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GEORGIA JOURNAL OF SCIENCE

Volume 73 **2015** **Number 1**

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

Hello Academy Members and Guests:

Welcome to the 2015 meeting of the Georgia Academy of Science!

The academy is grateful to President Steve Dorman for the invitation to meet at Georgia College. The academy is also grateful to Koushik Banerjee and his committee for organizing this meeting.

Georgia College was founded in 1889 as a college for women. One famous student of this college is the writer Mary Flannery O'Connor. This college became co-educational in 1967. Currently 6600 graduate and undergraduate students are pursuing advanced studies at this institution. Georgia College has an observatory along with a variety of programs of study.

If you get some free time please explore the town of Milledgeville. It was founded over 200 years ago. This town was the capitol of Georgia from 1804 to 1868. Important places to visit include the Oconee River, the Old State Capitol Building and the Bartram Educational Forest.

Sincerely,

Richard W. Schmude, Jr.
President
The Georgia Academy of Science

GEORGIA COLLEGE
125
1889-2014

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Georgia Academy of Science Colleagues:

We are pleased that Georgia College & State University is the site of the 2015 Meeting of the Georgia Academy of Science. If this is your first visit to our campus, we are sure that you will be impressed with the historic, stately buildings and wide-open green spaces. The beauty and charm of Georgia College is as appealing to students now as it was in 1889 when it was founded.

Georgia College is the state's designated public liberal arts university, offering undergraduate programs of study in a residential college setting to students who are motivated to make a difference in the world. Our liberal arts core curriculum provides a breadth of training offering students exposure to a broad curriculum content with critical thinking, communication and presentation skills. However, part of this education is also a depth of understanding in a specific or unique area of study or learning.

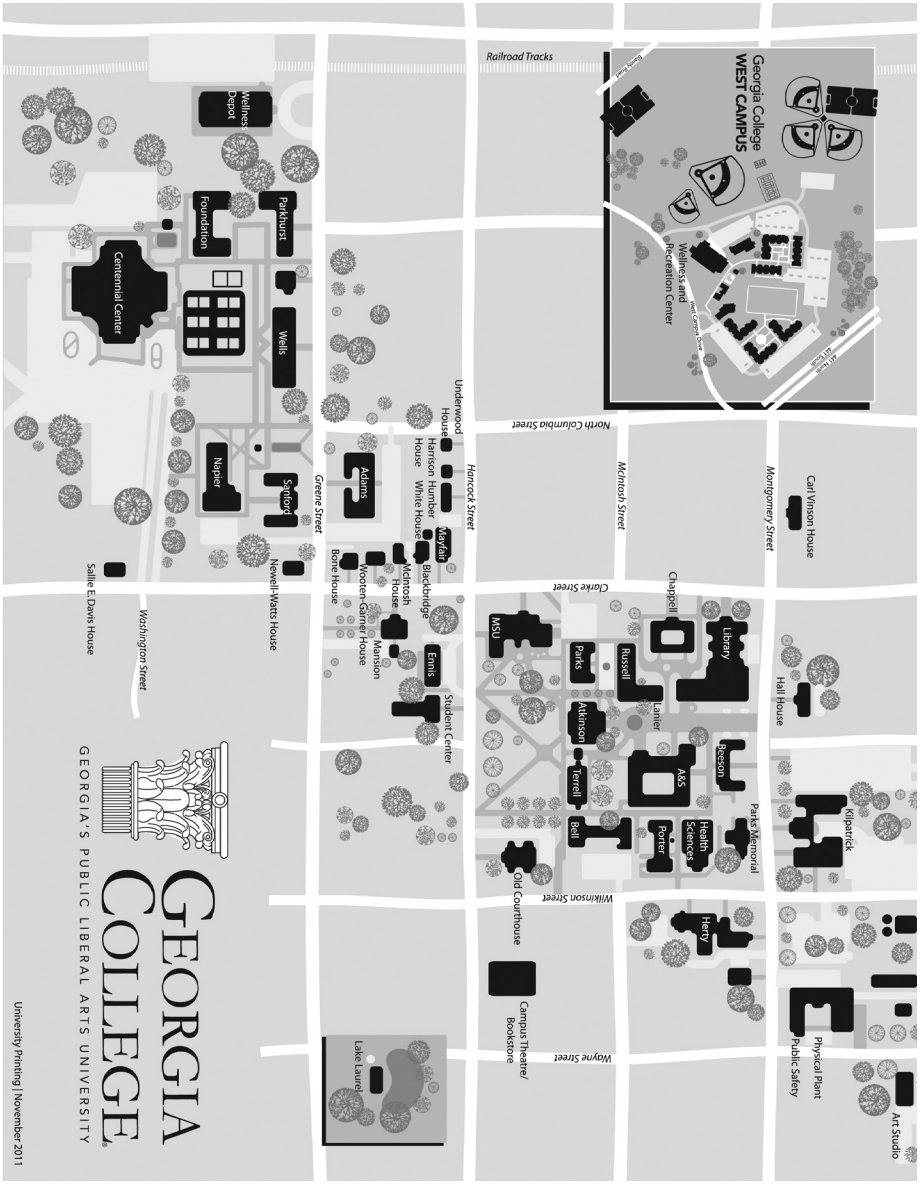
One example of these specific areas is the study of science. Georgia College has one of the fastest growing Physics programs in the country. The University System of Georgia approved our Physics program to begin in fall of 2010, and we now have over 200 Physics majors. The Chemistry program has been active for many years. The Chemistry Club has been recognized as an Outstanding Student Affiliate of the ACS for seven years in a row. The Pohl Observatory has a 24-inch Corrected Dall-Kirkham Astrograph telescope that was made possible by a donation from Emeritus Chemistry faculty - Dr. Doug Pohl. It is located in Herty Hall and will be open on Friday evening for GAS participants to experience.

We also hope that you will have an opportunity to explore the city of Milledgeville. As a former capital of Georgia, Milledgeville has a rich history and many historic sites and museums to discover.

Steve M. Dorman, Ph.D.
President

Kelli R. Brown, Ph.D.
Provost & Vice President for Academic Affairs

GEORGIA COLLEGE MAP



GAS 2015 PROGRAM

Friday, March 13, 2015

12:00 PM
Georgia Academy of Science Board of Directors Meeting — HSB 211

1:00 PM to 5:00 PM
Oral Presentations — HSB 213

3:00 PM to 5:00 PM
On-site Registration — HSB Student Commons

5:15 PM to 6:30 PM
Opening remarks, Poster Presentations Refreshments Served — HSB 314

6:30 PM to 6:45 PM
Break

6:45 PM to 7:30 PM
Keynote Lecture — A&S Auditorium

Dr. Chryssa Kouveliotou of the Marshall Space Flight Center and UA-Huntsville will deliver our keynote address. Dr. Kouveliotou, a Fellow of the American Physical Society, is a recipient of several prestigious awards for her contributions to physics (2003 Rossi Prize, 2004 Descartes Prize, and 2012 Heineman Prize), and has helped develop multiple missions dedicated to the study of gamma-ray bursts and highly-magnetized neutron stars.

