracy of data collection. In these experiments, we have measured the speed of sound in air at atmospheric pressure and room temperature to an accuracy of about 0.04% error.

3:00 STUDYING STELLAR BINARY ORBITAL PARAMETERS: A STUDENT PROJECT, Ben Jenkins, Robert Moore Jr., Benjamin Team and Bob Powell, University of West Georgia, Carrollton, GA 30118. This project was developed as an ongoing student project to study of the orbital parameters of visual binary systems. Photographs of binaries of known angular separations have been taken and have been measured for determining the plate scales of several different orientations. These initial measurements

are now being applied in the study of binaries in the Washington Double Star list; these binaries have not been studied in decades. When the analysis of these images is completed, the data will provide the WDS catalogue with updated information on positions of the components of some of the binaries for the upgrading of the listed orbital information. A future goal of this project is to determine the orbital parameters of the binary systems. The protocol used in this project will be carefully documented so that other students may conduct similar studies in the future.

3:15 HIGH-PRESSURE-HIGH-TEMPERATURE X-RAY DIFFRACTION STUDIES ON ELEMENTAL CERIUM\*\*, Matthew M. Bishop\*<sup>1</sup>, Gary N. Chesnut<sup>1</sup> and Nenad Velisavljevic<sup>2</sup>, <sup>1</sup>University of West Georgia, Carrollton, GA 30118 and <sup>2</sup>Los Alamos National Laboratory, Los Alamos, NM 87545. Cerium, a member of the rare earth metals, is an ideal element for studying electronic and atomic behavior. Cerium experiences a number of structural phase transitions under pressure and temperature, which provide information about the behavior of the atomic arrangements and the influence of s, p, d, and f electrons. Pressure is induced by the utilization of a diamond anvil cell, and temperature is controlled by resistive heating techniques. Synchrotron radiation provides intense x-rays for monitoring electronic and atomic behavior. The high-pressure-high-temperature experiments on cerium will provide a greater fundamental understanding of the electronic and structural phase transitions in regions of phase space that are poorly defined if known at all. 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. The Advanced 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.

3:30 SEARCHING FOR NEW ASTEROIDS: A STUDENT PROJECT, Amanda Brock, Jacob Hewells, Robert Moore Jr., Benjamin Team and Bob Powell, University of West Georgia, Carrollton, GA 30118. Asteroids have collided with the Earth in the past and will collide in the future. People are searching for new asteroids, especially those which come relatively close to the Earth. We are doing a ground-based optical astrometry survey for asteroids in a defined area of the night sky. We have selected the region of Lambda Aquarii, which has a mean apparent magnitude of 3.73, visible to the naked eye but not bright enough to distort images. This search area of the sky was chosen because it is close to the ecliptic where the most asteroids are located and because it is an area of the sky visible in the east beginning in the early fall and visible in subsequent months until it sets in the early spring to allow a long period of observation. The study uses instrumentation at the University of West Georgia Observatory, including a CCD imager attached to a 120 mm, F5 refractor. The search area will be photographed repeatedly during the same night and on consecutive nights to detect rapidly moving objects quite close to the Earth as well as slower moving objects much further away. Astrometric differential comparison of the objects in the images will allow the detection of any object(s) moving across the sky at velocities differing from the background stars. Orbital parameters will be determined for the detected objects. These orbital parameters will be compared to those in a database to determine if the object has previously been reported. To date, only known asteroids have been detected.

3:45 USING LABVIEW TO MEASURE THE LIGHT INTENSITY OF A TWO-SLIT INTERFERENCE PATTERN\*\*, Nathaniel R. Sonderman\* and Julie L Talbot, University of West Georgia, Carrollton, GA 30118. In a typical introductory lab setting,

students can calculate the distance between minima in a two-slit interference pattern, but cannot measure anything related to the intensity of the light. Using a Vernier light sensor connected to the NI ELVIS interface and LabVIEW software, we are able to measure the light intensity (in Lux) and make a direct comparison between the experimental light curve and the theoretical equation.

4:00 AN EXAMINATION OF RENEWABLE ENERGY SOURCES: DO USED AND NEW COOKING OILS HAVE THE SAME AMOUNT OF ENERGY?, Sabir N. Siddique\* and Mark A. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Today's societies across the globe are trying to find and harness all potential sources of energy to save money and conserve natural resources. Recycling used cooking oils may be one such resource. Waste cooking oils are produced in large quantities at fast food restaurants, grocery store delis, and fryers at home. But what happens to this used cooking oil after it is used? It could be sent to a landfill, or perhaps, it could be recycled. Cooking oils can be easily recycled and used as fuel for combustion in diesel engines and in most types of generators. In the following experiment, the energy or calories in new and used cooking oils was measured and compared. A modified food calorimeter was used to burn samples of cooking oil, measure changes in temperature, and calculate the number of calories. In this experiment, several types of cooking oils were investigated, including: corn oil, canola oil, and commercial cooking oil mixtures (e.g. Publix Deli). The results indicate a significant difference between the energy contained in new (unused) cooking oils as compared to used cooking oils. Used cooking oils had a 10-20% decline in calories compared to the new cooking oil. Some of the energy loss was attributed to the cooking and heating process, while other energy loss was attributed to oil impurities (water and fats from the food cooked in the oil). Thus, used cooking oils are not entirely homogenous mixtures due to impurities from cooked food products. This variable may conflict with how consistent used oils burn. As natural resources are quickly being depleted in our world, it is becoming vital to understand and discover all potential sources of energy.

4:15 AN EXAMINATION OF ENERGY POTENTIAL IN USED MOTOR OILS, Christopher Tran\* and Mark A. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Motor oils are the products of fossil fuels, which is a nonrenewable resource. Each day, vast quantities of used motor oil are generated as thousands of Americans have their vehicle's oil changed. In order to avoid dealing with these waste oils, many companies pay to send their used oils away. Most waste oils from engines or motors are dumped and not reused. However, there is an alternative to this approach. Waste motor oil could be used in commercial furnaces and other combustion engines. The goal of our study was to determine the amount of energy available in new and used motor oils. In the following experiment, the energy or calories in new and used motor oils was measured and compared. A modified food calorimeter was used to burn samples of motor oil, measure changes in temperature, and calculate the number of calories. In this experiment, several types of motor oils were investigated, including: 10W30 and 10W40. The results indicate a significant difference between the energy contained in new and used motor oils. Used motor oils had a 5-15% decline in calories compared to the new oils. Some of the energy loss was attributed to the heat from the engine in the lubrication process, while other energy loss was attributed to oil impurities (metal fragments and dirt). As fossil fuels are quickly being depleted in our world, it is becoming vital to determine the maximum usage we can harvest from these limited resources.

4:30 PHASE SYNCHRONIZATION EFFECTS IN A LATTICE OF CHAOTIC OSCILLATORS\*\*, Philip Javernick\* and Trinanjan Datta, Department of Chemistry and Physics, Augusta State University, Augusta, GA 30904. We investigate the effects of phase synchronization in a lattice of weakly coupled chaotic oscillators. We find that in the synchronous state the phases of the oscillators are locked. In the non-synchronous state the phases are either zero (oscillation quenching) or the difference between the phases is non-zero. We explore the synchronization behavior by computing the phase synchronization plot for the interaction parameters of the chaotic system. We also explore the effects of a spatially varying coupling on the phase synchronization in the lattice of coupled chaotic oscillators.

4:45 MAKING A HOME-OWNER DEVICE FOR PRODUCING BIO-CHAR FROM PLANT WASTE AND CALCULATING IF THIS METHOD IS VIABLE FOR CARBON SEQUESTRATION\*\*, Alexander Bauer\*, Augusta State University, Augusta, GA 30904-2200. Bio-char has been used as soil amendment for centuries. Terra Petra soils in the Amazonian basin contains large amount of facilitated charcoal to improve soil quality. The purpose of this research is to built and test a device that is suitable for home-owner use and to evaluate the yield of charcoal and energy conversion efficiency. Then to produce a significant amount of charcoal that can be used in further research for soil fertility and determine if the process yields a net sequestration of carbon. The method employed for the pyrolysis will be the indirect or retort method, since it is cleaner than direct burning. In the retort method biomass is sealed in a container with no access to oxygen, which is then heated between 250°C and 750°C. Most of the times the gases produced are either burned off or caught to produce bio-crude. The container used here is a 13.5 gallon steel barrel wrapped with insulating material. Heat is supplied from the bottom through a gas burner and the vapors produced from inside the barrel are rerouted back into the fire. The container will be heated until all the raw material has been converted into charcoal. Factors that have to be determined are conditions for maximum yield, energy input, and net amount of carbon sequestered by this method. We are currently in the early stages of the research and are expecting results in the future.

**Section VII: Science Education  
Cunningham Center, Room 215  
Anil Banerjee, Presiding**

3:00 PERFORMING INQUIRY-BASED LABS USING BEAN BEETLES HELPS STUDENTS UNDERSTAND THE SCIENTIFIC METHOD, Mark Schlueter and Allison D'Costa, Georgia Gwinnett College, Lawrenceville, GA 30043. Since very little is known about the physiology of the bean beetle, *Callosobruchus maculatus*, they are an excellent model organism for inquiry-based labs at the undergraduate level. Several inquiry-based labs were conducted with Introductory Biology students to help them understand and apply the scientific method. Following an introduction to bean beetles, students analyzed data from a “staged” experiment, to get them accustomed to observing and handling the beetles. After this, the students were posed two questions: (1) Which senses do beetles use to mate? (2) Do adults need food to survive? Following some on-line research, student groups had to create hypotheses and design experiments to test their hypotheses. During the following two weeks, students conducted their experiments and analyzed their data. Based on student evaluations after the completion of the project, 95% indicated that their knowledge of the scientific method significantly increased. Approximately 80% of the students indicated that they enjoyed developing their own hypothesizes and creating their

own experiments. Written feedback indicated that students enjoyed learning the scientific method in this hands-on fashion compared to memorizing definitions or performing a step-by-step experiment from a laboratory manual. Overall, we conclude that students both learn more about the scientific method and enjoy science when performing inquiry based labs.

3:20 **QUALITATIVE ASSESSMENT OF AN INTRODUCTORY SCIENCE COURSE**, Randal L. N. Mandock, Department of Physics, Clark Atlanta University, Atlanta, GA 30314. Two assessment surveys in two forms, preliminary and exit, have been developed and used in an introductory science course at Clark Atlanta University. Although the subject of the course is earth science, the surveys are general enough to be adapted for use in any science discipline. The lecture survey was introduced in the Spring 2003 semester and has been used every semester thereafter. The laboratory survey was developed and first used in the Fall 2009 semester. The lecture preliminary survey probes student expectations for the course on the first day of class. The laboratory survey investigates the student's notions about the purpose of laboratory science for a non-science major. The exit surveys are given on the day of the final exam. Both surveys measure the degree to which expectations for the course were met. The results of recent surveys can be used to compare strengths and weaknesses in instruction among the faculty who taught the course. These results show qualitative improvements in technical knowledge and abilities and in computer skills. Changes are revealed when comparing survey results from the beginning to the end of the semester in personal preference for teaching styles, the desirability of working in a team, the approach to the subject taught and to lifelong learning, and personal definitions of science. Preliminary and exit laboratory survey results show the qualitative level of improvement in laboratory skills and abilities from the beginning to the end of the semester. These results also show how the student's perceived purpose for laboratory science changed from the beginning to the end of the semester. Significant improvements are seen in the areas of critical thinking, analytical thinking, and measurement skills.

3:40 **INCORPORATION OF ONLINE LABORATORY SUPPLEMENTAL MATERIAL FOR A NON-MAJORS CHEMISTRY COURSE**, Maureen Burkhart, Jose Gonzalez-Roman, Teresita Lampe, Vivian A. Mativo, Ken Moss, Michael Sakuta, Melissa Schoene, Howard Silverstein and Luise E. Strange de Soria, Georgia Perimeter College, Clarkston, GA 30021. Our main goal was to provide a website that had information for the 1152 lab students to use prior to coming to class. Videos and pictures were taken to post on the website. Student feedback on the website will be shown, as well as a brief view of the changes in scores on the assessment exam for questions pertaining to the particular experiments. This work was funded by a Georgia Perimeter College, University System of Georgia STEM mini-grant.

#### 4:00 **Break**

4:15 **STUDENT SURVEY RESULTS FROM AN INTEGRATED LECTURE AND LABORATORY EARTHQUAKE PROJECT**, Randal L. N. Mandock, Department of Physics, Clark Atlanta University, Atlanta, GA 30314. An integrated earthquake project and laboratory assignment was developed for an introductory earth science course at Clark Atlanta University. The project analyzes a major earthquake and is assigned to predominantly non-science students to teach different methods of earthquake magnitude calculation, plate motions, evaluation of seismic hazards, and how to locate and plot an epicenter on a map. The students use relations found on the United States Geological

Survey (USGS) Earthquake Hazards Program website to calculate the different earthquake magnitude types used by earthquake seismologists. They use the seismic record sections for Western-Hemisphere earthquakes to locate the earthquake epicenter on a map. They apply their knowledge of earth structure and dynamics to understand how and why the earthquake happened. If the earthquake produced a tsunami, the students calculate its wave properties and speed. Students learn how to estimate seismic hazard from a seismic hazard map. Results of student surveys conducted in the Fall semesters of 2008 and 2009 show how student self-assessments of learning can help instructors evaluate student preparation for the project, comprehension of the project, barriers to project completion, knowledge gained from the project, and weaknesses in teaching. The survey results indicate student participation in office hours and faculty-led study sessions. The results measure the degree to which the project helped the student understand difficult concepts taught in lecture and laboratory. The results show how students perceive differences in teaching by different instructors. Evolution of the project from one semester to the next is seen in the survey results.

4:35 GUIDED INQUIRY TO DEVELOP CONCEPTS OF ACID STRENGTH AND BUFFER IN INTRODUCTORY COLLEGE CHEMISTRY, Anil+ C. Banerjee, Columbus State University, Columbus, GA 31907. The study was conducted with 48 students in two lab sections using a pre-post design. The students were enrolled in a survey of chemistry lecture lab sequence course taught by the author. The pretest questions on weak and strong acids and their relative strengths indicated wide spread misconceptions and conceptual difficulties about strength of strong and weak acids, and pH. Some common misconceptions were higher concentration means stronger acid, and pH of 0.1M strong and weak acids are same. A post test after teaching the topics in the lecture class indicated students still had similar misconceptions. A qualitative guided inquiry lab was designed on pH of strong and weak acids, and change in pH after adding diluted hydrochloric acid to a buffer solution and distilled water. Students were not taught concept of buffer before the inquiry lab. The idea was to see whether students can apply the concept of equilibrium in a weak acid to explain buffer action. After the lab, students were told what the buffer contained but no explanation was given on buffer action. A post test after the inquiry lab showed less misconception and better understanding about weak and strong acids, and how concentration and strength were not related. However students could not interpret pH changes in buffer solution and reason out the action of buffer. How inquiry helps in developing acid base concepts but not necessarily and automatically reasoning abilities will be discussed.

4:55 PROMOTING INSTRUCTIONAL IMMEDIACY IN AN ONLINE COURSE, Ollie Manley, Georgia State University, Atlanta, GA 30303. This research will focus on instructional immediacy and examine the interactions between students/students and students/facilitator. The specific question that will guide this study is: What are the implications of instructional immediacy on student/student and student/facilitator interactions in an online course? The Theory of Engagement will be used as a theoretical basis for investigating student/student and student/facilitator interactions in a virtual classroom. Specifically interactions between students/students will be examined by analyzing postings on a discussion board, responses to postings on the discussion boards, virtual meetings to complete projects and solve problems, attendance at meetings in the virtual classroom, group evaluations, and communications via e-mail. Interactions between student/facilitator will include feedback to students, responses to postings on the discussion board, and invitations to meet in the chat room or virtual classroom. Instructional immediacy was facilitated by the activities in which the students engaged. Strategies used in the

online course promoted immediacy between students/students and students/facilitator. Interactions occurred frequently between students/students and student/facilitator both in and outside of the virtual classroom. Students were involved in completing projects and group assignments which required that they cooperate with each other and work as a team which is one of the guiding principles of instructional immediacy. Students' active involvement in chats, discussions, and the virtual classroom indicated that they were highly motivated, on task, and open to comments and suggestions made by their peers. Instructional immediacy is a principle that should be considered when designing online courses.

## SATURDAY PAPER PRESENTATIONS

\*Denotes student presenter

\*\*Denotes student "in progress" research

### Section I: Biological Sciences Cunningham Center, Room 310 Shane Webb, Presiding

8:15 THE CONSTITUTIVE NATURE OF LYSOZYME IN HOUSEFLIES\*\*, Christopher Evett\*, Dana Nayduch and Ashika Patel\*, Georgia Southern University, Statesboro, GA 30460. Because they live and breed in extremely septic environments and are often associated with humans, houseflies (*Musca domestica*) are important vectors of many diseases. To get an idea of the immune system component of the interaction between bacteria and houseflies, housefly lysozyme expression was examined by RT-PCR throughout the life-cycle of the organism from undeveloped egg *in utero* to old-age adult. Bacteria-fed adult flies will be examined for a change in lysozyme expression, and fly mortality will be measured after a combination of bacteria and lysozyme-inhibitor are introduced. By expression analysis and chemical inhibition of lysozyme, the aim of this study is to prove the central role that lysozyme plays in housefly immunity.