The Transient High-Energy Sky

High-energy transients exhibit themselves in many diverse ways: supernovae, gamma-ray bursts (GRBs), magnetars, X-ray Binaries, Active Galactic Nuclei, among others. My work has focused predominantly in magnetars and GRBs; I will discuss here these transients, their properties and the evolution in the last 30 years of our knowledge of their nature and radiation mechanisms. Finally, I will briefly mention the findings of the NASA Astrophysics Roadmap team, who produced the long term (beyond the next 30 years) strategic planning of NASA.

7:30 PM to 8:30 PM
Tour Historic Downtown Milledgeville (self guided)

8:30 PM to 10:00 PM
Observatory Visit

Saturday, March 14, 2015

7:30 AM to 8:00 AM
Light Breakfast — HSB Student Commons

8:00 AM to 12:00 AM
Oral Presentations — HSB Rooms

12:00 PM to 1:00 PM
Lunch — Magnolia Ballroom

1:15 PM to 1:45 PM
Student awards — HSB 211

FRIDAY PAPER PRESENTATIONS

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

Section I: Biological Sciences
Health Sciences Building, Room 144
Paul T. Arnold, Presiding

2:00 **AN ASSESSMENT OF THE MOBILITY OF STEM LOOP DNA IN NATIVE AND DENATURING POLYACRYLAMIDE GELS**,** Holly R. DuPlain* and A.C. Spencer

2:15 **MORPHOLOGICAL AND ULTRASTRUCTURAL CHANGES USING ESSENTIAL OIL VAPORS AGAINST *ASPERGILLUS FLAVUS* IN GEORGIA PEANUTS,** Reesheda T. Gilbert* and P.N. Achar

2:30 **ASSESSMENT OF VEGETATIVE CHARACTERISTICS FOR RESTORATION OF CRITICAL SANDHILL HABITAT AND CONSERVATION OF THREATENED REPTILE SPECIES**,** Regan A. Phillips*, M. Elliot, L.M. Kruse, J.M. Moffett Jr., C.J. Tant and B.L. Simmons

2:45 **DRILLING FREQUENCY OF *CERITHIUM* SPECIES IN THE BAHAMAS,** Elizabeth Lemley*, M. DeVore and D. Freile

3:00 **OCTOPUS DRILLING FREQUENCIES IN TWO CARIBBEAN COWRIE SPECIES (*EROSARIA ACICAULARIS* AND *LUCRIA CINEREA*),** Aeron Attwooll* and M. DeVore

3:15 **Break**

3:30 **ALARM CUES IN PLANARIANS,** Heather L. Perona*, J.L. Winkler and F.S. Corotto

3:45 **DOCUMENTING CHANGES IN MOTH LIFE CYCLE AND ABUNDANCE CAUSED BY URBAN WARMING**,** Vy Tran*, Linh Do*, I.Y. Rickets, J. Pickering and J.M. Lochamy

4:00 **HABITAT PREFERENCES, ABUNDANCE, AND POPULATION CHARACTERISTICS OF A STATE-ENDANGERED CRAYFISH *CAMBARUS PARRISHI* ALONG AN ELEVATION GRADIENT**,** S. Weaver*, K. Cash* and J.G. Davis

4:15 **A NEW TECHNIQUE FOR AGING THE SICKLEFIN REDHORSE *MOXOSTOMA SP.* TO MEASURE ANNUAL GROWTH RATES**,** Benjamin A. Farley*, W.H. Leatherwood and J.G. Davis

4:30 **REIN TENSION DURING TROT AND CANTER IN DRESSAGE HORSES OF VARYING LEVELS**,** Ashley Davenport*, B.K. Hull, D.S. Hanson, J.G. Davis and A. Roy

4:45 **Posters (will be displayed through 5:30)**

Section II: Chemistry
Health Sciences Building, Room 105
Ghislain Mandouma, Presiding

3:15 **DETERMINING THE GLASS TRANSITION OF POLYSTYRENE NANOSPHERES UNDER HARD AND SOFT CONFINEMENT**,** Nicole M. Sikes*, Rubicelys Torres Guzman and D. Wade Holley

3:30 **EXPLORING SUPPLEMENTAL INSTRUCTION USAGE BY ORGANIC CHEMISTRY STUDENTS,** Oneida E. Muniz* and Suzanne R. Carpenter

3:45 **A NOVEL AND GREEN SYNTHESIS OF SUBSTITUTED BENZO[*c*]CINNOLINES AND DIBENZO[*c,h*]CINNOLINES AND THEIR CYTOTOXICITY SCREENING**,** Tahera Nembhard* and Ghislain Mandouma

4:00 **DEVELOPING A CALIBRATION MATRIX FOR DETERMINING ACTIVES IN CHILDREN'S DIMETAPP USING UV DATA AND TARGET FACTOR ANALYSIS,** Huggins Z. Msimanga*, Truong Thach Ho Lam, Mihyang Song and Newsha Tavakoli

4:15 **Posters (will be displayed through 5:30)**

Section IV: Physics, Mathematics, Computer Science and Technology
Health Sciences Building, Room 207
Hasson M. Tavossi, Presiding

1:00 **TOROIDAL MOMENT CONTRIBUTIONS TO THE MULTIFERROIC ACOUSTIC SUSCEPTIBILITY,** Alexander Price and Trinanjan Datta

1:15 **TRANSVERSE DISTORTION EFFECTS ON THE KASTELEYN AND KDP TRANSITION IN SPIN ICE,** CurtisLee M. Thornton and Trinanjan Datta

1:30 **MAXIMALLY EXPOSED OFFSITE INDIVIDUAL WORST-CASE SECTOR DETERMINATION FOR NESHAP COMPLIANCE AT THE SAVANNAH RIVER SITE,** K.R. Moore, R.A. Stahman, G.T. Jannik, K.L. Dixon and J.R. Newton

1:45 **EXPLORATION OF THE INTENSITY SIGNAL OF A JDSU 1145P HELIUM-NEON LASER,** Owen L. Angleton, Jr. and Dr. Tom Colbert