8:30 A PRELIMINARY ASSESSMENT OF THE PRIMARY LARVAL MORPHOLOGY OF *MATUS OVATUS* LEECH (DYTISCIDAE: COLEOPTERA), Brandi Dent\*<sup>1</sup>, J.W. Ammons\*<sup>1</sup>, E.H. Barman<sup>1</sup>, T.A. Shepley-James<sup>2</sup> and B.P. White<sup>2</sup>, <sup>1</sup>Georgia College & State University, Milledgeville, GA 31061 and <sup>2</sup>Georgia Military College, Warner Robins, GA 31093. The Matinae van den Branden, hypothesized as the sister-group to the remaining Dytiscidae, has relatively few species that are restricted to Nearctic and Australian regions. The genus *Matus* Aubé is represented in Georgia by two species, *M. bicarinatus* (Say) and *M. ovatus* Leech, easily distinguished from other dytiscid larvae by the presence of pseudochelate modifications of tibiae and tarsi. Primary larval (first instar) morphology has been shown to be important in dytiscid systematics. However, although descriptive information for mature larvae of *M. ovatus* is available, the morphology of first instars of *M. ovatus* is unknown. The analysis of the primary chaetotaxy of legs, head, and last abdominal segment of *M. ovatus* revealed no significant differences between this species and *M. bicarinatus*. Undescribed matine primary anatomical features presented herein include: *i*) anterior tentorial pits and fragments of the anterior tentorial arms; *ii*) pronotal anterior modifications and chaetotaxy; and *iii*) complete sclerotization of the seventh abdominal segment. Differences in mandibular morphology permit identification of first instars of Georgia species of *Matus*. This project was supported in part by a Faculty Research Grant, Office of Research Services, Georgia College & State University. Aquatic Coleoptera Laboratory Contribution No.79.

8:45 THE EFFECTS OF PRESCRIBED BURNING AND POPULATION FRAGMENTATION ON THE DEMOGRAPHY OF THE FEDERALLY ENDANGERED HERB, *TRILLIUM PERSISTENS*, AND ITS COMMUNITY\*\*, Cassandra M. Plank\* and Lissa M. Leege, Georgia Southern University, Statesboro, GA 30458. *Trillium persistens* is a federally endangered perennial herb that is restricted to three counties in Georgia and one in South Carolina where it exists in fragmented populations. At Tallulah Gorge State Park, *T. persistens* co-occurs with the threatened Table Mountain pine ecosystem, which requires fire. The effects of fire are unknown for *T. persistens*. The objectives of this study were to analyze the effect of fire on demography of *T. persistens*, compare population

structure among sites to evaluate demography across the range of *T. persistens*, and to analyze community composition and structure. Four study sites were established in spring 2009. A prescribed burn was conducted in one site in February 2009 to test the effect of fire on *T. persistens* populations. A census of *T. persistens* populations was conducted in spring and summer of 2009 for each site; each plant was marked with a numbered metal tag and life stages recorded. Stage structure differed among sites ( $\chi^2 = 35.337$ ,  $P = 0.0001$ ) with subadults representing the largest group (55.09%) while seedlings represented the smallest (2.3%). Stage structure did not differ between the burned and unburned sites at Tallulah Gorge following the burn ( $\chi^2 = 3.238$ , NS). Results are pending for community composition and structure analyses. The Department of Natural Resources and Georgia Power provided assistance for this research.

## 9:00      **Break**

9:15      A PHYLOGENETIC COMPARISON OF UNICELLULAR SUBAERIAL GREEN ALGAE FROM SOUTH GEORGIA\*\*, J. D. Griner\* and J. A. Nienow, Valdosta State University, Valdosta GA 31698. Subaerial algae are a diverse group of photosynthetic microorganisms defined by their ability to grow on surfaces exposed directly to air. While some groups of subaerial algae, most notably the Trentepohliales, form complex structures, most are morphologically simple, making assessments of genetic diversity and phylogenetic relationships difficult. In this study, we examine the genetic diversity of 20 strains of unicellular green algae isolated from subaerial sites in southern Georgia. All of the strains are morphologically similar. To differentiate the isolates, we will use universal eukaryotic 18s ribosomal primers (SSU1 and SSU2) in PCR assays. Genomic DNA will be extracted via a modified CTAB method. The small subunit 18s region will be amplified by PCR using SSU primers and PCR products will be subjected to gel electrophoresis. Properly amplified and purified PCR products will be sequenced. Sequence comparison and phylogenetic tree construction will be performed using Geneious software. These sequences will be compared to previously published green algal sequences to better understand the phylogenetic relationships of green algae and to assist in the identification of potentially cryptic species.

9:30      CYANOBACTERIA ASSOCIATED WITH MICROBIALITES FROM PAVILION LAKE, CANADA\*\*, J. Trull\* and J. A. Nienow, Valdosta State University, Valdosta, GA 31698. Microbialites are rock formations that develop at least partially through the activity of photosynthetic microorganisms. Well-known examples include formations in Shark's Bay, Australia, and Exuma Cay, Bahamas. The work reported here is part of a long-term study of microbialite formations in Pavilion Lake, British Columbia. Pavilion Lake is a circumneutral (pH 8.4), highly oligotrophic freshwater lake with a maximum recorded depth of 65m. Microbialites of varying morphologies develop all along the walls of the lake. Our role in the project is to inventory the photosynthetic microorganisms associated with the microbialites and to assess potential relationships between photosynthetic associations and the morphology of the microbialites. Cyanobacteria, in particular, are thought to play an important role in microbialite formation. Samples of living microbialites were collected in September, 2009, and shipped to Valdosta State University. Aliquots of each sample were preserved in glutaraldehyde for investigation later. Live material is being examined using light microscopy after decalcification with 5% EDTA. In addition, attempts are being made to develop unialgal cultures using the algal media BG11, BBM, and a version of BBM modified to maintain pH near 8. Our preliminary investigations indicate that members of at least nine genera of cyanobacteria are present, several of which are thought to precipitate calcium carbonate in other aquatic systems.

9:45      **CHARACTERIZATION OF WATER QUALITY PARAMETERS ALONG A NORTH TO SOUTH TRANSECT IN FRENCHMAN BAY, ME\*\***, Demi Brett Rabeneck\* and James B. Claiborne, Georgia Southern University, Statesboro, GA 30458. Interest in maintaining marine biodiversity creates awareness of ocean acidity and its impact on fish physiology. We characterized the pH and associated water quality parameters, including temperature, salinity, dissolved inorganic carbon (DIC), and total alkalinity (TA), of a small transect in Frenchman's Bay, ME. Twenty-one water samples from depth and surface were collected on three separate days by lowering a niskin bottle on a line at three coordinates along a South to North transect. The coordinates stretched from the Mount Desert Island Biological Laboratory (N44°26'02.3", W068°17'25.5"), through open pelagic waters (N44°26'21.8", W068°17'21.8") to Lamoine Beach (N44°27'00.4", W068°17'10.2"). The Ocean Process Analysis Lab of the University of New Hampshire in Durham measured the DIC, TA, and pH, with salinity and temperature measurements provided in replicates of three or four. A Mann-Whitney-U test showed a significant difference between pH at depth and at surface ( $U=1109$ ,  $df=1$ ,  $P < 0.0001$ ), with a mean pH of  $7.75 \pm 0.08$  and  $7.91 \pm 0.41$ , respectively. This difference in pH coincided with a significant difference in TA at depth ( $2086 \pm 32.5 \mu\text{mol/kg}$ ) and at surface ( $2035 \pm 79.3 \mu\text{mol/kg}$ ) ( $U=1035$ ,  $df=1$ ,  $P < 0.0001$ ). Larger amounts of TA give the ocean a greater buffering capacity for  $\text{H}^+$  ions, a product of  $\text{CO}_2$  absorption. In future experiments pH values may be used to see if sodium hydrogen exchangers (NHEs) of Marine Longhorn Sculpin, *Myoxocephalus octodecemspinosus*, acclimate to maintain homeostasis. Our results are based on a subset of the final data, but should support the prediction that sculpin NHEs acclimate to increased acidity levels since this demersal species has to cope with lower pH than species living in shallower waters.

10:00      **Section business meeting**

## POSTERS

**MOVEMENTS OF SOUTHERN FLYING SQUIRRELS (*GLAUCOMYS VOLANS*) IN A FRAGMENTED FOREST\*\***, Jamie Adams\*, Lindsay Brotherton\*, Paul Smith\* and Thomas Nelson, North Georgia College and State University, Dahlonega, GA 30533. Southern flying squirrels are found in forested habitats throughout the eastern U.S., inhabiting deciduous and mixed forests in the Appalachian region. Because the species moves primarily by leaping and gliding among trees, forest fragmentation may impact movements, home range, and dispersal. Yet few studies have addressed the spatial ecology of this species. We initiated a long-term study to investigate: (1) home range size, (2) habitat use, and (3) impacts of road development on the movements of squirrels in a hardwood forest on the NGCSU campus. Squirrels were live-trapped, radio-collared, and tracked regularly from May-September 2009. We live-trapped a total of 13 squirrels, including 7 males and 6 females. The mean fixed kernel home range size for all squirrels was 8.3 ha (4.4 SE), whereas the core areas averaged 2.1 ha (1.2 SE). These home ranges are generally comparable to those reported by other researchers in the SE U.S., an indication that our study area provides high quality habitat. Of 16 den trees, 81% were either white oaks or poplars. Den trees tended to be living trees (not snags) with large diameters (mean = 136 cm; SD = 37.3). Midway through the study, the university built a 30-m wide road bisecting the study area. During road-building, squirrels shifted their home ranges away from the disturbance. Subsequently, the road proved to be no barrier to movements as individuals were sometimes located on both sides in a single activity period. Research is continuing to better quantify seasonal movements and microhabitat use.

INFLUENCE OF WATERSHED LAND-USE ON STREAM FISH COMMUNITIES IN NORTH GEORGIA\*\*, Michael Damron\*, Kyle Stowe\*, Wade Holcomb\*, Lindsay Brotherton\* and Thomas Nelson, North Georgia College and State University, Dahlonega, GA 30533. 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 analyzed the relationship between sub-watershed land use and two measures of stream quality, the Index of Biotic Integrity (IBI) and the Index of Well-Being (IWB) at 10 sites along 5 first- and second-order streams in the Chestatee River watershed. Sites were classified as urban, agricultural, or forested based on the predominant land-use in each sub-watershed. We hypothesized that both indices would decline from forested to urban sites. A total of 906 fishes of 25 species was processed during the study. Based on a composite of both indices, forested sites were usually good to excellent, agricultural sites were highly variable, and urban sites were fair to poor. Although sample sizes were small, our data suggest that increased intensity of local land use alters the composition of stream fish communities, lowering biotic integrity.

SURVIVABILITY OF GFP-EXPRESSING *ESCHERICHIA COLI* IN THE DIGESTIVE TRACT OF HOUSE FLIES (*MUSCA DOMESTICA*)\*\*, Naveen Kumar H.V\* and Dr. Dana Naydich, Georgia Southern University, Statesboro, GA 30460. House flies are cosmopolitan and have indiscriminate feeding habits, and are involved in the propagation of many bacterial diseases that affect humans. Ingested bacteria are first harbored in the fly's crop, from which they are either regurgitated or diverted into the midgut for digestion. Although house flies have been shown to lyse bacteria within their alimentary canal, some species of bacteria persist within the fly for various periods of time. Since surviving bacteria may be disseminated and/or excreted from infected flies, persistence directly affects the potential of the fly to be a vector or reservoir for these organisms. This study investigated the location, survival and persistence of bacteria in house flies. Adult house flies were fed a known amount of GFP-expressing *Escherichia coli*, and both quantitative (bacterial enumeration by culture-recovery) and qualitative (fluorescent microscopy of dissected fly digestive tracts) assessments were performed. Preliminary results demonstrated that *E. coli* persisted in whole-fly homogenates for up to 48 hours post-ingestion (hpi). Viable *E. coli* cells, as determined by cellular integrity along with GFP expression, were viewed using microscopy, and their location in the alimentary canal was determined. These observations were compared to bacterial enumeration tests at different times post ingestion, to determine the actual location of surviving bacteria within the flies. Initially, bacteria were present in the crop, but then many entered the alimentary canal where they were progressively lysed, as soon as 6 hpi. The role of house flies as significant reservoirs or vectors of *E. coli* will be discussed.

REPRODUCTIVE BIOLOGY OF THE ENDANGERED HERB *TRILLIUM PERSISTENS* IN NATURAL CONDITIONS, Chase H. Patrick\* and Dr. Lissa M. Leege, Georgia Southern University, Statesboro, GA 30460. Fragmentation can adversely affect species, potentially pushing them towards collapse. *Trillium persistens* is an endangered herb that occupies a narrow range in NE Georgia and SW South Carolina, recently fragmented by a dam. This experiment examined the reproductive biology of *T. persistens* in two sites in Georgia. In Spring 2009, we studied the pollination biology of *T. persistens* by administering three treatments: open and supplemental pollination and simulated florivory. We harvested ripe fruit in July 2009. Persistence of plants through fruit harvest did not differ by treatment, and because persistence indicates successful fruit set, we infer that fruit production did not differ by treatment. Eighty-six percent of the

marked plants persisted until the time of fruit harvest, and therefore likely produced fruit though fruits were not present on all plants. Fruits contained  $4.97 \pm 0.33$  seeds, though treatment did not affect seed production. Fruit diameter and seed number were strongly correlated ( $R^2 = 0.5864$ ,  $P = 0.0001$ ). We conclude that the small population size of *T. persistens* is not limited by pollinators, suggesting resource limitation. The correlation between fruit diameter and seed number can also be used to better estimate seed production non-destructively. Further research is needed to better understand resource limitation in *T. persistens* to improve conservation practices. We would like to thank the Chandler Research Fellowship, the Department of Natural Resources and Georgia Power for supporting for this research.

DIATOM ASSEMBLAGES ASSOCIATED WITH MICROBIALITES FROM PAVILION LAKE, CANADA\*\*, A. J. Williams\* and J. A. Nienow, Valdosta State University, Valdosta, GA 31698. Microbialites are rock formations that develop at least partially through the activity of photosynthetic microorganisms. The work reported here is part of a long-term study of microbialite formations found in Pavilion Lake, a circumneutral (pH 8.4), ultra-oligotrophic freshwater lake in south-central British Columbia. Because individual microbialites in the lake have estimated ages between 1,000 and 10,000 years, it is possible that environmental conditions have changed during their period of development. We are investigating this possibility by examining the diatom assemblages both living on the surface and buried within microbialites. The specimens used were collected during the 2004 field season, fixed with formaldehyde, and stored at 4°C. Samples cut from the surface or cored from the interior of larger specimens were subdivided into 3 parts. One subsample was critical-point dried in the natural state. A second subsample was partially decalcified with 5% EDTA, then critical-point dried. A third sample was treated with concentrated nitric acid to remove all carbonate and organic material. Each subsample was then sputter-coated and observed using scanning electron microscopy. More than 35 diatom taxa have been identified from surface assemblages, including three species of *Mastogloia*. Fewer taxa were found in the interior. We are continuing to examine the samples to determine if the differences are the result of differential preservation or changes in the environment.

**Section II: Chemistry**  
**Cunningham Center, Room 312**  
**Ellen W. Moomaw, Presiding**

8:00 A COMPARISON OF THE N-TERMINAL MANGANESE BINDING SITE OF OXALATE DECARBOXYLASE (PDB CODE: 1UW8) WITH A MINIMIZED STRUCTURE OF THE SAME ATOMS\*\*, Crystal Bruce\* and Ellen W. Moomaw, Gainesville State College, Oakwood, GA 30566. Oxalate decarboxylase (OxDC) catalyzes the difficult carbon-carbon bond cleavage of oxalate to yield carbon dioxide and formate. High resolution X-ray crystal structures of *Bacillus subtilis* OxDC (PDB codes: 1J58 and 1UW8) have confirmed that the OxDC monomer is composed of two  $\beta$ -barrel domains, each of which contains a Mn-binding site. These Mn ions are 26 angstroms apart from each other in the monomer. In the current work we are using the tools of molecular modeling (Deep View – Swiss pdb Viewer and Spartan 08) to compare the constrained structure of the N-terminal domain manganese-binding site of oxalate decarboxylase (PDB code: 1uw8) with the ideal (minimized) structure. We are comparing bond angles and atom distances in the minimized structure and that from the crystal structure to understand the degree of constraint in the available crystallographic snapshot.

8:20 SYNTHESIS AND THERMAL ANALYSIS OF NEW PHOSPHONATED NORBORNENE HOMO- AND COPOLYMERS,\*\* Sergey A. Isarov\*, Michelle J. Razumov\*, Jacob L. Hicks\* and Gregory J. Gabriel, Kennesaw State University, Kennesaw, GA 30144. Phosphorous-containing macromolecules have many applications including bioadhesives, fuel cell membranes, and fire-retardant (FR) materials. A series of new phosphonate-containing norbornene homopolymers and statistically random copolymers were polymerized in 5 minutes at room temperature via ROMP. Gel permeation chromatography (GPC) measured polydispersities of less than 1.15 for all polymers. NMR spectroscopy indicated that targeted chain lengths and percent phosphonate compositions were achieved. In this talk we will discuss our interest and studies in using these polymers as FR additives. A total of 15 polymers were studied by thermogravimetric analysis (TGA). TGA showed a well-defined, three-stage degradation process distinct from other polymeric phosphorus FR analogues reported in literature. Notably, we observed that onset temperature and char yield were easily tunable by varying the chain length and percent phosphonate content. These trends may help in the design and development of more inexpensive and compatible FR additives for wider use in materials from clothing to wire coatings to construction materials.

8:40 PHOTODYNAMIC PROPERTIES OF 2,4-DIFLUOROTETRAPHENYL PORPHYRIN\*\*, Adegboye Adeyemo<sup>1</sup>, Jonathan Bookout<sup>2</sup>, Benjamin Callahan\*<sup>2</sup>, Donovan Tucker<sup>2</sup> and James LoBue<sup>2</sup>, <sup>1</sup>Savannah State University Department of Natural Science and Mathematics, Savannah, GA 31404 and <sup>2</sup>Department of Chemistry, Georgia Southern University, Statesboro, GA 30460. The photolytic properties of *2,4-difluoro-tetraphenylporphyrin in diphenylanthracene* (DPA) were observed in order to verify if *2,4-difluoro-tetraphenylporphyrin* causes the destruction of DPA when exposed to light at a specific wavelength, thus potentially making it a candidate for use in photodynamic therapy. This was measured through photolysis under laser light at a wavelength of 488nm at 50mW. Absorbance readings were taken initially, after 30 minutes of photolysis, and again after 60 minutes of photolysis. The decrease in absorbance for DPA was calculated to be 3% between 0 and 30 minutes and another 3% between 30 and 60 minutes.

9:00 **Break**

9:20 HYDROTHERMAL SYNTHESIS OF METAL ORGANIC FRAMEWORK MATERIALS (MOFs) TOWARDS HYDROGEN STORAGE, Stephanie N. Patterson\* and T. O Salami, Department of Chemistry, Valdosta State University, Valdosta, GA 31698. In recent times, research in the design of three-dimensional and two-dimensional architectures has been significant. This is due to their potential applications in hydrogen storage. An example of such class of material is the metal organic frameworks (MOFs). Our area of research involves the synthesis of novel materials using hydrothermal methods. Presently we are utilizing carboxylates and sulfonates as template and focusing on lower main group elements our metal sources. We will discuss the synthesis and detailed characterization of some of our new materials and their potential applications.

9:40 SYNTHESIS OF IMINES AND AMINES ON SILICA, MOLECULAR SIEVES, AND ANHYDROUS SODIUM SULFATE, Michael Quinif\*, Sung-Taek Kim and John T. Barbas, Valdosta State University, Valdosta, GA 31698. Imines were synthesized in a facile reaction between primary amines and aldehydes or ketones, using activated silica gel, molecular sieves or anhydrous sodium sulfate. No other acidic catalysts were utilized. Typically, 2 g of activated silica, activated molecular sieves, or anhydrous sodium

sulfate were added to a round bottomed flask equipped with a drying tube, followed by the addition of 20 mL of dry ether or hexane. While stirring at room temperature, equimolar amounts ( $2.0 \times 10^{-3}$  mol) of the amine and the aldehyde or ketone were added. The mixture was stirred for 15 minutes. It was then filtered, and the silica washed twice with 10 mL portions of ether. The ether was removed under vacuum leaving behind the pure imines. The reactions took place equally well in the presence of dry silica alone and the yields were quantitative. In the reactions on silica, secondary amines were successfully synthesized in the same pot by further reaction of the imines with sodium borohydride, followed by the addition of water. All procedures are simple, go to completion, are environmentally friendly, and require no heating or harsh acidic catalysts. Analysis was done by GC-MS, proton and C-13 NMR and by IR.

## 10:00 Section business meeting

10:30 DETERMINATION OF MERCURY IN BIOLOGICAL AND ENVIRONMENTAL SAMPLES: A COMPARISON BETWEEN SAMPLE PREPARATION TECHNIQUES, Samuel Abegaz<sup>1</sup>, Ilse Gelaude<sup>2</sup>, Frank Vanhaecke<sup>2</sup>, Luc Moens<sup>2</sup> and Richard Dams<sup>2</sup>, <sup>1</sup>Department of Chemistry, Columbus State University, Columbus, GA 31907 and <sup>2</sup>Laboratory of Analytical Chemistry, Gent University, Institute for Nuclear Sciences, Belgium. Microwave digestion reduction-aeration and pyrolysis combined with cold vapour atomic absorption and fluorescence are compared for the determination of total mercury in several biological and environmental matrices. Biological samples were digested in a  $\text{HNO}_3/\text{H}_2\text{O}_2$  and environmental samples in  $\text{HNO}_3/\text{HClO}_4$ . After reduction with  $\text{SnCl}_2$ , the mercury was collected by two-stage gold amalgamation. After microwave digestion reduction-aeration, detection limits of  $1.4 \text{ ng g}^{-1}$  and  $0.6 \text{ ng g}^{-1}$  were obtained for cold vapour atomic absorption spectrometry (CVAAS) and cold vapour atomic fluorescence spectrometry (CVAFS), respectively, for 250 mg of environmental samples. For biological samples (500 mg), the detection limits were  $0.7 \text{ ng g}^{-1}$  (CVAAS) and  $0.4 \text{ ng g}^{-1}$  (CVAFS). After pyrolysis, detection limits of  $3.5 \text{ ng g}^{-1}$  and  $1.6 \text{ ng g}^{-1}$  for CVAAS and CVAFS, respectively, were obtained for a 10 mg sample. Pyrolysis can only be applied when the organic content of the sample is not too high. Accurate results were obtained for 8 certified reference materials of both environmental and biological origin.

## POSTERS

NEW INDICATORS FOR ACID-BASE VOLUMETRIC TITRATIONS, Yousef Ahmadi Beni, Department of Chemistry, Columbus State University, Columbus, GA 31907. During the investigations on multi functional compounds for binding to multiple antiviral drugs, two interesting poly functional molecules (*Bepa Red* and *Bepaxy Red*) were designed and synthesized. Two *tris(2-(hydroxyl-methyl)phenol)* derivatives were synthesized as acid/base indicators. Reduction of *5,5',5''-(hydroxymethanetriyl)tris(2-hydroxybenzoic acid)* in the presence of hydrogen ( $\text{H}_2$ ) and palladium/charcoal afforded *5,5',5''-methanetriyltris(2-hydroxybenzoic acid)* in 89% yield. Further reduction of this product with a borane solution in THF gave *4,4',4''-methanetriyltris(2-(hydroxymethyl)phenol)* in 76% yield. Furthermore, *5,5',5''-(hydroxymethanetriyl)tris(2-hydroxybenzoate)* was synthesized in 67% yield by the reaction of methyl salicylate and 1,3,5-trioxane in glacial acetic acid. Reduction of *5,5',5''-(hydroxymethanetriyl)tris(2-hydroxybenzoate)* with a suspension of  $\text{LiAlH}_4$  in THF produced *4,4',4''-(hydroxylmethanetriyl)tris(2-(hydroxymethyl)phenol)* in 70% yield. In conclusion: The acid/base volumetric titration of a standard solution of 0.1 M HCl with a standard solution of 0.1 M NaOH using *4,4',4''-methanetriyltris(2-(hydroxymethyl)phenol)* and *4,4',4''-(hydroxymethanetriyl)*

*tris(2-(hydroxymethyl)phenol)* as acid/base indicators showed a sharp color change from dark orange to light yellow at pH=7.7 and from dark red to light yellow at pH=6.8, respectively. These indicators may have potential applications for acid/base titration in a narrow range.

IMPROVEMENT OF CONDUCTIVITY IN POLYPYRROLE HOMOPOLYMERS\*\*, Yousef Ahmadi Beni and Wendell Grainger, Department of Chemistry, Columbus State University, Columbus, GA 31907. Conductive polymers are organic polymers that conduct electricity as a true metallic conductors or semiconductors. Processibility, flexibility, toughness, malleability and elasticity are the major advantages of conductive polymers. Conductive polymers are also plastics (which are organic polymers) and therefore can combine the mechanical properties (processibility, flexibility, toughness, malleability, elasticity, etc.) of plastics with high electrical conductivities. Their properties can be fine-tuned using the exquisite methods of organic synthesis. Since most conductive polymers require oxidative doping, the properties of the resulting state are crucial. Such materials are often salt-like, which diminishes their solubility in organic solvents and hence their processibility. Furthermore, the charged organic backbone is often unstable towards atmospheric moisture. Compared to metals, organic conductors can be expensive requiring multi-step synthesis. The poor processibility for many polymers requires the introduction of solubilizing substituents, which can further complicate the synthesis. In this research several polypyrrole conductive polymers were synthesized using optimized condition to improve the physicochemical properties of polymer and the conductivity as well. In conclusion, these improved polymers may have potential applications in the electronic and semi conductivity technology.

SYNTHESIS, CHARACTERIZATION AND LUMINESCENCE STUDIES OF EUROPIUM (III) COMPLEXES\*\*, Zewdu Gebeyehu, Lee Whitworth\*, Joseph Rugutt and Rajeev Dabke, Columbus State University, Columbus, GA 31907. Complexes possessing lanthanide (III) ions, especially  $\text{Eu}^{3+}$  and  $\text{Sm}^{3+}$  are of interest because of their photoluminescence properties which are important in a variety of applications such as light-emitting diodes, in biomedical imaging and optical amplification. The luminescence intensity of these metal ions can be enhanced by chelating the metal ions with appropriate ligands that are capable of absorbing intensely in the UV region. In this study, aromatic carboxylic acids and dithioimido-diphosphine ligands that possess a large conjugated system and have multiple coordination modes were used to synthesize the complexes. Europium (III) complexes were synthesized by the reaction of  $\text{EuCl}_3 \cdot 6\text{H}_2\text{O}$  with *2,2'-Biquinoline-4-4'-dicarboxylic acid, dipotassium salt* and *potassium dithioimidodiphosphine ( $K[\text{N}(\text{PPh}_2\text{S})_2]$ )* in methanol at room temperature. The reactions resulted in the formation of a yellowish and a white powder respectively in high yields. Products were characterized by spectroscopic methods and melting points. Preliminary results suggested the formation of the expected complexes,  $\text{Eu}_2(\text{C}_{20}\text{H}_{10}\text{N}_2\text{O}_4)_3$  and  $\text{Eu}(\text{N}(\text{PPh}_2\text{S})_2)_3$ .  $\text{Eu}_2(\text{C}_{20}\text{H}_{10}\text{N}_2\text{O}_4)_3$  is insoluble in most polar and non polar organic solvents, whereas  $\text{Eu}(\text{N}(\text{PPh}_2\text{S})_2)_3$  is soluble in THF, acetonitrile, and methylene chloride. The fluorescence property study of  $\text{Eu}(\text{N}(\text{PPh}_2\text{S})_2)_3$  in THF gave an excitation band at  $\lambda_{\text{max}} = 312 \text{ nm}$  and emission band at  $\lambda_{\text{max}} = 364 \text{ nm}$ .

LAYERED MATERIALS IN SENSOR TECHNOLOGY\*\*, Victoria D. Jones\* and T. O. Salami, Department of Chemistry, Valdosta State University, Valdosta, GA 31698. Sensor technology represents an expanding field in chemistry, thus it is important to research materials that can be used as sensors. Layered materials are very interesting because they have interlayer spaces/pores that can be used to carry out interesting chemistry. Several

materials can be trapped in the interlayer space, by utilizing host-guest chemistry (simple ion-exchange) or by acid-base chemistry depending on the layered material. Our research interest lies in the investigation of the potential use of layered compounds (thin films, nanomaterials, etc.) as sensors. We will be highlighting some of our preliminary result from the incorporation of an organic indicator group for example crystal violet into the interlayer space of alpha-zirconium phosphate and results from acid vapor detection.

NOVEL DENSITY FUNCTIONAL THEORY STUDIES ON THE INTERACTION BETWEEN ELECTRON DONATING/WITHDRAWING MOLECULE AND GRAPHENE LAYER \*\*, Yin Moe\*<sup>1</sup>, Xinye Monica Wang<sup>2</sup> and Yixuan Wang<sup>1</sup>, <sup>1</sup>Albany State University, Albany, GA 31705 and <sup>2</sup>Emory University, Atlanta, GA30322. In the current study, clusters C<sub>24</sub>H<sub>12</sub> and C<sub>54</sub>H<sub>18</sub> are used to model a graphene layer, and a variety of benzene derivatives and electron-donor/acceptor molecules such as *tetracyanoethylene (TCNE)*, *tetracyanoquino-dimethane (TCNQ)*, *2,4,7-trinitrofluorenone (TNF)*, *tetrathiafulvalene (TTF)*, and *N,N-dimethyl para-phenylenediamine (DMPD)* are chosen to get the effect of substituent on the noncovalent interaction between graphene layer and aromatic molecules. To well describe the weak noncovalent interaction existing in the current systems, the novel density functional theories like MPWB1K and M05/cc-pVDZ are employed to optimize the complexes of graphene and aromatic molecules. Binding energies were calculated to demonstrate the strength of interaction, and charges carried by electron acceptors/donors were obtained with the CHELPG scheme. The distances between benzene derivate and graphene layer (C<sub>24</sub>H<sub>12</sub>) decreased generally as compared with benzene, and consequently larger interaction energy than unsubstituted benzene was shown. The optimized complexes usually deviate from a parallel orientation, for which considerable electrostatic attraction between substituted benzene and peripheral H is responsible. For substituted benzenes, their interaction with C<sub>24</sub>H<sub>12</sub> only causes small amount of charge transfer (~0.01 to 0.04e) from graphene layer.

COMPARISON OF SOLUTION AND BIOLOGICAL PROPERTIES OF AMINO AND GUANIDINO AMPHIPHILIC CATIONINC POLYMERS\*\*, Michelle J. Razumov\* and Gregory J. Gabriel, Kennesaw State University, Kennesaw, GA 30144. *Poly amino oxanorbornenes (PAON)* and *polyguanidino oxanorbornenes (PGON)* were made at various molecular weights and studied. These types of amphiphilic cationic polymers are of recent interest because of their various membrane activities. For instance it has been reported that *PAON* is not antibacterial but becomes membrane-disruptive and bactericidal when one modulates the amphiphilicity of *PAON* via the incorporation of nonpolar units. On the other hand, *PGON*'s known bactericidal properties are not due to membrane disruption. It has been shown to be a non-membrane disruptive cell-penetrating polymer with possibilities of being developed into a type of drug delivery agent. We have been curious about these properties for quite some time and have pursued solution and biological studies to gain a better understanding of them. Reverse-phase HPLC indicated that *PGON* is more polar than *PAON* at all molecular weights. Also solubility studies have been performed on these polymers via turbidity measurements. Most recently we have started a collaboration in which the effective charge, nanoparticle formation, and lastly, mitochondrial targeting of these polymers will be studied.

POLYMER NETS AS TEMPLATES FOR INORGANIC MORPHOLOGIES\*\*, Siddhi Shah\* and T. O Salami, Department of Chemistry, Valdosta State University, Valdosta, Ga 31698. There is an increase interest in the synthesis of metal oxide morphologies for oxides such as titanium oxide; this is due to their use as fillers, catalysts and for catalytic supports. Generally the synthesis involves the use of a metal organic precursor infused

or loaded into a sacrificial template (polymer). This is followed by hydrolysis; the formed metal oxide takes the shape of the polymer (template). The template can then be annealed leaving behind the desired oxide morphology. We desire to develop a simple synthetic method to form a variety of interesting and tunable morphologies. Our poster will highlight our initial result from our research using Agarose gel, commercially available polypropylene nets and titanium (IV) butoxide as metal oxide precursor.