2:00 **DEVELOPMENT OF AN INEXPENSIVE TRACKING DEVICE FOR MOCK MRI TRAINING SESSIONS USING RASPBERRY PI,** J.C. Stephens, J.A. Hauger and N. Yanasak

2:15 **INTERFEROMETRIC MEASURMENT OF THE THERMAL EXPANSION COEFFICIENT OF BK7 GLASS,** Matt Herren and Dr. Tom Colbert

2:30 **MEASUREMENTS OF LOW ENERGY GAMMA RAYS WITH METALS COMPARED TO LEAD FOR APPLICATIONS IN GAMMA CAMERA COLLIMATORS,** Thomas F. Lynam, Jessica S. Robinson and Gregory G. Passmore

2:45 **PORPHYRIN-GRAPHINE OXIDE FIELD EFFECT TRANSISTOR BIOSENSOR,** Akilah I. Mateen and Thomas A. Searles

3:00 **Break**

3:15 **SIMULATION OF CUBESAT ORBITAL MOTION AND THE ITS POWERSUBSYSTEM,** DeAndre C. Penn and Thomas A. Searles

3:30 **LOW COST SOURCE MEASUREMENT UNIT FOR THE CHARACTERIZATION OF DYE-SYNSITIZED SOLAR CELLS USING INTEL GALILEO DEVELOPMENT BOARD,** B. Erin Davy and Thomas A. Searles

3:45 **MAXIMALLY EXPOSED OFFSITE INDIVIDUAL WORST-CASE SECTOR DETERMINATION FOR NESHAP COMPLIANCE AT THE SAVANNAH RIVER SITE,** K.R. Moore, R.A. Stahman, G.T. Jannik, K.L. Dixon and J.R. Newton

4:00 **A SIMULATION AND MODELING OF REFLECTIVITY FOR TWO PERIOD BRAGG REFLECTOR,** Jared W. Thacker, J.E. Hasbun and Ajith DeSilva

4:15 **THE EFFECT OF PRESSURE AND TEMPERATURE ON THE ELECTRICAL RESISTANCE OF GRAPHITE AND NANODIAMOND,** Evan Reed, Calleigh Hitt and Ben de Mayo

4:30 **STUDY OF CADMIUM SELENIDE QUANTUM DOT DISTRIBUTION USING TEMPERATURE DEPENDENT PHOTOLUMINESCENCE**, Sarah G. Martino and Ajith DeSilva.

4:45 **GENERALIZATION AND MATHEMATICAL MODEL DEVELOPMENT FOR THE MAGIC TEN CARD GAME**, Sara L. Hojjatie and Roxana A. Hojjatie

Posters (will be displayed through 7:00)

SATURDAY PAPER PRESENTATIONS

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

Section I: Biological Sciences
Health Sciences Building, Room 144
Paul T. Arnold, Presiding

8:45 **DETERMINATION OF PHYLOGENETIC GROUPS OF *ESCHERICHIA COLI* IN *SUS SCROFA* AND *BOS TAURUS*,** Brennan Poon-Kwong* and D. Bachoon

9:00 **AN ANALYSIS OF NON-GENITALIC CHARACTERS OF THE *AULICUS* SPECIES GROUP OF *NEOPORUS* GUIGNOT (COLEOPTERA: DYTISCIDAE)**,** Sergio Minchey, G.W. Wolfe, P. Murray, D. Oetter and E.H. Barman

9:15 **AN ASSESSMENT OF THE ALGAL COMMUNITY COMPOSITION OF STREAMS IMPACTED BY ACID MINE DRAINAGE**,** Laura Aycock* and K.M. Manoylov

9:30 **PHYTOPLANKTON ASSOCIATIONS IN THE NORTHEASTERN GULF OF MEXICO: CHANGES IN THE NET PLANKTON ASSOCIATION, 2011 – 2014,** Courtney M. Bryller*, J.A. Nienow and S. Wise

9:45 **EFFECTS OF MILITARY ACTIVITY ON GOPHER TORTOISE MOVEMENT USING RADIO-FREQUENCY IDENTIFICATION**,** Brittany A. Mixon*, J.M. Lockhart, C.M. McDonough, C.D. Anderson, P.C. Vincent and G.W. Lee

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

10:30 **Posters (will be displayed through 12:00)**

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INVESTIGATION OF THE PROPERTIES OF STEM LOOP DNA,** Delphine R. Baumert* and A.C. Spencer

AN EXAMINATION OF THE SEX RATIO OF LAB-REARED EMERGING ADULT *SASAJISCYMNUS TSUGAE* BEETLES, Crystal J. Bishop* and P.T. Arnold

PREFERENCE OF *MEGACOPTA CRIBRARIA* ACROSS FOUR SOYBEAN VARIETIES (INOCULATED VS UNINOCULATED), Carson Bowers*, A. Grimes*, K. Guyton*, S. Whitehouse* and C. Zehnder

CONSTITUTIVE EXPRESSION OF THE BARLEY DEHYDRIN GENE *DHN1* ENHANCES *ARABIDOPSIS* GERMINATION IN RESPONSE TO SALT STRESS, Cristina Calestani, M.S. Moses, E. Maestri, N. Marmiroli and E.A. Bray

EVOLUTION OF *HOX* PG2 GENE REGULATION AND EXPRESSION IN THE JAPANESE MEDAKA (*ORYZIAS LATIPES*), Adam Davis and E. Stellwag

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ASSESSMENT OF THE MACROINVERTEBRATE COMMUNITY IN POTATO CREEK FOLLOWING A FISH KILL,** Megan Dedge* and M.J. Bender

ANALYSIS OF PHYTOPLANKTON PROFILES IN THE NORTHEASTERN GULF OF MEXICO USING IMAGING FLOW CYTOMETRY,** Tiffani S. Dinkins*, C.M. Bryller, C.D. Horruitiner, J.A. Nienow and S. Wise

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INSECTICIDAL EFFECT OF SALICYLIC ACID AND ITS PRECUSORS ON THE ARGENTINE ANT (*LINEPITHEMA HUMILE*),** Gaylin Gladden*, Emily Harden*, Megan Babb*, C. Kang and C. Lee

GLOBAL GENE EXPRESSION CHANGE IN *ARABIDOPSIS THALIANA* UNDER SHADE AVOIDANCE CONDITION AT DIFFERENT TEMPERATURES, Byung-hoon Kim, K. Peets, J. Grant, J. Hicks, D. Zellous and D. Anderson

EVALUATION OF SAMPLING STRATEGIES FOR THE SICKLEFIN REDHORSE *MOXOSTOMA SPP.*, William H. Leatherwood*, B.A. Farley* and J.G. Davis

MOLECULAR GENETIC ANALYSIS OF A *SACCHAROMYCES CEREVISIAE* MUTANT THAT GROWS BROWN IN THE PRESENCE OF COPPER,** Joshua D. May* and B.W. Schwartz

ANALYSIS OF MOLECULAR RELATEDNESS IN *ASPERGILLUS FLAVUS* IN PEANUTS USING POLYMERASE CHAIN REACTION, Natalie C. Mellem* and P.N. Achar

PREVALENCE OF RANAVIRUS IN TERRESTRIAL AND AQUATIC TURTLES IN SOUTH GEORGIA,** Brittany A. Mixon*, J.M. Lockhart, D.L. Bechler and J.W. Hall

STRESS RESPONSE IN THE SOCIAL, PARASITIC INSECT *COPIDOSOMA FLORIDANUM* (HYMENOPTERA), A.A. Shirley*, N.M. Vargas*, E.E. Barding and M.S. Smith

HUMAN FACIAL RECOGNITION BY NORTHERN MOCKINGBIRDS (*MIMUS POLYGLOTTOS*),** Jessica A. Stehlin*, N.A. Tinoco* and J.R. Crook-Hill

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MAYFLY LARVAE ABUNDANCE IN RELATION TO CHANGE OF SEASON IN AQUATIC HABITATS OF NORTH GEORGIA, C.L. Vaeth*, C.D. Garner*, L. Mcduffie*, R. Ownbey and M. Horton

Section II: Chemistry
Health Sciences Building, Room 105
Ghislain Mandouma, Presiding

8:30 **METHYL KETONES AND OBSERVATIONS OF IODOFORM TESTS**,** Ali Goode* and Richard W. Schmude, Jr.

8:45 **POLYAZA[N]PHENACENES: SYNTHESIS AND CHARACTERIZATION**,** ZaKeyvia McCoy* and Ghislain Mandouma

9:00 **COMPUTATIIONAL STUDIES OF HOW SERTRALINE INHIBITS THE REUPTAKE OF SEROTONIN**,** Kathryn E. Morris* and Robert W. Zurales

9:15 **Break**

9:30 **ELECTROCHEMISTRY OF EUROPIUM AND SAMARIUM IN BIS(TRIFLUOROMETHYLSULFONYL)IMIDE IONIC LIQUIDS,** Michael S. Stephens* and Christopher L. Klug

9:45 **SYNTHESIS OF CYCLOBUTATE DERIVATIVES USING GREEN CHEMISTRY**,** Taylor A. Schmit* and Koushik Banerjee

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

10:30 **Posters (will be displayed through 12:00)**

POSTERS

SYNTHESIS, CHARACTERIZATION AND ANTIBACTERIAL ACTIVITY OF PHENOXY-IMINE TRANSITION METAL COMPLEXES, Ashaunte Davis*, Xiaomei Zheng and Louise Wrensford

SYNTHESIS OF BRANCHED *CIS,CIS,CIS,CIS*-1,2,3,4-CYCLOPENTANE TETRA-CARBOCYCLIC ACID–BASED PEPTIDE-MEDIATED DRUG DELIVERY SYSTEMS FOR FLUOROQUINOLONE ANTIBIOTICS,** Genevieve Coe*, Kelsey Moore and Iryna O. Lebedyeva

INVESTIGATING HEALTH OF SURFACE WATER OF LAKE SINCLAIR,** John Olmstead* and Dr. Catrena Lisse

COMPLEXATION OF ERBIUM BY DTPA IN ROOM TEMPERATURE IONIC LIQUIDS, Kiana N. French* and Christopher L. Klug

SYNTHESIS AND CRYSTAL STRUCTURE OF CALCIUM SALT OF 4-NITROPHENOL,** James N. Padgett*, Kenneth L. Martin and Russell G. Baughman

"CLICK"-ENHANCED FRET ASSAY FOR THE PEPTIDE-LINKED SUBSTITUTED COUMARINS,** Alexander Plotkin, Lin M.Chen and Iryna O. Lebedyeva

SYNTHESIS OF GOLD (III) PORPHYRIN NANOPARTICLES AS AGENTS AGAINST TUMORS, Kristopher A. Nelson*, Rosalie A. Richards and Catrena H. Lisse

SYNTHESIS OF CHIRAL AMINES ON SILICA SURFACES,** Eboni Skerrit*, Kahdejah Patrick, Tyonna Hill and John T. Barbas

CHEMICAL REDUCTION'S EFFECT ON THE SENSITIVITY OF GRAPHENE MODIFIED FOR ELECTROCHEMCIAL DEVICES,** Natalie Cox * and Thomas A. Searles

REGIOSELECTIVITY IN DINITRATION OF *p*-DIHALOBENZENES,** Victoria Stephens* and Ghislain Mandouma

Section III: Earth and Atmospheric Sciences
Health Sciences Building, Room 207
Samuel Mutiti, Presiding

8:00 **EVALUATION OF MICROBIOLOGICAL WATER QUALITY IN POINT JUDITH POND (RHODE ISLAND, USA): QUANTIFICATION OF FECAL POLLUTION AND PRESENCE OF HUMAN PATHOGENIC BACTERIA,** Ralph Scott Rozier, Jose A. Amador, Dave S. Bachoon* and Jessie Dyer

8:15 **INVESTIGATING THE TRANSPORT OF RHODAMINE WT AND SODIUM CHLORIDE THROUGH CLAY SLUDGE**,** Taylor Upole* and Samuel Mutiti

8:30 **ASSESSING THE POTENTIAL OF PLANTS TO TRANSPIRE METALS AND OTHER CHEMICALS**,** Jenna Forte*, Alyssa Thomson and Samuel Mutiti

8:45 **ASSESSMENT OF WATER QUALITY AND MIXING IN LAKE SINCLAIR**,** Megan Corley*, Gabriel Stone, John Morgan, Raleigh Burch and Samuel Mutiti

9:00 **PALEOECOLOGICAL RECONSTRUCTION OF EARLIEST OLIGOCENE UNGULATES FROM NEBRASKA: COMBINED EVIDENCE FROM MESOWEAR, HYPSODONTY, AND STABLE ISOTOPE ANALYSES,** Theron M. Kantelis* and Grant S. Boardman

9:15 **UTILIZING GIS TO CREATE A 3D MAP OF GROUNDWATER AND SURFACE WATER INTERACTION**,** Demichael Winfield*, Trevor Alexander, Lena White, Christine Mutiti and Samuel Mutiti

9:30 **UNDERSTANDING THE SOURCES OF NUTRIENT IN A FARM POND USING FLUORESCENT DYE AND CHLOROPHYLL-a**,** Katie Garth*, Taylor Upole and Samuel Mutiti

9:45 **ALGAE DIVERSITY IN GEORGIA FARM PONDS**,** Hunter E. Gay*, Spencer W. Salter, Regan A. Phillips, Dana M. Bedgood, Jimmy Wedincamp, Jr., Michael F. Chislock, Brianna K. Olsen, Alan E. Wilson and J.E. Schneider, Jr.