**Section III: Earth & Atmospheric Sciences**  
**Cunningham Center, Room 214**  
**Donald Thieme, Presiding**

7:30 COPROLITES OF DEINOSUCHUS: LATE CRETACEOUS ESTUARINE CROCODYLIAN FECES FROM WEST GEORGIA, Samantha D. Harrell\* and D. R. Schwimmer, Columbus State University, Columbus, GA 31907. The giant eusuchian crocodylian *Deinosuchus rugosus* is abundantly represented by bones and teeth in the Late Cretaceous deposits of the estuarine Blufftown Formation, western Georgia. Approximately 20 concretionary masses assumed to be fossil crocodylian feces are found in association. Six, large spindle-shaped coprolitic masses, tentatively attributed to *Deinosuchus*, range from 8.0 to 13.0 cm in length. They are cylindrical in cross section, laterally fusiform with tapering ends. Transversely and laterally cut or broken specimens of this morphology show poorly organized, internally concentric, structure with subtly septate fracturing. Minute bone fragments and small fish teeth are present on or near on the outer surfaces in most specimens, whereas the internal composition does not contain significant preserved bone. One specimen contains a well-preserved shark tooth (*Squalicorax kaupi*) in the cortex. It is assumed that the intense dissolution of crocodylian digestive juices demineralized larger prey bones in the bulk of these coprolites, whereas vertebrate teeth on or near the outer surfaces accumulated after the feces were excreted and represent coprophagous feeding by bony fish and sharks. Smaller, relatively elongate and irregular coprolitic masses are of more typical crocodylian fecal morphology and may come from *Borealosuchus* sp., also represented by bones, teeth, and osteoderms in the fossil assemblage.

7:45 A PRELIMINARY DESCRIPTION OF THE PLEISTOCENE RODENTS FROM CLARK QUARRY, BRUNSWICK, GEORGIA\*\*, Ray J. Cornay\* and A. J. Mead, Georgia College and State University, Milledgeville, GA 31061. Since 2001, excavations at Clark Quarry, Brunswick, Georgia, have yielded abundant Pleistocene-aged mammalian fossils. The vast majority of the macro-fossils belong to the Columbian Mammoth (*Mammuthus columbi*) and Giant Bison (*Bison latifrons*). A number of the micro-fossils are teeth belonging to rodents that inhabited Georgia between 12,000 and 21,000 years ago. The rodents identified thus far include: Woodchuck (*Marmota monax*); Round-tailed Muskrat (*Neofiber alleni*); Southern Bog Lemming (*Synaptomys cooperi*); Marsh Rice Rat (*Oryzomys palustris*); Eastern Harvest Mouse (*Reithrodontomys humulis*); Hispid Cotton Rat (*Sigmodon hispidus*); and Capybara (*Hydrochaeris holmesi*). The Round-tailed Muskrat, Marsh Rice Rat, Eastern Harvest Mouse, and Hispid Cotton Rat are common inhabitants of southern Georgia today and typically are found in marshy habitats. The presence of the South American capybara also indicates densely vegetated swamps. The Woodchuck and Southern Bog Lemming represent species presently found in more northern portions of Georgia. Both species are more typical of open meadow/forest edge habitats. As a group, the rodents taxa identified thus far indicate an ecosystem somewhat different from closed forest habit that currently exists in the region.

8:00 TEXTURAL RELATIONSHIPS AMONG TI- AND ZR-BEARING ACCESSORY PHASES IN A BANDED AMPHIBOLITE: CARROLL COUNTY, GA, Lindsey Elise Hunt\* and C. Berg, University of West Georgia, Carrollton, GA 30118. Understanding the growth history of Ti- and Zr-bearing minerals such as titanite, zircon, and rutile permits correlation of metamorphic conditions with time, so long as the minerals are determined to be in equilibrium. These systematics were examined in a sample of banded amphibolite gneiss, part of the Ropes Creek Metabasalt, collected near Carrollton, GA. The gneiss consists of alternating amphibole + plagioclase and epidote + quartz layers. Petrographic and SEM-EDS analysis resulted in the following observations: (1) Titanite is present in both layer types; titanites in amphibole layers contain inclusions of amphibole, and titanites in epidote layers contain inclusions of epidote. (2) Zircon appears both as inclusions in titanite and within the matrix of each layer. These textures indicate that these minerals were in equilibrium with the rock during metamorphism. (3) Rutile is abundant only as inclusions within titanite. This indicates that rutile is not part of the equilibrium assemblage; however, it may provide information on conditions during early stages of metamorphism. These textural and spatial relationships of Ti- and Zr-bearing phases are vital to appropriately applying accessory phase thermobarometers (e.g., TitaniteQ, Zr-in-titanite) and geochronometers, which will aid in the reconstruction of *PTt* paths for this region of the Southern Appalachians.

8:15 HIGH RESOLUTION, GROUND BASED MAGNETIC DATA AT DAGGER MOUNTAIN, BIG BEND NATIONAL PARK, TX, Christopher Parham\* and C. Poppeliers, Augusta State University, Augusta, GA 30904. We present results of an extensive, ground-based, high-resolution magnetic survey of a portion of Dagger Mountain, located in Big Bend National Park, TX. Dagger Mountain is a large map-scale anticline south of the Dog Canyon area. Previous work suggests that the topographic expression of this Dagger Mountain is due to purely structure deformation of the Cretaceous-aged rocks. However, an alternate hypothesis is that Dagger Mountain is cored by a map-scale intrusion of Tertiary-aged rocks similar to those seen in outcrops in the immediate vicinity of Dagger Mountain. Based on two lines of evidence, we favor the former hypothesis. First, structural data obtained during a field mapping campaign yields structural data that is consistent with Dagger Mountain being a map-scale anticline that is oriented favorably with regional Laramide-type deformation. Second, high resolution magnetic data do not support the hypothesis that Dagger Mountain is cored by Tertiary-aged intrusive igneous rocks.

8:30 CONSTRUCTING A CORRELATION ANALYSIS BETWEEN THE RADIAL GROWTH OF LOBLOLLY PINE *PINUS TAEDA* (L.) WITH PRECIPITATION RATES AND TEMPERATURE AVERAGES IN THE UNIVERSITY OF WEST GEORGIA AREA\*\*, S. Michael Edwards\*, K. M. Williams\* and G. G. DeWeese, University of West Georgia, Carrollton, GA 30118. Dendrochronology is a valuable integrated science for analyzing the impact of climatic variables, including temperature and precipitation, on tree growth in an area. From the analysis of specific trees, this study assesses the correlation between the radial growth of *Pinus Taeda* (L.) and precipitation rates and temperature averages in the West Georgia area. By using increment cores taken on campus, this study evaluates the link between radial growth variability as the result of these two variables. Hypotheses stated that the trees would experience significant growth in the early spring due to the moist warm climate that this area enjoys. Initial results indicate that trees showed increased radial growth if there was a dry previous December and a dry current January as opposed to just a warm moist summer.

8:45 PATHOGENS TODAY, PANDEMICS TOMORROW: A MODERN STUDY OF DISEASE DIFFUSION\*\*, Clint Thompson\* and M. G. Noll, Valdosta State University, Valdosta, GA 31698. This work concentrates on the general process of disease diffusion, beginning with an examination of historical examples, and then introducing the concept of the basic reproduction number ( $R_0$ ). The study investigates the various natural and anthropological control factors typically affecting disease outbreaks, and focuses on the current H1N1 influenza pandemic. Visualization of the H1N1 diffusion patterns will be a vital tool for medical geographers and epidemiologists, as it helps to highlight and analyze some of its components and control factors: 1) Fauna, 2) Climate, 3) Human genetic variation, 4) Genetic variation in diseases, 5) Quality and availability of healthcare resources, 6) Geographic point of origin, and 7) Sanitation. Keeping these factors in mind, this thorough geographic study of the current H1N1 outbreak will help understand its cause(s), the routes of its diffusion, and potential effects on society. Results presented in this study will also help with the implementation of protocols to better contain future pandemics.

9:00 GROUNDWATER CHEMISTRY WITHIN ALLUVIUM BENEATH A GEORGIA PIEDMONT FLOODPLAIN\*\*, Parna Bhattji\* and J. Mayer, University of West Georgia, Carrollton, GA 30118. Hydrochemical monitoring of groundwater beneath a portion of the Little Tallapoosa River floodplain in the Georgia Piedmont, Carroll County, Georgia, reveals complex spatial distribution of groundwater composition and relatively little temporal variation. We sampled groundwater from 15 piezometers installed in organic-rich, predominantly fine-grained floodplain alluvium at depths between 9 and 16 feet. Samples were collected five times over an eight-month period under conditions including drought and flood. Most waters are of a mixed-cation bicarbonate type; sodium chloride waters are also present. Approximate TDS ranges from 30 to 270 mg/L; pH ranges from 4.5 to 6.1. Concentrations of redox sensitive species ( $O_2$ ,  $NO_3^-$ ,  $Fe^{2+}$ ,  $Mn^{2+}$ ) vary considerably within the dataset. Preliminary colorimetric analysis suggests As concentrations in some wells greater than 30  $\mu\text{g/L}$ . Results show that hydrochemistry of this floodplain environment is heterogeneous over very small areas. At least some of the heterogeneity is explained by variable redox chemistry; other important processes may include mineral dissolution and ion exchange.

9:15 ARSENIC LEVELS IN GROUNDWATER IN WEST GEORGIA\*\*, K. Hope Ayash\* and C. L. Hollabaugh, University of West Georgia, Carrollton, GA 30118. Bacteria and arsenic can occur in domestic drinking water supplies. Arsenic sampling is minimal in Georgia, but this should be looked at after studies have been done in areas with the same bedrock that show high levels of arsenic. Arsenic is the 53rd most abundant element in the earth's crust at 1.8 ppm. Inorganic arsenic can occur naturally in groundwater at high levels. The Environmental Protection Agency standard is 10 ppb allowed in drinking water. Arsenic can cause non-cancerous problems with the digestive tract, the integumentary system, the circulatory system, and the nervous system. It has also been linked to cancers of the urinary system, and can lead to death. In fact millions of people worldwide are in danger of arsenic poisoning. Georgia's Piedmont shares a similar sulfide rich bedrock zone with much of the Appalachian Range. Over 50 domestic wells in Georgia were sampled and tested for arsenic levels using a non-compliant EPA method. Using a portable test strip they were screened for arsenic. The color test strip has 0 ppb, 10 ppb, 30 ppb, 50 ppb, 100 ppb, 300 ppb, and 500 ppb reading levels. All samples over 10 ppb will be resampled and retested and will be sent to an outside lab for testing by an EPA approved method. This research will be continued to determine the severity of arsenic leaching into domestic well water in Georgia and to determine the need to have this water monitored.

9:30      **GEOLOGIC AND GEOMORPHIC CONTROLS ON DAMAGE IN PUERTO RICO FROM HURRICANE GEORGES** (1998), R. F. Petruccelli\*, Department of Geosciences, University of West Georgia, Carrollton, GA 30118. Hurricane Georges made landfall on the eastern coast of Puerto Rico on September 21, 1998, causing a storm surge of up to 3-meters and waves of 6 meters. Damage was about \$1.9 billion. This study analyzes the pre-storm geomorphic setting to ascertain which parameters control damage. Previous studies of geomorphic controls on storm damage in Florida and South Carolina indicate that along those coasts, site elevation provided the best protection against property damage, followed by dune height (in front of the site) and beach width. Puerto Rico's geologic setting differs from the Florida and South Carolina study areas, which are barrier islands, and the Mississippi study area, which is a mainland coast behind small Gulf barriers. Puerto Rico's coastline consists of mainly rocky cliffs, headlands, mangrove coasts, sand and gravel beaches, and in between many different artificial and hard stabilization structures. Geomorphic parameters assessed in this study include storm surge inundation line, geologic rock types, coastal morphology, FEMA Q3 flood zones, slope and digital elevation models. A regression analysis was used to determine which pre-storm coastal attributes influenced the observed post-storm storm-surge penetration and damage. Having a quantitative understanding of coastal hazard risk is critical for producing accurate risk maps, as well as, for prioritizing spending on mitigation.

9:45      **COASTAL HAZARDS ASSESSMENT AND RECOMMENDATIONS FOR A SEVERELY ERODING TROPICAL SHORELINE: PALO SECO, PUERTO RICO**, Andrew J. Maloof\* and R. F. Petruccelli\*, Department of Geosciences, University of West Georgia, Carrollton, GA 30118. Palo Seco is a small community, but it plays an important role in Puerto Rico's culture, recreation, and infrastructure. Palo Seco is located just west of San Juan, and is home to a major thermoelectric power plant. Also, just offshore is Isla de Cabras, an important historical and recreational site, connected to the mainland by a causeway that can be accessed only via a local road that is also the main street through Palo Seco. The community faces west and is exposed to swell from North Atlantic winter storms. Severe long-term erosion and impacts from individual storm events have left most of the waterfront of Palo Seco as a trashy rock revetment. Palo Seco is a very small community, and if not for extenuating circumstances, it would probably not make economic sense to try to stabilize the shoreline. While pure economics may drive many coastal management plans, the cultural and historical considerations, as well as the presence of major utilities, cast a different light on the benefits of stabilizing Palo Seco's shoreline. An assessment of the coastal hazards was done in May, 2009, and recommendations were made for the community. These include: do nothing, continue to armor the community with large rocks, replenish the beach with sand from a local source, upgrade the seawall, or have a major seawall/ boardwalk/municipal plan.

#### 10:00      **Section business meeting**

10:30      **HISTORICAL STORM SURGE TABLES: ONE-STOP SHOPPING FOR ALL YOUR STORM SURGE DATA NEEDS**, Jacques R. Johnson\*, A. J. Maloof\* and R. F. Petruccelli\*, University of West Georgia, Carrollton, GA 30118. Researchers of hurricane impacts often encounter roadblocks when trying to evaluate storm surge history. Several federal agencies (FEMA, NOAA, Army Corps of Engineers) have unpublished reports for some storms but not for all. Older hurricanes may have public or private reports. Access to reports is difficult and even for archived storms the data is often sketchy at best. This project has assembled into one place all available data on historical storm surge, published or unpublished. Each storm surge measurement data point has been evaluated for

quality, methodology, and usefulness for scientific inquiry. Storm physical characteristics (size, strength, forward speed) are also tabulated along with the storm surge data. It is hoped that the database will provide the basis for statistical evaluation of the various factors impacting coastal storm surge. In addition, it will be a critical resource for numerical modelers who are in need of such data for model calibration and verification of predictive coastal flooding models. So far, data from southeastern U.S.A. hurricane back to 1968 have been tabulated. Plans are to increase the areal and temporal extent of the project.

10:45 EFFECT OF AN IN-SITU TREATMENT BMP ON ECOSYSTEM SERVICES IN AN IMPAIRED, URBAN STREAM, Megan Wheeler\*<sup>1</sup> and T.A. Keller<sup>2</sup>, <sup>1</sup>Central High School, Phenix City, AL 36870 and <sup>2</sup>Columbus State University, Columbus, GA 31907. Urbanization of watersheds can compromise valuable ecosystem services in streams. A best management practice (BMP) water treatment facility was installed to control peak flows, reduce sediment transport, and kill coliform bacteria in Weracoba Creek in Columbus, GA. Using an upstream-downstream before-after study design, we hypothesized the BMP would improve nitrate, nitrite, and orthophosphate removal but slow the rate of leaf mass over time. We analyzed nutrient concentrations bi-monthly from three, sub-surface grab samples taken at 4 sites (02/07-01/08), 1 upstream and 3 downstream. We quantified leaf litter loss rates using tulip tree leaves (*Liriodendron tulipifera*) in 1mm nylon mesh bags at the four water sampling sites over 10 weeks (sampled bi-monthly, three replicates per site). Nitrate and nitrite concentrations remained consistent pre- and post-construction, but orthophosphate increased during BMP installation. Nutrient uptake lengths remained similar before- and after- operation of the BMP. Leaf mass declined through time, but remained similar across sites. Results indicate that the BMP had no detectable positive effect on the two ecosystem services studied. Despite its impaired status, Weracoba Creek continues to degrade leaf litter and remove nutrients.

11:00 HOLOCENE PALEOCHANNEL AND MEANDER SCAR DEPOSITS ON UPATOI CREEK, WEST-CENTRAL GEORGIA, William J. Frazier and R. W. Brown, Columbus State University, Columbus, GA 31907. Upatoi Creek is a tributary of the Chattahoochee River in west central Georgia south of the Fall Line. The Upatoi has incised into its former flood plain, forming the T1 terrace about 3 to 4 m above stream level. We describe sediments exposed by cut-bank erosion and in a meander scar 150 m to the west. The exposure is composed of a 2.5 to 4 m, layered sequence of detrital sediments whose grain-size grades from coarse gravel at the base to silty very-fine sand near the top, the modern soil. This fining-upward sequence formed by point-bar migration. At the south end of the cut bank exposure, the sequence is capped by a silty, fine grained sand with thin laminations and small burrows. Above this is a channel-form unit in which we described and sampled two meters of silty clay containing palynomorphs. We interpret this to be a relict oxbow lake which filled with silty clay. The meander scar on the T1 terrace is the result of the same infilled oxbow lake exposed in the cut bank. In a 2 m core, we sampled silty, structureless, clay with palynomorphs recording a drier, diverse early Holocene forest with *Quercus* and *Pinus*. Increases in *Nyssa* indicate wetter conditions by the mid-Holocene. Forests continue to be dominated by tupelo until historic times, when their decline indicates a lowering of the water table due to incision of Upatoi Creek. Charcoal and organic matter yielded radiocarbon dates of  $9,940 \pm 220$  yr and  $10,310 \pm 220$  yr. Our analyses of the sedimentology and palynology of Upatoi paleochannel deposits reflect the same climate conditions in the lower Chattahoochee River drainage reported by other researchers for rivers in eastern Georgia.