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

10:30 **IMPACTS OF METALLIC ENGINEERED NANOPARTICLES ON SOIL BACTERIAL NITROGEN TRANSFORMATIONS,** Allison Rick VandeVoort

10:45 **MILLEDGEVILLE ON THE BOUNDARY: HISTORY AND GEOLOGIC SETTING WITH EXCERPTS FROM THE 'ROADSIDE GEOLOGY OF GEORGIA',** Pamela J. W. Gore

11:00 **Posters (will be displayed through 12:00)**

POSTERS

A GEOCHEMICAL SURVEY OF VEGETABLES AND TOP SOILS FOUND IN MILLEDGEVILLE GA,** Samantha Mutiti*, M.R. Corley*, M. Tembo, C.M. Mutiti and S. Mutiti

HISTORICAL CHANGES IN WATER QUALITY OF A MIDDLE GEORGIA LAKE,** Raleigh Burch*, Gabriel Stone, Christine Mutiti and Samuel Mutiti

CALCULATED CARBON SEQUESTATION LEVELS AMONG TREES ON CAMPUS USING STATISTICAL ANALYSIS AND GEOGRAPHIC INFORMATION SYSTEMS,** Ashlee R. Burkett* and S. Rose

ASSESSMENT OF WATER QUALITY AND EFFICACY OF WATER TREATMENT INFRASTRUCTURE IN SOUTHWESTERN PUERTO RICO, Brennan Poon-Kwong*, Sarah Horwitz, David Sotomayor and Dave Bachoon

CLAY 'SLUDGE' AND GYPSUM MIXTURES EFFECT ON FECAL BACTERIAL IN ENVIROMENTAL SAMPLES,** Lillie Brannen* and Dave Bachoon

ALGAL COMMUNITY ECOLOGY OF SPECIES FROM A SHALLOW SALINE MEROMICTIC LAKE,** Daniel Chung* and K.M. Manoylov

Section IV: Physics, Mathematics, Computer Science and Technology
Health Sciences Building, Room 201
Hasson M. Tavossi, Presiding

8:00 **PRE-SERVICE TEACHERS' UNDERSTANDING OF NUMERATION,** Iwan R. Elstak and Benjamin M. Wescoatt

8:15 **GENERAL INTEGRAL SOLUTION FOR THE ONE-DIMENSIONAL DIFFUSION PDE FOR BOUNDED SPACE REGIONS,** 'Kale Oyedeji and Ronald E. Mickens

8:30 **A SPECIAL CASE OF TRANSFORMATION OF RANDOM VARIABLES,** Andreas Lazari

8:45 **RANDOM PRESSURE FLUCTUATIONS BY NON-LINEAR DAMPING INDUCED EXCITED OSCILLATIONS IN A REACTOR-COLUMN,** Hasson M. Tavossi

9:00 **NEAR-INFRARED BRIGHTNESS MEASUREMENTS OF MARS IN 2014,** Richard W. Schmude, Jr.

9:15 **NEAR-INFRARED BRIGHTNESS MEASUREMENTS OF JUPITER AND SATURN,** Richard W. Schmude, Jr.

9:30 **DETERMINING THE LOCATIONS OF DUST SOURCES IN FELOBAL QUASARS,** Jay P. Dunn, Branden Wasik, Christin L. Holtzclaw, David Yenerall and S. Harper Dutton,

9:45 **REFLECTIVITY STUDY ON A TYPE OF BRAGG REFLECTOR,** Javier E. Hasbun and Ajith DeSilva

10:00 **Section Business Meeting**

10:45 **FUTURE WISE CARS WITH COOPERATIVE DRIVING ASSISTANCE,** Chunlei Liu, Taray Eady, Viktor Graczy, David R. Gully, Dalton Gurley, Willie Lawrence, Kinard Thomas and Christopher Whelan

11:00 **CHARACTERIZATION OF HYSTERETIC EFFECT OF CARBON COATEDFERRITE NANO PARTICLE SOLUTION,** Arun K Saha

11:15 **USING ARDUINO AND AUDIO TO INVIGORATE THE FRESHMAN EXPERIENCE,** J.A. Hauger

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INVESTIGATION OF CADMIUM SULFIDE THIN FILMS PREPARED BY SPIN COATING, LeQuardis English Jr., Ajith DeSilva, R.R. Gadipalli and J.E. Hasbun

A DEEP OPTICAL SPECTRUM OF THE PLANETARY NEBULAE NGC 6741, Hannah-Marie Wieser and Nicholas Sterling

HEAVY ELEMENTS IN THE NEAR-INFRARED SPECTRA OF SOUTHERN HEMISPHERE PLANETARY NEBULAE, D.V. Wood and N.C. Sterling

TESTING THE FEASABILITY OF A BLADELESS WIND TURBINE DESIGN, Jonathon Gardner, Austin Card, Jairus Elarbee, Brett Card, Michael Crawford, Anderson Kendrick and Hauke Busch

A FINITE TEMPERATURE THEORY FOR UNIVERSAL FERMIONIC SYSTEMS, Michael Stocker and Theja De Silva

11:00 **Posters (will be displayed until 11:59 AM)**

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

8:00 **EFFECTS OF RESVERATROL AND QUERCETIN COMBINATION TREATMENT ON CYP1A1 TRANSCRIPTION IN MOUSE HEPATOCYTES**,** Mary L. Calderon* and Jennifer C. Schroeder

8:15 **THE EFFECTS OF PERFLUOROOCTANOIC ACID ON CELL VIABILITY AND PEROXISOME PROLIFERATOR-ACTIVATED RECEPTOR GENE EXPRESSION IN MCF-7 CELLS**,** April N. Smith* and J.D. Cannon

8:30 **THE PREVALENCE OF PRESUMPTIVE PATHOGENS IN COMMERCIAL AND FARMERS MARKET MEATS**,** Paige L. Stanley*, Taylor Winslow and Indiren Pillay

8:45 **THE ROLE OF THE ENDOCANNABINOID SYSTEM DURING ZEBRAFISH DEVELOPMENT**,** Bryan A. Ordonez* and Linda G. Jones

9:00 **Break**

9:15 **DISASSEMBLY DYNAMICS OF THE YEAST PRION SUP35P**,** Matthew L. Oliver*, J.A. Tierno, G.N. Karadkhele, M.O. Carter, R.A. Peeler, K.T. Bradley, and M.L. Gleason

9:30 **ASC AIDS IN PROTECTION AGAINST INFERTILITY POST CHALMYDIA INFECTION,** D.N. McKeithen*, Y. Omosun, K. Ryans, F. Eko, C.M. Black, J.U. Igietseme, G.A. Ananaba, V.M. Dixit, U. Blas-Machado and Q. He

9:45 **THE ROLE OF EXOSOMES IN CHLAMYDIA PATHOGENESIS******,** Raedeen Russell*, Joseph Igietseme and Francis Eko

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

POSTERS

THE EFFECT OF BIOFLAVANOIDS AND STILBENOIDS AS AGONISTS OF THE AHR AND THEIR EFFECT ON LEVELS OF LACTIC ACID AS A MODEL OF DIABETES, Emily D. Adair* and Jennifer C. Schroeder

DETERMINING IF MUSHROOM EXTRACTS CAN PREVENT THE TRANSCRIPTION OF *CYP1A1* IN THE PRESENCE OF BENZO[*A*]PYRENE****,** Madison L. Perdue* and Jennifer C. Schroeder

INITIAL STUDIES TO EXAMINE AGING IN *C. ELEGANS*****,** M. Morris*, Adanna Njoku* and Fran Norflus

EXAMINING SUGAR TRANSPORT VIA THE PHOSPHOENOLPYRUVATE SUGAR PHOSPHOTRANSFERASE SYSTEM IN *FUSOBACTERIUM NUCLEATUM*****,** Roman Martin* and A.L. Kwiatkowski

THE ANTI-BACTERIAL EFFECTS OF BLOODROOT EXTRACT AGAINST SELECTED ORAL MICROFLORA****,** Lisset Olavarria*, P. T. Arnold and A. L. Kwiatkowski

EFFECTS OF ALTERNATIVE IRRIGANTS USED IN ROOT CANAL TREATMENTS ON DISRUPTION OF *FUSOBACTERIUM NUCLEATUM* BIOFILMS****,** S. Caitlin Ramsey* and A.L. Kwiatkowski

A PRELIMINARY ASSESMENT OF THE CORRELATION BEWTEEN THE HEALTH SCORES OF RESTAURANTS IN THE CSRA AND COLIFORM-COUNTS IN TEA****,** Zachery Fryer*, Rahil Syed*, Harnish Trivedi*, Lindsey Vernon, Samuel Whitten and Chris Bates

Section VI: Philosophy and History of Science
Health Sciences Building, Room 121
E.T. McMullen, Presiding

9:00 **SHELL BLUFF – A FOSSILIFEROUS RIDGE, THE SITE OF THE EXTINCT OYSTER *CRASSOSTREA GIGANTISSIMA* AND HISTORY OF ITS IDENTIFICATION,** Elliott O. Edwards, Jr.

9:30 **COLUMBIAN CATASTROPHES: FLOOD BASALTS, OUTBURST FLOODS, AND BRETZ,** E.T. McMullen

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

10:30 **IDEOLOGY (MASQUERADING) AS SCIENCE: THE LAFFER CURVE,** Ronald E. Mickens

11:00 **THE ROLE OF HISTORY IN SCIENCE,** Charmayne E. Patterson and Ronald E. Mickens

Section VII: Science Education
Health Sciences Building, Room 209
Mike Sakuta, Presiding

9:30 **USING VOLUNTEER WORKSHOPS TO IMPROVE STUDENT SUCCESS IN INTRODUCTORY PHYSICS,** Adam Pullen

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

10:30 **DESIGN AND IMPLEMENTATION OF AN UPPER LEVEL BIOLOGY COURSE WITH AN EMPHASIS ON EXPOSURE TO PRIMARY LITERATURE,** Chris S. Bates

10:45 **PEDAGOGIC CHALLENGES IN TECHNOLOGY INTENSIVE QUANTITATIVE ONLINE CLASSES,** Ulrike G. Lahaise

11:00 **Posters (will be displayed through 12:00)**

POSTERS

THE EFFECTS OF USING VISUAL STATISTICS SOFTWARE ON UNDERGRADUATE STUDENTS' ACHIEVEMENT IN STATISTICS AND THE ROLE OF COGNITIVE AND NON-COGNITIVE FACTORS IN THEIR ACHIEVEMENT,** K.L.H. Maxwell*

Section VIII: Anthropology
Health Sciences Building, Room 300
Teresa P. Raczek, Presiding

8:30 **DENTAL ANALYSIS OF TWO AREAS FROM A ROMAN CEMETERY IN IERPAPETRA, CRETE, GREECE**,** April M. Tolley and S.K. Smith

8:45 **HABITUAL LOADING PATTERN INFLUENCE ON METAPHYSEAL MORPHOLOGY IN THE JUVENILE LOWER LIMB**,** Alice E. Fazlollah*

9:00 **THE SEARCH FOR EVIDENCE OF DOMESTIC OCCUPATION: A SPATIAL ANALYSIS OF MISSISSIPPIAN FEATURES AT THE DABBS SITE, BARTOW COUNTY, GA**,** Emily A. Longacre*, Duncan Balinger, Britt Davis, Jamison Jewitt, Jon Kemp and Jason Whatley

9:15 **MISSISSIPPIAN SETTLEMENT PATTERNS IN THE OGEECHEE RIVER VALLEY: PRELIMINARY FINDINGS FROM A CASE STUDY AT OLD TOWN PLANTATION**,** Rachael V. Cohran*

9:30 **MAPPING SOIL PROFILES AND PHOSPHOROUS LEVELS AT CAMP LAWTON (9JS1)**,** William C. Brant

9:45 **A PRELIMINARY STUDY ON QUARTZ LITHIC ANALYSIS REPLICABILITY: AN EXPERIMENTAL ARCHAEOLOGY PROJECT**,** Staci Lusk*, Kennesaw State University, Kennesaw, GA 30144

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

10:30 **PUBLIC AFFAIRS OF THE PRECLASSIC MAYA: INVESTIGATIONS AT PACBITUN'S PLAZA A**,** Blake S. Bottomley, Jeffrey B. Davis, and Terry G. Powis