11:30 MULTI-SENSOR SHALLOW GEOPHYSICAL STUDY OF TWO URBAN LOTS IN VALDOSTA, GEORGIA, Donald M. Thieme<sup>1</sup>, C. Poppeliers<sup>2</sup>, D. Elliott<sup>3</sup>, M. Smith<sup>1</sup> and C. Denizman<sup>1</sup>, <sup>1</sup>Valdosta State University, Valdosta, GA 31698, <sup>2</sup>Augusta State University, Augusta, GA 30904 and <sup>3</sup>Lamar Institute, Savannah, GA 31402. We report on the use of geophysical instruments to detect anomalies immediately beneath the surface of two urban lots in Valdosta, Georgia. Measurements were made at intervals of either 1 m or 0.5 m on five rectangular areas using a Geometrics G-858 cesium magnetometer, a Geonics EM-38 conductivity meter, and a MALÅ ground penetrating radar system between December 14th, 2009 and January 13th, 2010. Based upon the results using the EM-38 on a 1 m x 1 m grid in three of the five areas studied, a total of 19 anomalies have been identified. Several of these anomalies are being investigated by a Valdosta State University archaeological field school. Magnetometer and ground penetrating radar data also show anomalies in many of the same areas, but there are a number of differences in the results from the different sensors which merit further investigation.

## POSTERS

DIGITAL GEOLOGIC MAP OF THE FORTSON AND MIDLAND, GEORGIA, 7.5 MINUTE QUADRANGLES, Anna M. Menser\*, T. B. Hanley and C. I. Barineau, Columbus State University, Columbus, GA 31907. Columbus, Georgia, lies within a region where coastal plain rocks of the Cretaceous Tuscaloosa Group unconformably lie atop Piedmont metamorphic rocks of the Gondwanan Uchee terrane. Over three decades of geologic research in the region has been recorded using traditional methods of pen and paper mapping. However, the results of this mapping have been largely unavailable to anyone except for local researchers. In an attempt to make this data more accessible to both geologists and the general public, these paper maps have been converted into digital format. Using AutoCAD software, hand-recorded data from the Fortson and Midland, Georgia, 7.5 minute quadrangles, have been georeferenced. This data was then used to construct a digital geologic map and corresponding cross-section. An electronic database records structural, stratigraphic, and lithologic information about this little-known region. The results of this mapping yield new insights into the geologic history of the southernmost Appalachian mountains.

GROUNDWATER QUALITY IN WEST GEORGIA WITH A FOCUS ON LEAD AND COPPER\*\*, Tina M. Skinner\*, K. H. Ayash\* and C. L. Hollabaugh, University of West Georgia, Carrollton, GA 30108. Well water is estimated to supply drinking water for nearly 500,000 households in Georgia. This research is on lead and copper in domestic drinking water supplies. The majority of lead and copper that enters the drinking water for human consumption is human imposed. Elevated lead levels in children can lead to learning disabilities and behavioral problems. Copper is an element that is vital to the human body, however in excess it can lead to digestive troubles and death. The EPA maximum standard for lead is 15ppb and 1.3ppm for a maximum copper standard. The Hach Scanning Analyzer was utilized to test ground water from residential wells for this study. This method is EPA approved for lead. Residential wells are not regulated by any authority and homeowner's are not aware of the need for monitoring water quality from these wells. Out of the 50 samples that have been tested for lead, ten percent of them have lead levels that exceed EPA standards. Out of the same 50 samples the copper results show only two exceeded the EPA standard. Plans for this research in the future consist of plotting the well locations in a GIS program and then comparing the results to the rock unit's particular geochemistry, as well as, how these results relate to the age of the home and the well. The results will be sent to the homeowners so that they can be proactive with this problem, and live healthier lives.

ANTHROPOGENIC ALTERATION OF STREAMFLOW THROUGH INTRODUCTION OF TREATED WASTEWATER EFFLUENT\*\*, Michael R. Johnson\*, Valdosta State University, Valdosta, GA 31601. Treated wastewater effluent is discharged into the Withlacoochee River from a wastewater treatment facility located in Lowndes County, Georgia. This study investigates changes in streamflow arising from this discharge. Data collected and analyzed for the completion of this study include daily precipitation recorded within the Withlacoochee River basin and at the wastewater treatment facility, daily volume of effluent discharged by the facility into the river, and daily streamflow measured at a USGS monitoring station downstream of the facility. Additionally, sinkholes in the streambed upstream of the facility establish a hydraulic connection between the river and the Floridan Aquifer; the effect of these sinkholes to baseflow during periods of limited precipitation and low flow are considered.

**Section IV: Physics, Mathematics, Computer Science,  
Engineering and Technology  
Cunningham Center, Room 209  
Andreas Lazari, Presiding**

8:00 CONVERSION OF A PETROLEUM COMBUSTION ENGINE TO HYDROGEN FUEL\*\*, Jeremy Robinson\*, Phil Hines\*, Alexander Bauer\* and Richard Gamble\*, Augusta State University, Augusta, GA 30904-2200. The use of petroleum in combustion engines has numerous adverse environmental and economic consequences. By replacing non-renewable petroleum fuel with a clean and renewable fuel, these problems can be avoided. Previous projects have demonstrated the generation of clean hydrogen gas to power a fuel cell or combustion vehicle. This project will use hydrogen gas to power a commercial combustion engine, previously suited for petroleum fuel. The exothermic reaction of hydrogen with atmospheric oxygen will provide the required energy, and will produce only water and heat as a result of the process. A variety of aspects of the engine's performance will be analyzed to indicate the feasibility of this technology. In particular, the dependency of engine power and maximum efficiency upon ignition timing and injection parameters will be explored using a two cylinder 1983 Suzuki GS300L motorcycle with commercially available hydrogen gas. We are currently in the early stages of the research and are expecting results in the future.

8:15 DYNAMIC PHASE TRANSITION IN THE NEXT-NEAREST NEIGHBOR KINETIC ISING MODEL, William D. Baez\* and Trinanjan Datta, Department of Chemistry and Physics, Augusta State University, Augusta, GA 30904. We investigate the effects of next-nearest neighbor interactions on the dynamic phase transition (DPT) of the two-dimensional kinetic Ising model subject to a spatially homogeneous AC field. Using the period-averaged magnetization as the order parameter for the DPT, we study the cross-over from the multi-droplet regime to the strong-field regime. We compute the probability densities of the period averaged magnetization to study the nature of the phase transition, the susceptibility, and the correlation between the external field and the system magnetization. We also explore the effects of frustration in this model.

8:30 P WAVES SLOWNESS ANOMALIES ACROSS USARRAY AS MEASURED BY LIMITED APERTURE BEAM FORMING, Rebecca Sawyer\* and C. Poppeliers, Augusta State University, Augusta, GA 30909. We analyzed eleven teleseismic earthquakes recorded by USArray (a transportable seismic array) for back azimuth perturbations. The seismic events were roughly divided between South America and North-

eastern Asia. We formed virtual seismic arrays by searching around geographic points on a uniform grid that superimposed the USArray stations. For each virtual array we performed conventional beam forming analysis on the first arrival P-waves. For the eastern portion of the array, our analysis shows that for earthquakes originating from the south, the back azimuths resolved from beam forming deviate to the east of the great-circle back azimuths. For the same eastern portion of the array our analyses show that for earthquakes originating from the north, the resolved back azimuths deviate to the west of the great-circle back azimuths. The opposite pattern exists for the northern portion of the array; earthquakes that originate from the south arrive at a back azimuth that deviates to the west of the great circle back azimuths, whereas for the earthquakes originating from the north the arrival back azimuths deviate to the east of the great circle back azimuths. These observations are consistent with a near surface seismic velocity gradient across the array. We hypothesize that the near-surface velocity is lower in the middle of the array, with an increase in velocity on the eastern and western portions of the array.

8:45 SEARCH OF CONDITIONAL PROBABILITY DENSITY FUNCTIONS, Remigio Padilla-Hernandez, Andreas Lazari and Jemal Mohammed-Awel, Valdosta State University, Valdosta, GA 31698. We know that the joint density of two independent random variables,  $X$  and  $Y$ , is  $f(x, y) = f(x) \cdot g(y)$  where  $f(x)$  and  $g(y)$  are the marginal probability density functions (pdfs) for  $X$  and  $Y$ , respectively. If the two variables,  $X$  and  $Y$ , depend on each other then the joint density is  $\begin{cases} f(y|x) \cdot g(x) \\ f(x|y) \cdot g(y) \end{cases}$ . If the conditional pdf  $f(x|y)$  is known and the marginal pdf of  $Y$ ,  $g(y)$ , is known then the joint density is  $f(x, y) = f(x|y) \cdot g(y)$ .

Now, we would like to know the conditional pdf of  $f(y|x)$  and the marginal pdf  $X$ ,  $f(x)$ . In our search for conditional pdfs we found that if  $f(y|p)$  is a binomial distribution with parameters  $n$  and  $p$  and  $f(p)$  is a beta distribution with parameters  $\alpha$  and  $\beta$  then  $f(p|y)$  is also a beta distribution with parameters  $\alpha + y$  and  $n - y + \beta$  and  $g(y)$  is a beta-binomial distribution. Also, if  $f(y|x)$  is a binomial distribution with parameters  $x$  and  $p$  and  $f(x)$  is a Poisson distribution with parameter  $\mu$  then  $f(x|y)$  is also a Poisson distribution with parameter  $(1 - p)\mu$  and  $g(y)$  is a Poisson distribution with parameter  $p\mu$ .

9:00 SIZING OF DEFECTS AND DAMAGED REGIONS IN THE POROELASTIC COMPOSITE MATERIALS, Hasson M. Tavossi, Valdosta State University, Department of Physics, Astronomy and Geosciences, Valdosta, GA 31698. Theoretical models for porous composite materials consider porosity as an input parameter and not the average pore size. In previous research we have shown that porous materials with the same porosity but different average pore sizes can have different responses to the elastic waves transmitted through the material. Data show that average pore-size has a significant effect on attenuation and pass-band frequency of these materials. Most poroelastic materials with open pores act as pass-band filters for the transmitted elastic waves. In this study pass-band frequency and attenuation are expressed as a function of the average pore size, when other material properties are kept constant. Inclusions and stress concentration are then introduced in the material and their effects on wave dispersion, attenuation and pass band are analyzed. The goal of this research is to detect shape, size and location of defects and damaged zones in composite materials used in the aerospace manufacturing industries.

9:15 DIMENSIONAL INSTABILITY ANALYSIS OF POROUS MATERIALS USING CAD AND FINITE ELEMENT METHODS\*\*, Barry Hojjatie and C. Hearn, Valdosta State University, Valdosta, GA 31698. This study investigates on application of

experimental mechanics and finite element analysis in measurements of mechanical and stress behaviors of porous materials such as paper and container board materials. Paper industry which employs more than ten percent of our state's manufacturing workforce, ranks one of the Georgia's top manufacturing industry. This industry often relies on labor-intensive methods of mechanical testing for screening of their products. In this study we develop simulated models of testing methods used by the industry to determine deformation and strength of paper and container materials. Computer models using the AutoCAD and Inventor programs were employed to create two-dimensional as well as three-dimensional models of various systems. The models created using the Inventor program were imported into the ANSYS finite element software to investigate on stress distribution in samples subjected to various type of functional loading conditions. Our results indicate that conditions of moisture sorption and stiffness distribution in samples have a major impact on stresses developed in the samples.

9:30 SOLVING THE TIME EVOLUTION OF A WAVEPACKET, Javier E. Hasbun, University of West Georgia, Carrollton, GA 30118. The time dependent Schrodinger equation is solved through a finite difference method. This is done in two dimensions (2D). The

Schrodinger equation in 2D is written as 
$$i\hbar \frac{\partial \psi(x, y, t)}{\partial t} = -\frac{\hbar^2}{2m_e} \left( \frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} \right) + V(x, y) \psi(x, y, t)$$

and after performing a time discretization of the  $x, y, t$  coordinates, a recursion expression is obtained to advance the solution in space and time. The obtained expression is suitable for immediate computation. The numerical solution is investigated under several conditions. The first of which assumes a zero potential. In such a case, an initial Gaussian shaped wave packet is seen to evolve according to the rules of quantum mechanics and becomes delocalized. The next investigation deals with a potential designed to resemble that of a single slit. An extension is also made to two slits. The results are of pedagogical use in a quantum mechanics course for which visualization enhances the learning experience. In particular, one can visualize the transmission and reflection of the wave packet as it interacts with the single slit. For the case of two slits, it is possible to reproduce what resembles a diffraction pattern.

9:45 A SELF-GENERATING RECURSIVE UNIVERSE, Dennis W. Marks, Valdosta State University, Valdosta, GA 31698. The universe is modeled as a recursive lattice of self-generating qubits. Each elemental qubit has two possible actions – *creation* and *annihilation*. Connections are made by a time-like operator *integration* and a space-like operator *differentiation*, corresponding to connections in series and in parallel, respectively. To distinguish space from time, we use only real, not complex, geometric algebras. Basis vectors for space-times of any dimension and signature can be generated by inner and outer products of a space-like basis vector and a time-like basis vector. Specifically,  $2 \times 2$  real matrices  $\mathbf{R}(2)$  describe either the Minkowskian plane or the Euclidean plane. Their outer product  $\mathbf{R}(4)$  describes Minkowskian space-time, whose inner products form bivectors, pseudo-vectors, and pseudo-scalars, describing spin, momentum-energy, and action, respectively, which automatically satisfy the Heisenberg Uncertainty Principle. The four space-time dimensions can be either open or closed. Microscopic closed loops appear in macroscopic open dimensions as the electromagnetic force [one time-like loop with  $U(1)$  symmetry] and the weak force [3 space-like loops with  $SO(3) \approx SU(2)$  symmetry]. The outer product of the two 4-dimensional space-times yields an 8-dimensional space-time  $\mathbf{R}(16)$ , including 8 pseudo-vectors with the  $SU(3)$  symmetry of the strong force. After 8 dimensions, the pattern of real geometric algebras repeats itself, leading to a recursive hexadecimal lattice – cosmically large expanding space-time with the Standard Model of physics at each lattice point.

## 10:00 Section business meeting

10:30 A MODIFIED LOKTA-VOLTERRA PREDATOR-PREY, 'Kale Oyedeji<sup>1</sup> and R.E. Mickens<sup>2</sup>, <sup>1</sup>Morehouse College, Atlanta, GA 30314-3773 and <sup>2</sup>Clark Atlanta University, Atlanta, GA 30314. We construct and investigate the mathematical properties of a modified Lotka-Volterra predator-prey model of two interacting populations. The

differential equations for this model are (in dimensionless form) (\*) 
$$\begin{cases} \frac{dx}{dt} = x(1-y^2), \\ \frac{dy}{dt} = -y(1-x^2) \end{cases}$$
. There are two fixed-points, one located at  $(\bar{x}, \bar{y}) = (0, 0)$ , the other at  $(\bar{x}, \bar{y}) = (1, 1)$ . The non-

trivial fixed-point, corresponds to a center and thus the solutions are expected to oscillate. However, our preliminary analysis suggests that all solutions are periodic. This result was derived from a detailed numerical integration of Eq. (\*). We also are able to calculate a first-integral for this system of equations. Additional work needs to be done to determine mathematically the exact behavior of the solutions. We construct and investigate the mathematical properties of a modified Lotka-Volterra predator-prey model of two interacting populations. The differential equations for this model are (in dimensionless form).

10:45 EVAPORATIVE DEPOSITION UNDER GEOMETRIC CONSTRAINT, K. C. Chan, Albany State University, Albany, GA 31705. The deposition pattern of a common surfactant droplet has been investigated with and without an imposed geometric constraint. It is found that without constraint, multiple morphologies are possible, depending on concentration. Whereas with the constraint, a consistent radial pattern emerged, drastically different from those patterns free from the constraint, regardless of the concentration. A possible qualitative mechanism explaining this formation will be presented.

11:00 COMET LULIN, Richard W. Schmude, Jr., Gordon College, Barnesville, GA 30204. The writer has analyzed hundreds of visual estimates of the brightness, coma diameter and degree of condensation estimates of Comet Lulin. (The degree of condensation is a measure of the coma's appearance.) The data that I analyzed was published in recent issues of the *International Comet Quarterly*. My main conclusions of Comet Lulin are: 1) its normalized magnitude is  $H_0 = 5.3$ , 2) its pre-exponential value is  $2.5n = 10.3$ , 3) the solar phase angle coefficient is below 0.012 magnitudes/degree and 4) the average coma diameter near perihelion is 340,000 km. Both the coma diameter and the amount of light reflected increased by about a factor of four during October 2008. During that same month, the degree of condensation fell from 5.5 to 3.5.