10:45 **BANGLES, BEADS, AND OTHER CHALCOLITHIC THINGS: AN ANALYSIS OF THE MATERIAL CULTURE AT PACHAMTA, RAJASTHAN, INDIA**,** Charles K. Brummeler* and Antonio D. Mendez-Silva

11:00 **GHOSTS AND *GHORAS*: AN ARCHAEOLOGICAL PERSPECTIVE ON ORAL HISTORIES AND HERITAGE IN RAJASTHAN, INDIA**,** Antonio D. Mendez-Silva and Charles K. Brummeler*

11:15 **AN ETHNOGRAPHIC STUDY OF LATIN AMERICAN IMMIGRATION TO THE UNITED STATES**,** Daniel S. Garner*

11:30 **Posters (will be displayed through 12:00)**

POSTERS

A PURSUIT OF OCCUPATION: EFFICIENCY OF REMOTE SENSING FROM A MISSISSIPPIAN SITE IN BARTOW COUNTY, GA, Allison C. Smith and Jamison Jewitt

SEX DIFFERENCES IN VERTEBRAL PATHOLOGIES FROM A GERIATRIC COLLECTION EXHUMED AT THE ST. NICHOLAS CEMETARY IN LIMASSOL, CYPRUS, Caitlin E. Mayer* and Frank L. Williams

FRIDAY PAPER PRESENTATIONS

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

Section I: Biological Sciences
Health Sciences Building, Room 144
Paul Arnold, Presiding

2:00 **AN ASSESSMENT OF THE MOBILITY OF STEM LOOP DNA IN NATIVE AND DENATURING POLYACRYLAMIDE GELS**,** Holly R. DuPlain* and A.C. Spencer, Georgia Regents University, Augusta, GA 30912. Stem loop DNAs are single stranded oligonucleotides composed of a complementary stem region and a single stranded loop region. Several stem loop constructs consisting of either ten or twenty base pairs in the stem region and variable numbers of nucleotides in the loop region were studied to determine mobility through native and denaturing polyacrylamide gels. Due to its compact structure, stem loop DNAs run farther through native polyacrylamide gels than a single stranded oligonucleotide of the same length. Early observations of the behavior of the stem loop DNAs on denaturing gels indicate that stem loop DNAs with larger stem:loop ratios resist denaturation on traditional denaturing polyacrylamide gels. We are currently investigating the use of increased concentrations of urea and formamide as denaturants in gel electrophoresis to determine the optimal conditions for denaturing stem loop DNAs on polyacrylamide gels.

2:15 **MORPHOLOGICAL AND ULTRASTRUCTURAL CHANGES USING ESSENTIAL OIL VAPORS AGAINST *ASPERGILLUS FLAVUS* IN GEORGIA PEANUTS,** Reesheda T. Gilbert* and P.N. Achar, Department of Biology and Physics, Kennesaw State University, Kennesaw, GA 30314. Essential oils have been shown to display antifungal properties and could be a natural alternative to synthetic pesticides. Cinnamon and clove oils vapors may inhibit growth of *A. flavus* causing morphological and ultrastructural changes. Their antifungal activities were tested using the poisoned food method and their efficacy determined by zones of inhibition and analyzed by t-tests. Pure cultures were maintained on a potato dextrose agar plates. Various serial dilutions ranging from decreasing to increasing increments were prepared for each oil vapor, inoculated separately onto a sterile filter paper disk, and placed in an evaporating crucible. These crucibles then covered with an inverted PDA plate containing 10µL of spores and placed in a double sealed vapor chamber to prevent dissipation. After incubation, zones of inhibition were measured. The concentration at which a 15mm zone was observed was considered the minimum inhibitory concentration (MIC) for that particular oil vapor. A zone of 18mm or greater indicated the minimal fungicidal concentration (MFC). The MIC of Clove oil vapor was 1100ppm after 48 hours of exposure while the MFC was 2300ppm after 96 hours of exposure. Cinnamon oil vapor showed an MIC of 2300ppm after 72 hours of exposure and MFC of 2500 ppm following 96 hours of exposure. Statistical analysis resulted in a p-value of 2.07E-7 showing a significant difference between the two vapors in their antifungal properties. Electron micrographs showed damage to hyphal walls and conidiospores and disorganization of cell organelles.

2:30 **ASSESSMENT OF VEGETATIVE CHARACTERISTICS FOR RESTORATION OF CRITICAL SANDHILL HABITAT AND CONSERVATION OF THREATENED REPTILE SPECIES**,** Regan A. Phillips*[1], M. Elliot[2], L.M. Kruse[2],

J.M. Moffett Jr.[2], C.J. Tant[2] and B.L. Simmons[1], [1]East Georgia State College, Swainsboro, GA 30401 and [2]Georgia Department of Natural Resources, Nongame Conservation Section, Social Circle, GA 30025. In the Ohoopee Dunes Natural Area, restoration is ongoing to promote critical habitat and improve vegetative characteristics beneficial to the gopher tortoise (*Gophermus polyphemus*), a state-listed threatened species. The burrow of the gopher tortoise is utilized by a variety of native wildlife, making the tortoise a keystone species in sandhill habitats. The Ohoopee Dunes Natural Area is part of Georgia's most extensive riverine sandhill formation, with particular plant and animal communities adapted to the unique habitat characteristics. Randomly placed transects throughout suitable habitat were surveyed for gopher tortoise burrows. Each burrow found was measured, located with GPS, and scoped with a camera system to determine occupancy. Plant species were identified every 2 meters along 50 meter transects selected using GIS. This project will use monitoring data collected by the Georgia Dept. of Natural Resources, with assistance by the author, to quantify herbaceous cover and describe key indicator species that are either desirable or undesirable for restoration of critical habitat. These data are important for long-term monitoring by the Georgia Dept. of Natural Resources in order for them to determine if the current routine of burning is effectively sustaining or increasing the current tortoise population and decreasing the undesirable tree species in the area. Data on pre-treatment vegetative community structure and current tortoise populations will be presented.