## POSTERS

ENHANCED PERMITTIVITY OF ARTIFICIAL MATERIAL: A MACROSCOPIC VIEW, Arun Kumar Saha, Albany State University, Albany, GA 31705. Effective permittivity of artificial material composed of metal particles placed in 3 dimensional spaces in a regular fashion exhibits enhanced value. This phenomenon has been shown by simulations and experiments before by several researchers. Metal particles have free electrons which are polarized under the influence of external electric field and give rise to net polarization and contribute to the enhancement in permittivity. This is the microscopic explanation of this phenomenon. In this research, enhancement in effective permittivity has been

explained from macroscopic point of view and verified with 3-D electromagnetic simulation software HFSS (High Frequency Structure Simulation). A little disagreement which is observed between the developed theory and simulation has been explained reasonable justification. In this research, the artificial material is considered to be composed of similar unit cells which contain particles which are metal rods. A plane wave excitation is used in a parallel plate waveguide (PPWG) which is considered to be loaded with these unit cells. Each Unit particle contributes some lumped element impedance value to the distributed series impedance and shunt admittance value of the unit cell. The impedances resulted from the metal rod per unit cell is transformed into per unit length quantities of PPWG to calculate the effective parameters. This equivalent circuit approach of calculation provides a clear understanding as to why effective permittivity is enhanced more and more when length of the metal rod increases in the direction of electric field. Some limiting circumstances have been explained with the developed theory and verified with simulation.

**Section V: Biomedical Sciences**  
**Cunningham Center, Room 315**  
**Seyed H. Hosseini, Presiding**

8:15 PRELIMINARY DATA ON THE LONG-TERM SURVIVAL AND FUNCTION OF EMBRYONIC CHICK HEARTS MAINTAINED *IN VITRO*\*\* , Lindsey Parks\* , Terry Archer-Liefde-Chance and Army Lester, Kennesaw State University, Kennesaw, GA 30144. Cardiovascular diseases are a major health problem for the US and many other parts of the world. Scientists are constantly looking for effective and efficient ways to study this class of diseases. This study is based on the hypothesis that maintaining the appropriate culture environment will enhance the normal survival and development of embryonic chick hearts maintained *in vitro*, thus making the system more suitable for cardiovascular studies. Fertilized chicken eggs were incubated for 4-11 days and the embryonic hearts quickly dissected out. The hearts were placed in varying culture media supplemented with 10% fetal calf serum, and antibiotics. The hearts were placed in an O<sub>2</sub> or CO<sub>2</sub> enriched incubator and maintained at 37.5°C. The hearts were monitored daily for survival rate, growth, development, and pattern of contraction. Results indicate no significant difference in heart survival rates between the two varied gas concentrations. Hearts taken from 5-day-old embryos appeared to survive better than older and younger hearts. Strength of heartbeat appeared highly varied among organs of the same age. The strength of contractions appeared to diminish with length of culture. Contractions appeared to completely cease within the ventricles, while the beating became highly reduced to the atria region. Additionally, there was very little noticeable growth in the any of the hearts, however in most cases, cells from the hearts heavily populated the culture dishes. These results indicate that it is possible to culture embryonic hearts for up to two weeks while maintaining a beat. Modifications are needed to promote heart growth and uniformity in heart rate and strength.

8:30 IS OBESITY A PROBLEM IN COLLEGE STUDENTS?\*\*, Katie Rousseau and Deepa Arora, Middle Georgia College, Cochran, GA 31014. Obesity is a growing problem in the US. According to a report by the Centers for Disease Control, in 2008, the prevalence of obesity was greater than or equal to 25% in thirty-two states and below 20% in only one state. Since obesity is a predisposing factor for diabetes and cardiovascular problems, it is important to combat this growing menace. The objective of this study is to examine the prevalence of obesity with its contributing factors in a rural community college in the southeast. At least fifty students will be randomly selected from the

college campus to participate in the study. After obtaining informed consent, they will be asked to record their socio-demographic information, educational level, physical activity status, and their detailed dietary intake for five consecutive days. Each respondent's average dietary intake of energy, proteins, carbohydrates, and fat will be calculated. Results obtained will be compared to the Dietary Reference Intakes proposed by the Food and Nutrition Board of the Institute of Medicine, National Academy of Sciences. This preliminary study will help to determine if college students in a rural area meet the objectives of "Healthy People 2010."

8:45 DECREASED PRESSURE AND INCREASED DEHYDRATION AS INDICATORS OF THE PROBLEMS ASSOCIATED WITH SHELL-LESS CHICK CULTURES\*\*, Terry Archer-Liefde-Chance\*, Lindsey Parks, Army Lester, Kennesaw State University, Kennesaw, GA 30144. Shell-less chick cultures offer much promise in a myriad of biological studies. However, shell-less embryos with no prior in ovo incubation typically die during the first 10 days of culture. Embryos that survive longer experience reduced growth and development and all die prior to hatching. This study investigates the hypothesis that removing the eggshell leads to low atmospheric pressure around the embryo, thus decreasing available oxygen and promoting dehydration. After 0, 24, 48, or 72 hours of in ovo incubation, embryos were cultured on a sheet of gas permeable plastic wrap, placed in a clear plastic cup-like culture vessel at various oxygen levels, saturated humidity levels and 37.5°C. Embryos were monitored daily for survivability, growth and development. Preliminary results showed that mortality rates increased as the hours of in ovo incubation decreased, while embryos cultured in an oxygen-enriched environment experienced no increase in mortality. Embryos cultured at high pressures survived similarly to embryos cultured under high oxygen. The yolk of shell-less embryos often appeared very viscous with a greenish bile color. These findings suggest that the open culture system led to a reduced partial pressure of oxygen and thus inhibited survival of embryos before the development of a vascular system. The decreased pressure also led to dehydration thus causing the yolk to become too viscous for absorption, which may have caused the observed lower rate of growth and development. The liver may have attempted to compensate by increasing bile production and hence accounting for the greenish color of the yolk and liver.

9:00 **Break**

9:15 TARGETING *TRYPANOSOMA BRUCEI* CALCIUM ATPASES AND CHANNELS: A POTENTIAL STRATEGY FOR DISRUPTING CALCIUM HOMEOSTASIS, Kiantra Ramey\*<sup>1</sup>, Zuzana Kucerova<sup>2</sup>, Winston Thompson<sup>1</sup> and Jonathan K. Stiles<sup>1</sup>, <sup>1</sup>Morehouse School of Medicine, Atlanta, GA 30310 and <sup>2</sup>Centers for Disease Control and Prevention, Atlanta, GA 30333. *Trypanosoma brucei* causes Human African Trypanosomiasis (HAT). 200-300 million people are affected by this disease with an estimated 50,000 deaths annually in sub-Saharan Africa. Existing drugs for HAT are toxic and often times lethal and parasite resistance is common due to having an impervious membrane and antigenic variation. As a result vaccine development against HAT has been unsuccessful, thus there is a need for an effective vaccine that targets the accessible flagellar pocket membrane proteins. We previously synthesized *T. brucei* Ca<sup>2+</sup> ATPase and channel peptides and determined their expression and localization in the flagellar pocket of parasites where they are involved in [Ca<sup>2+</sup>] homeostasis. Commercial Ca<sup>2+</sup> pump inhibitors and channel blockers were tested against parasites which decreased parasite survival. We hypothesized that inhibiting *T. brucei* Ca<sup>2+</sup> ATPases and channels together will disrupt intracellular [Ca<sup>2+</sup>] ion ([Ca<sup>2+</sup>]) levels and arrest growth in parasites. To test this

hypothesis we performed drug and antibody inhibition assays using  $\text{Ca}^{2+}$  pump and channel inhibitors and antibodies respectively on blood stage parasites. Intracellular  $[\text{Ca}^{2+}]_i$  was determined by assaying for levels of fura-2, a  $[\text{Ca}^{2+}]_i$  indicator. Results indicate that combining  $\text{Ca}^{2+}$  pump inhibitors and channel blockers decreased intracellular  $[\text{Ca}^{2+}]_i$  and inhibited parasite growth greater than when treated individually. Combining pump and channel antibodies also reduced parasite growth more effectively than alone. Therefore, targeting both  $\text{Ca}^{2+}$  pump and channel proteins simultaneously reduces the capability of parasites to utilize alternative strategies for  $[\text{Ca}^{2+}]$  homeostasis. Thus, this is a plausible approach for developing new drugs and/or vaccines targeting  $[\text{Ca}^{2+}]$  homeostasis in African trypanosomes. This study was supported by the Minority Biomedical Research Support Program, NIH-NIGM-MBRS/RISE (GM58268), at Morehouse School of Medicine and the National Institutes of Health, NIH-RCMI (RR033062).

9:30 **CHLAMYDIA TRACHOMATIS CRYPTIC PLASMID ANTIGENS IN RECOMBINANT pGKVAX CHLAMYDIA VACCINE DEVELOPMENT\*\***, A. Campbell<sup>\*1</sup>, E. Ekong<sup>2</sup>, G. Ifere<sup>1</sup>, K. Joseph<sup>3</sup>, T. Belay<sup>1</sup>, E. Barr<sup>1</sup>, F. Eko<sup>2</sup>, C. Black<sup>3</sup>, J. Igietseme<sup>2,3</sup> and G. Ananaba<sup>1</sup>, <sup>1</sup>Clark Atlanta University, <sup>2</sup>Morehouse School of Medicine and <sup>3</sup>Centers for Disease Control & Prevention, Atlanta, GA. *Chlamydia trachomatis* genital infection is a prevalent sexually transmitted disease that is often asymptomatic. Developing a vaccine is an ideal way to protect against this disease and its pathology. A strategy is the development of a vaccine that utilizes *Lactobacillus* as a live delivery vehicle of chlamydia antigens to the immune system. Many chlamydial species contain a 7.5-kb cryptic plasmid (pCT). The role of pCT in the pathogenesis of *Chlamydia trachomatis* genital infection is unknown. We hypothesize that cryptic plasmid antigens may be used in the development of an efficacious vaccine against chlamydial genital infection. We have evaluated the effect of chlamydia cryptic plasmid in fertility, and found that plasmid deficient Chlamydia did not cause pathology. Additionally, we have isolated the eight open reading frame genes. The pCT antigens, p-glycoproteins or pgps were isolated from pGEX/pgp plasmid construct using a series of different restriction enzyme digestions. The pgp 2 and pgp3 have been ligated with pGKVAX and cloned via JM109 transformation. Positive JM109 *E. coli* transformants were cultured on LB chloramphenicol selective media plates. Qiagen Miniprep was performed to isolate the plasmids from each culture. *Lactobacillus fornicalis* was transformed with pGKVAXpgp by electroporation and cultured on Lactobacillus MRS chloramphenicol selective media plates. Live recombinant *Lactobacillus* has the potential to produce an efficacious vaccine against Chlamydia genital infection pathology. Supported by NIH grants GM08247 and A141231.

## 10:00 **Section business meeting**

10:30 **ENTEROCOCCUS ISOLATES FROM COMMERCIAL MEATS**, Michael W. Reeves, Perimeter College, Covington, GA 30014. In previous studies, *Enterococcus* have proven an excellent indicator of fecal contamination of commercial foods, particularly processed meats. To examine if this problem still exists, commercial and local meats were purchased from four stores in the Athens, GA, area over a period of six months. Samples were tested for contamination in tryptic soy broth. *Enterococcus* were identified by growth on bile-esculin-azide agar, by gram stain and catalase reaction, and growth in 6.5% salt. Species were identified by sugar fermentation patterns. All meats examined contained a low level of bacterial contamination with the exception of a single sliced ham product. Of thirty-four meats tested, fifteen contained *Enterococcus*, and these meats were all locally ground beef and pork. None of the national commercial brands contained *Enterococcus*. The most common species isolated was *E. faecalis*. Antibiotic testing

showed that none of the isolates were resistant to vancomycin. Isolates from one store were all *E. faecalis* with similar antibiotic patterns, suggesting a single point source of contamination. Isolates from other stores were more varied, suggesting multiple sources of contamination. These results show that *Enterococcus* contamination is specifically a local problem, and that protection programs must be organized at that level.

10:45 *PLASMODIUM BERGHEI* ANKA INFECTION UP REGULATES FOXP3 AND IL-10, AND DOWN REGULATES TGF- $\beta$ 1 IN IP-10 DEFICIENT C57BL/6 MICE, Bismark Sarfo<sup>1</sup>, Nana Wilson<sup>\*1</sup>, Danielle Whittaker<sup>\*2</sup>, Vincent Bond<sup>1</sup> and Jonathan Stiles<sup>1</sup>, <sup>1</sup>Dept. Microbiology, Biochemistry, and Immunology, Morehouse School of Medicine, Atlanta, GA 30310 and <sup>2</sup>Vanderbilt University, Nashville, TN 37235. The mechanism mediating cerebral malaria (CM) is not clear, although sequestration of infected red blood cells in the brain and high production of pro-inflammatory factors such as IP-10, have been implicated. C57BL/6 mice deficient for IP-10 are less susceptible to experimental CM. Depletion of IP-10 enhanced the production of regulatory T cells (T regs), IL-10 and TGF- $\beta$ 1 which regulate excessive production of pro-inflammatory factors. We hypothesized that deletion of IP-10<sup>-/-</sup> protects against ECM due to modified expressions of T regs, IL-10 and TGF- $\beta$ 1. To test this hypothesis, IP-10<sup>-/-</sup> and WT mice were infected with *Plasmodium berghei* ANKA, and brain, peripheral blood mononuclear cells (PBMCs) and plasma were analyzed for Foxp3, IL-10 and TGF- $\beta$ 1. T-cells were isolated from non-T cells from PBMCs using antibody coated magnetic beads, and T regs (CD4+CD25+) and non-T regs (CD4+CD25-) were subsequently isolated, and restimulated with *P. berghei* antigens with co-stimulants PMA and ionomycin in vitro. The supernatants from this restimulation assay were analyzed for IL-10 and TGF- $\beta$ 1. Infected WT but not IP-10<sup>-/-</sup> mice exhibited CM symptoms. *P. berghei* induced high Foxp3 mRNA ( $p < 0.05$ ) in brain and PBMC's of infected IP-10<sup>-/-</sup> at days 2 and 4 compared with WT. Plasma IL-10 in infected IP-10<sup>-/-</sup> mice was up regulated ( $p < 0.05$ ) at days 2 and 4 than in infected WT. In contrast, at day 2 and 4, TGF- $\beta$ 1 in infected WT was significantly up regulated ( $p < 0.05$ ) compared with infected IP-10<sup>-/-</sup> mice. Ex-vivo CD4+CD25+ and CD4+CD25- T cells re-stimulated with *P. berghei* antigens produced higher amounts of IL-10 and TGF- $\beta$ 1 than those re-stimulated with supernatants from uninfected cells. *P. berghei* antigen re-stimulated CD4+CD25+ T cells from IP-10<sup>-/-</sup> produced higher IL-10 and TGF- $\beta$ 1 than WT CD4+CD25+ T cells. Deleting IP-10 and early activation of T-regs in conjunction with IL-10 are important in preventing ECM.

## POSTERS

EPIGENOMIC REGULATION OF VEGFR2 BY LEPTIN-OTCH SIGNALING CROSS-TALK IN MAMMARY CANCER CELLS, Shanchun Guo<sup>\*</sup>, Yanbo Xu, Miles Fuller and Ruben R. Gonzalez-Perez, Microbiology, Biochemistry & Immunology, Morehouse School of Medicine, Atlanta, GA 30310. The vascular endothelial growth factor (VEGF) receptor family in mammals contains three members, VEGFR1 (Flt-1), VEGFR2 (KDR/Flk-1) and VEGFR3 (Flt-4), which are transmembrane tyrosine kinase receptors and directly regulate the formation of blood and lymphatic vessels. VEGFR2 is generally recognized as the major form that mediates VEGF-induced response and the earliest marker for endothelial cell development. More importantly, VEGFR2 directly regulates tumor angiogenesis. We have previously reported that leptin signaling plays an important role in the growth of both ER+ and ER- breast cancer that is associated with the leptin regulation of pro-angiogenic and pro-proliferative molecules, i.e., VEGF/VEGFR2. Disruption of leptin signaling with pegylated leptin peptide receptor antagonist (PEG-LPrA2) markedly reduced the growth of tumors and the expression of VEGFR2 in mouse models of syngeneic and human

breast cancer xenografts. On the other hand, it is generally believed that Notch signaling is essential for tumor angiogenesis. We hypothesized that Notch and leptin signaling crosstalk could impact the expression of pro-angiogenic molecules, especially VEGFR2. In the present studies, the mouse VEGFR2 5'-end transcription region was cloned and used to establish VEGFR2-Luc assay in mouse mammary tumor (MT) cells. We found that VEGFR2 expression is heavily depend on VEGFR2 gene methylation and histone acetylation status in MT cells that maybe linked to leptin's regulatory effects. Interestingly, leptin signaling affects several important members of Notch family (Notch 2 and Notch 3) in MT cells. This suggests leptin and Notch signaling crosstalk could impact on MT angiogenesis and growth. Our results provide novel evidence on how VEGFR2 could be regulated in MT cells. Present data reinforce the idea that disruption of leptin signaling could reduce tumor angiogenesis/growth by inhibiting leptin-mediated upregulation of VEGFR2 and/or by negatively impacting on signals from some key members of Notch family. This might help to design new pharmacological strategies aimed at controlling breast cancer growth and angiogenesis. [This work was supported in part by NIH/NCI 1SC1CA138658-02; NIH/ARRA/3SC1CA138658-02S1; NIH/UAB Breast SPORE Career Development Award and the Georgia Cancer Coalition Distinguished Cancer Scholar Award (to RRG)].

MUTUAL EXCITATION AMONG OLFACTORY BULB MITRAL CELLS REVEALED BY RECURRENCE TIME HISTORY MAPPING (RTHM)\*\*, Alexandra Radu\*, Maame Boateng\*, Hena Razzak\* and Barry K. Rhoades, Wesleyan College, Macon, GA 31210. In the mammalian olfactory bulb coordinated neural activity associated with odor discrimination is dominated by narrow-band oscillations in the gamma EEG range (30-80 Hz), gated by respiratory inspiration. Mutual excitation among the mitral cell projection neurons is a required feature of successful bulbar models, but has not been conclusively demonstrated by either direct histological or electrophysiological evidence. In the present study tungsten-steel microelectrodes were lowered to the mitral cell layer of the olfactory bulb in urethane- or pentobarbital-anesthetized rats, and positioned using electrophysiological response criteria. Ten to twenty minute samples of resting neuronal activity were recorded to analog tape. A template matching system was used to isolate and extract multiple, simultaneous single-unit spike trains. Temporal linkages between spike trains were evaluated using recurrence-time history mapping (RTHM), a algorithm for enhancing conventional conditional cross-correlograms. In the RTHM analysis plots of some pairs of mitral cells apparent mutual excitation was evidenced by the presence of high-density, short-latency linkage bands and a within-band pattern suggesting activity-dependent gain. The validity of inferences based on RTHM was verified using artificially-generated spike trains with stochastically-defined firing patterns and inter-neuronal linkages.

A SURVEY OF THE ANTIBIOTIC RESISTANCE OF BACTERIAL SPECIES IN THE EAR OF *CANIS FAMILIARIS*, Kristin S. Timmons\*, Christopher S. Bates and Richard D. Griner, Department of Biology, Augusta State University, Augusta, GA 30904. Recurring ear infections in canines are a common problem encountered in veterinary medicine and are usually associated with high bacterial growth in the ear canal. For this reason, we chose to examine the bacterial flora in the external ear canal of healthy canines and canines with infected ears. A survey was conducted using 19 randomly selected infected and non-infected canine ears. From these, over 30 bacterial colonies were isolated and were subjected to gram staining and disk diffusion antibiotic susceptibility testing. Most of the bacterial species isolated from the ears were gram positive and demonstrated increased resistance to several antibiotics. Specifically, 44% of the bacteria were resistant to sulfisoxazole, 31% were resistant to vancomycin, and 16% were resistant to cipro-

floxacin. A lower incidence of resistance to streptomycin, doxycycline, and erythromycin was observed. The large percentage of vancomycin resistant bacterial species was highly unexpected since this antibiotic is not commonly used to treat ear infections in canines.

**Section VI: Philosophy and History of Science**  
**Cunningham Center, Room 211**  
**Vivian Rogers-Price, Presiding**

8:00 ONLINE TEACHING AND LEARNING OF “FUNDAMENTALS OF EVOLUTION”, William A. Said and Ollie I. Manley, Georgia State University, Atlanta, GA 30303. Considering that only about 40% of adults in the United States accept the idea of “evolution”, it’s expected that percentage of Georgia’s population agreeable with the principles of evolution is not larger by any account. Additionally, recent efforts to tamper with teaching of “evolution” as a component of science curricula manifested by school board battles and court decisions, adds to the challenge of the teaching and learning of “evolution” as an “online” class. Realizing the need for curricular renewal, and the value of the competency-based education, Georgia State University, has installed a new “Fundamentals of Evolution” course through the Georgia On My Line (GOML) program so that future 7-12 teachers may achieve the desired competencies for teaching the hard-to-sell subject of “evolution”. The current efforts at GSU’s GOML would instill in the future teachers the basic understanding of the “fundamentals of evolution” to qualify them as effective science educators and to make them better prospects to fill the large hole of the small pool of qualified 7-12 school teachers in Georgia particularly, and in the southeastern U.S. in general. Interdisciplinary efforts and collaboration between science educators of the COE and biology instructors of the College of Arts and Sciences have begun. It’s our plan that work will continue to grow and evolve and produce seeds viable enough to keep the next generations of Georgia more responsive to, even engaged in and excited about learning and teaching the fundamentals of evolution.

8:30 ARE SOCIAL MEDIA USEFUL TOOLS FOR PUBLIC ENGAGEMENT IN THE SCIENCES?, Laura Seifert, Coastal Heritage Society, Savannah, GA 31401. Archaeologists have recently recognized the importance of public education as both a public service and a self-service to enable the continuation of our discipline. As we see American children graduate with fewer skills and less knowledge, many scientists are looking for new methods to educate the public. Social media has emerged as a part of a larger societal trend focusing on the power and validity of the individual. Is social media a good tool to reach, engage, and educate the American public? This paper will weigh the benefits and drawbacks of using social media for education (or edutainment) using “Savannah Under Fire”, an ongoing archaeological research project, as an example and experiment.

9:00 INTERPRETING THE INTERPRETATION: TOURING CLERMONT LEE’S HISTORICAL SAVANNAH LANDSCAPES IN THE TWENTY-FIRST CENTURY, Christy M. Crisp, Georgia Historical Society, Savannah, GA 31401. The Georgia Historical Society recently acquired a substantial collection of mid-twentieth century plans by landscape architect Clermont Lee (1914-2006) that inspired the development of a guided walking tour exploring what remained of Lee’s designs in downtown Savannah. One of the few women practicing her profession in Georgia at the time, Clermont Lee was particularly interested in re-creating antebellum urban gardens by researching nineteenth-century plantings and design in order to develop plans for public and private spaces.

Her work both enhanced and informed the focus on preservation of Savannah's built environment during the latter half of the twentieth century. The tour illustrated not only Lee's significant impact on Savannah's famous historic preservation movement but also the changing ideas of gardening and landscape architecture in the urban environment throughout the city's history, including societal and cultural changes that influenced shifts in landscape priorities.

9:30     **DARWIN'S SCIENCE**, Tom McMullen, Georgia Southern University, Statesboro, GA 30460. Science is a discipline for learning about nature that requires reproducibility and repeatability. It has basically two parts: an empirical one involving gathering, categorizing, and/or studying data about nature; and a theoretical part, which involves formulating testable ideas about nature. Prior to his *Origin of Species*, Darwin's scientific reputation rested on empirical science - his observations and descriptions gathered from his voyage on the HMS *Beagle*. Darwin's theoretical science is presented in his *Origin of Species*. It is gradual evolution based on descent from a common ancestor by natural selection and unlimited variation. Natural selection and limited change are observable, but descent from a common ancestor and unlimited variation are not. So, even though descent from a common ancestor and unlimited variation are not seen now, Darwin made the unprovable claim that they happened in the past. The fossil record gives us an indirect look into the past. Unfortunately for Darwin, the predictions of his theory, such as "innumerable" and "countless" transitional forms, and change from simple forms to complex ones, are not seen in the fossil record.

#### 10:00     **Section business meeting**

10:30     **PHYSICS VERSUS PURE MATHEMATICS**, Ronald E. Mickens, Clark Atlanta University, Atlanta, GA 30314. Mathematics' historical roots have their genesis in attempts to understand and predict the behavior of physical phenomenon. Because of this fact, two separate traditions came into existence. The first focuses on the use of mathematical structures as the language of science, while the second is centered on mathematics as an (essentially) closed system for deriving "certain knowledge". We denote these two activities, respectively, as physical and pure mathematics. The main purpose of our presentation is to discuss and explain the interpretational differences between corresponding concepts appearing in these two fields. In particular, we use dimensional analysis and the existence of time, length, and mass scales for physical systems, to illustrate the seemingly disconnect between the physical and mathematical understandings of "point" and "infinity". We also discuss the relevance of the distinction between these two types of mathematics for the Navier-Stokes millennium problem. However, in the end, we conclude there is no fundamental conflict since the two separate activities are not concerned with the same subject matter.

11:00     **A DICERANDRA (LAMIACEAE) INSIDE THE ANDERSONVILLE STOCKADE**, Robin B. Huck, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611. Twenty years after the Civil War ended, Charles T. Mohr (1824-1901) collected a plant of *Dicerandra* at the site of the former Confederate prison stockade in Andersonville, Georgia. Plants of this endemic mint genus of the Southeastern Coastal Plain were first gathered by Stephen Elliott (1771-1830) in his 1818 excursion through the sandhills of the Georgia pine barrens along the historic Federal Road and were subsequently described and named "*Ceranthera linearifolia*" by him in his Sketch (1821). Transferred to a new genus and the subject of a new combination by George Bentham in 1848, *Dicerandra linearifolia* is easily recognized in the field by spurred anthers

on the flowers. Recently rediscovered populations of this plant near Sweetwater Creek in Andersonville and on ridges above the Flint River in Sumter and Macon Counties have flowers with purple corollas and golden anthers and are apparent hybrids between *D. linearifolia* var. *linearifolia* of northwestern Georgia and *D. linearifolia* var. *robustior* of extreme southern Georgia and north central Florida. This discovery and the presence of other relict populations in southern Georgia suggest that the range of *D. linearifolia* var. *robustior* extended at one time further north than where it is today.

11:30 WILLIAM BARTRAM – AMERICA’S SECOND NATURALIST, MADE SIGNIFICANT CONTRIBUTIONS TO THE SCIENCE OF MALACOLOGY AND FOSSILS, Elliott O. Edwards, Jr., Memorial Day School, Savannah, GA 31406. The *Travels* of Pennsylvania naturalist William Bartram (1739 – 1824) have intrigued scientists and historians for over 200 years. Although he was recognized during his lifetime for his scientific contributions, only in the last fifty years have his contributions been recognized with greater appreciation by a continuous flow of new research denoting his important advances in the sciences. Organizations who commemorate William Bartram’s career and the establishment of new trails that follow his *Travels* and recognize his accomplishments continue to grow. His study of shells and fossils began in 1765, when he accompanied his father, John Bartram (1699 – 1777) Botanist to the King, on a one-year botanical trip to Georgia and Florida that included a survey at Shell Bluff, Georgia. Here John Bartram wrote a description of the site that contained giant fossil shells, later named in 1834 by T. A. Conrad, as *Ostrea gigantissima*. William revisited the Shell Bluff site at a later date during his four-year expedition to eight southeastern states: North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, and Tennessee. On this trip, William wrote yet another scientific description of the fossil site. During his lifetime, he visited additional fossil sites, developed an interest in fossils and became well informed in malacology as he continued his lifetime study of our natural world.

**Section VII: Science Education**  
**Cunningham Center, Room 215**  
**Anil Banerjee, Presiding**

7:40 USING WRITTEN COMMENTARY TO SUPPORT BUBBLE STUDENT ACHIEVEMENT IN SCIENCE\*\*, Jane Blair Gilbert\*, Georgia State University, Atlanta, GA 30303. This research project defines a specific strategy geared toward improving the achievement of “bubble students.” Bubble students, based on previous academic performance, are at risk of failing one or more subjects, the Criterion Referenced Competency Test (CRCT), and are inclusive of general and special education students. This strategy combines formative assessment and corrective feedback into a teaching strategy. As the teacher walks the class formatively assessing students’ work written commentary is given, and this written commentary is expected to encourage students’ performance, provide scaffolding of content, and guide students toward a deeper connection of scientific concepts. Data from print media support the use of written feedback as a means for formatively assessing the performance of middle level students.

8:00 IMPROVING HIGH SCHOOL CHEMISTRY STUDENTS’ PERFORMANCE USING STUDY SKILLS TECHNIQUES\*\*, Jeffrey Klotz\* and Bonita Flournoy, Columbus State University, Columbus, GA 31907. A good teacher keeps a class motivated in order to get the most out of the teaching time available. What about when students are out of the classroom and studying alone? As a teacher, it is of real value

to know how to encourage students to adopt best practices in studying. During the first semester of the academic year, students in 4 high school chemistry courses were given a science attitude questionnaire to determine their attitudes toward science. Results indicated that most students had positive attitudes about science; however, several questions revealed that students did not have effective study skills. A study skills questionnaire was then given to the sample to ascertain specific parameters of students' study habits. As a result, an intervention composed of four study skill techniques were implemented with these students. The four techniques were: note review, note cards, study groups, and mnemonics. During daily chemistry lessons, in the unit on naming and writing chemical formulas, a technique was discussed. Oral examples were given on how to use the techniques in addition to mimeo handouts, distributed to the sample. After the intervention period, students reported that they only used some of the study techniques presented. Exercises and test scores reveal only nominal gains. The study techniques will continue to be emphasized with students in the second semester in the stoichiometry unit, and more data will be collected regarding the use of the study techniques, test scores, and post-study skills questionnaire.

8:20 EFFECTIVE FIFTH GRADE SCIENCE ASSESSMENTS – PERFORMANCE TASKS OF TRADITIONAL TESTS\*\*, Ryan Sweeney\*, Georgia State University, Atlanta, GA 30303. Educators have the task of selecting the most effective assessment for a specific lesson or unit. The teacher must design assessments that correlate with the defined essential questions for a lesson or unit. Within the classroom setting, it is not always known which type of assessment will work best for a given student or class population. The question that will guide this study is: Which form of assessment, performance or traditional tests, is most effective in producing a record of students' understanding in a fifth grade science students? Data from the literature point toward performance task assessments as being the most effective assessment tool for fifth grade science students.

8:40 MAKING THE *DAPHNIA* HEART RATE LAB WORK: A PRACTICAL WAY TO REDUCE HEART RATE SO THE EFFECTS OF TEST AGENTS CAN EASILY BE DETERMINED, Stephanie Bond\* and Frank Corotto, North Georgia College & State University, Dahlonega, GA 30597. Students commonly test the effects of chemical agents on the heart rate of the crustacean *Daphnia magna*. A vexing problem is *Daphnia*'s high heart rate, which makes counting difficult. We investigated whether the beta blocker propranolol could be used to maintain *Daphnia*'s heart rate at a lower value. Students could determine the effects of test substances combined with propranolol while control animals receive propranolol alone. We found that propranolol at concentrations of 10  $\mu\text{M}$ , 100  $\mu\text{M}$ , and 1 mM reduced mean heart rate to ~80%, ~50%, and ~10% of control values (n=6-7). In a teaching lab, a 50% reduction brought about by 100  $\mu\text{M}$  propranolol would be ideal. It would make for easy counting while allowing test agents to lower heart rate further without killing the animals. Could animals be kept in 100  $\mu\text{M}$  propranolol long enough to conduct a teaching lab? We tested six animals with 100  $\mu\text{M}$  propranolol and followed their heart rates for 3 hrs along with six controls. Heart rates were lower than in the initial experiments, ~25% of control values, but rates were stable for the duration of the experiment and none of the animals died. Propranolol effectively resets *Daphnia*'s heart rate to a lower value. Provided that control animals receive propranolol alone, the effects of various test agents could easily be determined by combining those test agents with propranolol.

9:00 **Break**

9:20 CURRENT AWARENESS REGARDING THE H1N1 FLU VIRUS IN COLUMBUS, GEORGIA, Koosh Desai\*, Columbus State University, Columbus, GA 31907. Although measures have been taken by federal and state agencies to educate the public regarding the prevention and management of the H1N1 flu virus, it is unknown whether and at what level the public is aware of this disease. A cross-sectional oral interview with a street survey method was used in two different locations in Columbus, Georgia to find out the current awareness about this virus. The interviews were conducted with 30 adults over a period of 2 days. A set of three predetermined questions based on the Centre for Disease Control guidelines was used. Individuals of the public were recruited to participate in the interview in a random manner to get responses on symptoms, prevention, and personal preparation related to H1N1 virus. Data from two locations yielded similar results indicating reproducibility of results and reliability of the method. The data was scored using a Likert-type scale and then analyzed. The mean raw response score was 2.4 out of 9 indicating low awareness levels. Also, the awareness level for each individual question was found to be very low. Overall, it was observed the sample did not know much about the H1N1 flu virus. The data as well as implications and suggestions to improve awareness will be presented.

9:40 MAKING THE *DAPHNIA* HEART RATE LAB WORK: OPTIMIZING THE USE OF CLUB SODA AND ISOPROPYL ALCOHOL, Cassandra Major\*, Diana Diaz\* and Frank Corotto, North Georgia College & State University, Dahlonega, GA 30597. Students commonly test the effects of chemical agents on the heart rate of the crustacean *Daphnia magna*. We investigated whether club soda and isopropanol are suitable test agents. Treatment groups contained 6-12 animals. Club soda caused a dose-dependent decrease in heart rate, presumably because of the anesthetic effects of CO<sub>2</sub>. Ten percent, 30%, and 50% club soda reduced mean heart rates to 78%, 57%, and 47% of initial values. The effect was transient; heart rates quickly recovered to control values even though the club soda remained present. Control animals treated with aged tap water showed no change in heart rate. Isopropanol's effect was dose-dependent and sustained. Three percent, 5%, and 10% isopropanol reduced mean heart rate to 45%, 35%, and 12% of initial values. Removal of the isopropanol failed to fully reverse its effects. Ten percent isopropanol proved fatal to one animal out of the eight tested at that concentration. Again, control animals treated with aged tap water were not affected. Both club soda and isopropanol are suitable agents for students to test. If reversibility is to be investigated, for example to show that a separate control group is not always necessary, club soda should not be used. Its effects wear off even when the club soda is still present. Isopropanol is best used at 3-5% as it causes marked heart rate suppression, no fatality, and partial reversibility.

## 10:00 Section business meeting

10:30 TEACHER TRAINING IN PHYSICS AND PHYSICAL SCIENCE, Bob Powell<sup>1</sup>, Sharon Kirby<sup>2</sup> and Ann Robinson<sup>3</sup>, <sup>1</sup>University of West Georgia, Carrollton, GA 30118, <sup>2</sup>Cherokee County Schools, Canton, GA 30114 and <sup>3</sup>University of West Georgia and Paulding County Schools, Dallas, GA 30132. We have completed the first two years of a Math Science Partnership Grant to provide training for in-service teachers in physics and physical science. The curriculum was developed by the American Association of Physics Teachers (AAPT) and the Physics Teacher Resource Agents (PTRA) has been used for this training. The workshops and follow-up sessions are held on the campus of the University of West Georgia. The training consists of a workshop lasting one week during the summer and two follow-up sessions on a Friday and a Saturday. During 2007-

2008, we offered “Kinematics and Dynamics” to 24 participants. We offered “Energy, Momentum, and Impulse” to 19 participants during the 2008-2009. Topics are 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. A tour of the nearby Plant Wansley, operated by the Georgia Power Company, was arranged for part of the September follow-up session in the second year. Participants showed significant increases in content knowledge on the post-test compared to the pre-test, as reported by an external evaluator. This project was funded by a grant from the Georgia Math Science Partnership.

10:50 ADDITION OF ONLINE LABORATORY SUPPLEMENTAL MATERIAL FOR ORGANIC CHEMISTRY, Jose Gonzalez-Roman<sup>1</sup>, Vivian A. Mativo<sup>1</sup>, Michael R. Nelson<sup>1</sup>, Melissa Schoene<sup>1</sup>, Howard Silverstein<sup>1</sup>, Luise E. Strange de Soria<sup>1</sup> and Jose J. Soria<sup>2</sup>, <sup>1</sup>Georgia Perimeter College, Clarkston, GA 30021 and <sup>2</sup>Emory University, Atlanta, GA 30022. Our main goal was to, via incorporation of a few new experiments, increase student understanding of those concepts in the corresponding lectures, as well as increase the similarity of labs across the campuses. Student evaluations of the new experiments will be discussed as well as brief results from the assessment exam to see if there was any change in scores from spring 2009 to fall 2009. The online materials for the new experiments will also be shown. This work was funded by a Georgia Perimeter College, University System of Georgia STEM mini-grant.

11:10 ASSIGNING COLLABORATIVE LEARNING PAIRS BASED ON PERSONALITY TESTING, Jane E. Humble<sup>1</sup> and R. Penwell-Cooper<sup>2</sup>, <sup>1</sup>Buford Middle School, Buford, GA 30518 and <sup>2</sup>Brenau University, Norcross, GA 30071. This study addressed the effects of using personality tests to create student learning pairs on student success in Life Science. Four seventh grade classes were examined. The content, instruction, and instructor were the same for all classes. Three of four classes had students grouped in learning pairs based on the results of personality tests. The fourth class was the control group. A teacher developed exam similar to the Georgia Criterion Referenced Competency Test (CRCT) for Life Science was used as the pretest and the CRCT was used as the posttest. No significant differences were found, however specific student populations did exhibit gains in their post-test scores.

11:30 STUDENT SURVEY RESULTS FROM AN INTERACTIVE ENERGY BALANCE PROJECT, Randal L. N. Mandock, Department of Physics, Clark Atlanta University, Atlanta, GA 30314. An energy-balance project and laboratory assignment were developed for an introductory earth science course at Clark Atlanta University. The project uses an interactive energy-balance model to estimate surface energy fluxes at Georgia Automated Environmental Monitoring Network (AEMN) meteorological stations. Afternoon and predawn observations from these stations and satellite images provide the data to be modeled. After modeling four progressively more difficult environmental scenarios in the laboratory assignment, the student in the lecture project uses the satellite images to establish an estimate of the net radiation. Estimates of sensible and latent heat fluxes, ground heat flux, canopy heat storage, and advective heat transport are obtained from the AEMN insolation, temperature, humidity, soil temperature profile, ground cover, and wind observations. Energy-balance requirements fine tune these estimates Results of student surveys conducted in the semesters from Fall 2008 through Fall 2009 show how student self-assessments of learning can help instructors evaluate project design, student preparation for the project, barriers to project completion, knowledge gained from the project, and weaknesses in teaching. The survey results indicate student participation in

office hours and faculty-led study sessions. The results measure the degree to which the project helped the student understand difficult concepts and processes taught in lecture and laboratory. The results show how students perceive differences in teaching by different instructors. Evolution of the project from one semester to the next is seen in the survey results. The surveys make it clear that assessments of this type should be used with every significant science project.

**Section VIII: Anthropology**  
**Cunningham Center, 1st Floor Incubator Room**  
**Terry G. Powis, Presiding**

7:45 PRELIMINARY PERSPECTIVES ON THE MIDDLE WOODLAND GEORGE SMITH SITE: APPLYING SURFACE SURVEY APPLICATIONS\*\*, Jennifer Weber<sup>1</sup>, Terry Powis<sup>2</sup> and Kong Cheong<sup>3</sup>, <sup>1</sup>Georgia State University, Atlanta, GA 30302, <sup>2</sup>Kennesaw State University, Kennesaw, GA 30144 and <sup>3</sup>Brockington and Associates, Inc., Norcross, GA 30071. The George Smith Site is located in Bartow County, Georgia and dates to the Middle Woodland Period (300 BC- AD 200). The Middle Woodland is perceived as a time of seasonal movement and occupational specialization for exploiting a specific resource niche. Over the past few decades, Geographic Information Systems (GIS) have proven to be valuable tools to map and record spatial data, particularly settlement patterns and artifact density analysis. The spatial and distributional analyses of this data lead to a better understanding of various aspects of prehistoric occupational periods. This paper focuses on the implementation of GIS to survey and document the George Smith site.

8:00 POTTERY ANALYSIS OF BURNT VILLAGE SITE (9TP9)\*\*, Vanessa N. Hanvey\*, University of Georgia, Athens, GA 30602. Burnt Village (9TP9) or Okfuskenena was a historic Native American Creek town located three miles west of LaGrange, Georgia. On September 21, 1793, white colonists burned the town in an attempt to force the inhabitants west. Harold Huscher of the University of Georgia excavated the site during the field seasons of 1966-69. No final report was published. Ongoing analyses of the recovered artifact collections are increasing our knowledge of this little know Creek occupation. In this paper I will report on recent findings of Burnt Village, focusing on pottery chronology and spatial distribution for the site. The Laboratory of Archaeology at the University of Georgia provided space and supplies for the completion of this research.

8:15 CLEANERS AND SOCIALIZING\*\*, Stephanie Blocker\*, Georgia State University, Atlanta, GA 30303. Cleaning has an important role in our lives. We learn how to clean as children and continue throughout adulthood. In particular, housecleaners hold a significant role in society by entering the private sphere of the home from the public sphere. Housecleaning has been studied by scholars in many fields with different goals. However, it has not been documented how social the act of housecleaning is. With my study, I emphasize the importance of socialization in the arena of cleaning. I interviewed and did participant observation with a local cleaning company for three months. I work for this company and continue to do fieldwork with them. The company name has not been changed at the request of the owner. The names of the people interviewed have been altered. This is a part of the larger project for my thesis. However, the preliminary results of this sub project indicate how socialization encourages the modernization of cleaning service. Overall, socialization improves the cleaning experience.

8:30 IDENTIFYING SHELL WORKSHOPS IN THE MAYA LOWLANDS: A VIEW FROM THE PRECLASSIC SITE OF PACBITUN, BELIZE, Terry Powis, Stephany Valdez\*, Jason Lee\* and Catherine McBee\*, Kennesaw State University, Kennesaw, GA, 30144. Plaza zone excavations at the medium-sized Maya site of Pacbitun have revealed evidence of a Middle Preclassic (900-300 BC) shell workshop. The association of fourteen well-preserved structural foundations, household and workshop midden deposits, and more than 3,000 pieces of marine shell ornaments and production byproducts suggest that it was a household-level workshop. Preclassic workshops, especially those involving marine shell artifacts, are not well documented in the Maya Lowlands, thus Pacbitun provides a unique opportunity to study craft production at the household level during Middle Preclassic times. Comparative data from other regions of Mesoamerica are discussed. Funding for this project was made possible by a grant from the Center for the Excellence in Teaching and Learning, Kennesaw State University.

8:45 THE ORIGINS OF AGRICULTURE IN NORTH AMERICA: USING GEOGRAPHIC INFORMATION SYSTEMS (GIS) TECHNOLOGY TO MODEL FOOD PRODUCTION DEVELOPMENT\*\*, Vicki Ina F. Gloer\*, Kennesaw State University, Kennesaw, GA 30144. This paper uses Geographic Information Systems (GIS) to map radiocarbon and accelerator mass spectrometry data on *Zea mays* and *Cucurbita pepo* published over the last sixty years to model the development of food production across North America. Technology is underutilized in archaeology and this paper demonstrates the usefulness of technological advancements in archaeological applications by describing and analyzing the temporal and geographic movement of these two cultivars across the North American prehistoric landscape.

9:00 EDWARDS' 1952 EXCAVATION AT TUGALO, 9ST1: A CLASSIFICATION AND ANALYSIS OF THE ARTIFACTS\*\*, Benjamin M. Storey\*, University of Georgia, Athens, GA, 30602. The Tugalo Site (9ST1) was an important prehistoric and historic Native American village and mound town located in the headwaters of the Savannah River valley. In 1952, William E. Edwards conducted excavations in a large portion of the village area. However, complete analysis of the recovered artifacts was never completed. I took on this task as part of my graduate and ongoing research at the University of Georgia, with the hopes of contributing to a final report of the Tugalo site. My first objective was a thorough, concise, and comprehensive preliminary identification and classification of the recovered cultural materials. The identification involved trying to directly relate artifacts to the specific archaeological components known at Tugalo. The classification involved the massing of data to assist in drawing correlations between the tentatively unidentifiable artifacts and their proper archaeological component. The second objective was the interpolation of the material data into map-rendering computer software to configure and conceptualize the spatial and temporal distribution patterns of these archaeological groups occurring within the village area excavation. This classification and analysis may provide initial evidence to interpret the possible chronologies, boundaries, and densities of these particular archaeological cultures and their individual settlement occupations at Tugalo. The Laboratory of Archaeology furnished both space and supplies in order to conduct this research.

9:15 DIFFERENT PERSPECTIVES ON POWER: USING VIEWSHED ANALYSIS TO ASSESS EMERGING SOCIAL INEQUALITY IN THE YALAHAU REGION, QUINTANA ROO, MEXICO\*\*, Jennifer Weber\* and Dr. Jeffrey B. Glover, Georgia State University, Atlanta, GA 30302. The Yalahau region, located in the northeastern portion of the Yucatan peninsula, presents archaeologists with a unique perspective on emerging

social inequality in the northern Maya lowlands during the Terminal Preclassic period (100 B.C. – A.D. 400). Across the Maya lowlands this is a time period marking the transition from more communal leadership structures to more hierarchical ones associated with divine kings. While archaeological data such as the presence of tombs in public architecture has been used as a correlate for this transition, the restriction of access to portions of a site's buildings can be another clue to this important transition. Through the application of the ArcGIS's viewshed tool, we will systematically test whether certain portions of a site's major architecture was more restricted, indicating that the activities were not intended to be viewed by the general populace. By conducting this analysis at large and small sites across the region, we hope to explore how pervasive these emerging inequalities might have been.

9:30      **GEOCHEMICAL ANALYSIS OF THE COPELAN SITE (9GE18), GREENE COUNTY, GEORGIA**, Mark Williams and M. Jared Wood, University of Georgia, Athens, GA 30602. Soil chemistry analyses of archaeological sites have proven effective in locating and helping to explain areas of human activity from the distant past. Cooking, waste disposal, and accumulation of organic refuse often leave chemical signatures in the soil, particularly in elevated levels of soil phosphates. The Copelan site (9GE18), located on a high bluff overlooking Lake Oconee in Greene County, Georgia, is interpreted by Mark Williams of the University of Georgia as the location of a late prehistoric festival ground, evidenced by structural remains and differentially distributed artifacts located during UGA excavations. The authors of this study implemented a systematic soil sampling and phosphate testing program at the site. Soil samples were tested using the Mehlich-3 Extraction methods for phosphorus, and the extracted soil phosphate samples were measured using a Hach colorimeter. Differential phosphate densities across the site were recorded and mapped, then compared with topographical data, structure and feature data, and artifact density data. Potential problems with the geochemical data are identified and addressed. The results of this study indicate that differential phosphate accumulation at the Copelan site is present, higher accumulations of phosphates appear to be located outside of the core structural area, and thus activity areas may be reflected in the site's geochemistry. Funding and materials for this project provided by the UGA Laboratory of Archaeology.

9:45      **AUTOPSY OF AN ANOMALY: HUMAN DEMOGRAPHIC PROCESSES IN THE CHACHAPOYAS CLOUD FORESTS OF PERU**, Warren B. Church, Columbus State University, Columbus, GA 31907. Standard characterizations of human occupation in the tropical montane forests of northeastern Andes of Peru cite late pre-Hispanic population movements to account for dense populations in this precipitous, wet and generally-inhospitable environment. This presentation will describe twenty years of research conducted to evaluate four principal human demographic models utilized to account for the heavily constructed cultural landscape and monumental architecture in Peru's Rio Abiseo National Park valley where sites such as Gran Pajatén, Los Pinchudos and Cerro Central are still perceived as enigmatic. The evidence in hand does not support the three most-common models citing population expansions and imperial colonization. Instead it suggests processes of nucleation and dispersal similar to those that occurred elsewhere throughout the pre-Hispanic Andes. Interpretations of such ordinary human demographic processes in this challenging environment will remain counter-intuitive until further research addresses new questions regarding regional economic configurations and local subsistence strategies. Some new questions and data sets needed to address these issues will be considered.

10:00      **Section business meeting**

## POSTERS

GIS VISUALIZATION OF ARCHAEOLOGICAL SETTLEMENT PATTERNS IN SPATIAL, TEMPORAL AND PALEOECOLOGICAL CONTEXTS IN THE RIO ABISEO NATIONAL PARK, NORTHERN PERU\*\*, Jennifer Collins\*, Department of Earth and Space Sciences, Columbus State University, Columbus, GA 31907. The Rio Abiseo National Park holds unique dual status as a World Heritage Natural and Cultural Site by UNESCO in 1990 because of its great biodiversity, high species endemism, and its remarkably intact pre-Columbian cultural landscape. The park encompasses an area of 2,745.2 km<sup>2</sup> between 350 m and 4200 m on the eastern flanks of Peru's northern Andes, and includes at least seven climate zones. It is presently uninhabited and has been closed to tourism since 1986 because of its fragile nature. Discovery, inventory and documentation of the archaeological sites is critical to assist NGOs attempting to preserve the integrity of the park's "symbiotic" natural and cultural resources. The entry of site data gathered to date into a GIS geodatabase now permits a spatial analysis and tentative interpretations relating to the park's natural and cultural histories. Explored here are specific relationships between: 1) cultural chronology, settlement patterns, and environmental zones, and 2) chronology, settlement patterns and paleoenvironmental change. A series of GIS maps provide graphic illustrations of changing settlement preferences at progressively higher altitudes. Combining these data with published data on late Holocene climate variability shows that rising temperatures may have affected choices of settlement locations.

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

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

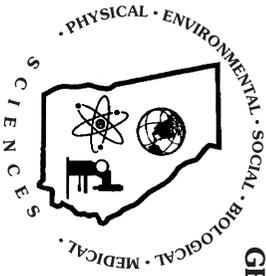
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