2:45 **DRILLING FREQUENCY OF *CERITHIUM* SPECIES IN THE BAHAMAS,** Elizabeth Lemley*[1], M. DeVore[1] and D. Freile[2], [1]Georgia College & State University, Milledgeville, GA 31061 and [2]New Jersey City University, Jersey City, NJ 07305. Studies of boring gastropods have largely focused on the drilling behaviors and patterns for Muricidae and Naticidae. Most of these studies examined the boring activity of these gastropods on bivalves. In the present study, we examine the frequency of drilling by naticids on the gastropod species *Cerithium* based on collections from recent death assemblages. Samples were obtained from the islands of Abaco, New Providence, and Sal Salvador Island in the Bahamas. The average drilling frequency for all sites on all three islands was 15%. For Abaco, 16% of the *Cerithium* species were drilled and the drillhole position was in the whorl above the aperture in 30% of the sample. *Cerithium* species from the New Providence sample had a drilling frequency of 12% with the drillhole positioned in all but one specimen, just above the aperture. Finally, 17% of the *Cerithium* samples from San Salvador Island were drilled and the position of the drillhole varied. Specimens from the New Providence sample were considerably larger than those from the other islands. The larger shell size, in conjunction with a strong preference in drillhole position, suggests that prey handling may play a role in determining the drillhole position. A second possibility is that species of naticids may select different size classes of prey.

3:00 **OCTOPUS DRILLING FREQUENCIES IN TWO CARIBBEAN COWRIE SPECIES (*EROSARIA ACICAULARIS* AND *LUCRIA CINEREA*),** Aeron Attwooll* and M. DeVore, Georgia College & State University, Milledgeville, GA 31061. Octopi often feed on mollusks and commonly drill the shells of prey. They then inject toxins into the drillhole before extracting the animal from its shell. When octopi consume gastropods they often, but not always, drill the shell. If the prey is drilled the hole is made in the region of the spire. In cowries (Family Cypraeidae, Subfamily Cypraeinae), the spire is generally concealed in mature individuals by the most recent shell growth. There are no reports documenting that octopi drill cowries in a preferred region of the shell. After examining and recording the position of drill holes in the two most common species of cowries in the Bahamas *Lucria cinerea*, (Atlantic Grey Cowrie) and

Erosaria acicularis (Atlantic Yellow Cowrie), we found that there is indeed a preferred region of drilling. Shells were consistently drilled through the inner lip below the spire. In our studies we found that octopi strongly predate *Lucria* and only a single specimen out of 51 *Erosaria* shells was drilled. It appears that octopi display both preference in cowrie species consumed and also in the position where they drill these prey. It is not certain if octopi predate both species based only on the presence and absence of drilling. It is possible that octopi predate *Lucria* without drilling through the shell and use an alternative means to immobilize when feeding on this species of cowrie.

3:15 **Break**

3:30 **ALARM CUES IN PLANARIANS,** Heather L. Perona*, J.L. Winkler and F.S. Corotto, University of North Georgia, Dahlonega, GA 30597. Planarians reportedly avoid a solution prepared by pulverizing a conspecific in 1 ml of water (the full-strength test solution). This finding suggests that damaged planarians release alarm cues, but we suspect that the full-strength test solution contains compounds at concentrations higher than would be found following predation. We analyzed planarian behavior when they were exposed to two test solutions that might be more realistic, a 10-fold dilution of the full-strength solution and a "poked" test solution in which an animal was placed in 1 ml of water and then stabbed 10 times with a pin. For testing, a planarian was placed in a hemisected, water-filled straw with cotton balls at both ends. A test solution was pipetted onto one cotton ball and a control solution onto the other. To determine preference between the solutions, the position of the flatworm was determined at 1-min intervals for 10 min. We also quantified lengthwise body contractions (scrunching) in response to the diluted test solution. Results confirmed previous findings that planarians avoid the full-strength solution, but we failed to detect a preference between the control and either the diluted or poked test solutions. Exposure to the diluted test solution, however, did lead to significantly more scrunching than exposure to the control. Scrunching could be the planarians' equivalent to freezing, a behavior exhibited by fish when exposed to alarm signals. If so, then planarians display alarm behavior in response to a more realistic predation cue than shown previously.

3:45 **DOCUMENTING CHANGES IN MOTH LIFE CYCLE AND ABUNDANCE CAUSED BY URBAN WARMING**,** Vy Tran*[1], Linh Do*[1], I.Y. Rickets[1], J. Pickering[2] and J.M. Lochamy[1], [1]Georgia Perimeter College, Clarkston, GA 30021 and [2]University of Georgia (Discover Life Group), Athens, GA 30602. The potential upward shift in global temperatures of as much as 5°C has been predicted to have major effects on species abundance and distributions. The average 5°C increase of nighttime temperatures in Atlanta relative to Athens presents a natural experiment to test such predictions on moth species. Deforestation and air pollution are also factors specifically affecting the lichen moth population. Moths were photographed arriving at porch lights at nine forested, residential locations in Metro Atlanta. Abundance and species richness data were compared to two sites in Athens. Atlanta showed fewer overall moth species and individuals. There was also a significant mismatch between the most common 20 moth species in both locations, with only 3 shared species making both lists and 11 of the most common Athens species absent from the Atlanta area. As expected, several of the most common species in Atlanta are absent in Athens, yet commonly seen in Florida. These observations show that large urban heat islands like Atlanta can be used to predict changes in community ecology that might occur as a result of global warming.

4:00 **HABITAT PREFERENCES, ABUNDANCE, AND POPULATION CHARACTERISTICS OF A STATE-ENDANGERED CRAYFISH *CAMBARUS PARRISHI* ALONG AN ELEVATION GRADIENT**,** S. Weaver*, K. Cash* and J.G. Davis, Young Harris College, Young Harris, GA 30582. *Cambarus parrishi* (*CP*) is a Georgia state-endangered crayfish which has been prioritized as in need of study by the state wildlife action plan. This multi-year study defined habitat preferences within 4 drainages at 13 sites in the upper Hiwassee River watershed. Habitat parameters were collected at macro- and microhabitat scales and included substrate size, depth, water velocity, stream roughness, stream width, and substrate composition. Correlation analysis identified habitat variables associated with crayfish presence and density, which will be incorporated into predictive habitat models. On a macrohabitat scale, *CP* density was significantly (α=0.10) correlated with percent gravel (P=0.017) and small boulder (P=0.0092) substrates. *CP* density varied significantly (P<0.001) between drainages with *CP* most abundant in the Corbin Creek drainage whereas the co-occurring *Cambarus bartoni* (*CB*) did not vary. Observationally, *CP* density tended to increase with elevation. On a microhabitat scale *CP* (n=141) presence was significantly correlated with distance to bank (P<0.01), percent cobble (P<0.001), percent gravel (P=0.006), and percent small boulder (P=0.004). Additional analyses will investigate habitat differences between *CP* and *CB*, seasonal change in reproductive form of male and female CP, and ecological distances of crayfish communities among sites.

4:15 **A NEW TECHNIQUE FOR AGING THE SICKLEFIN REDHORSE *MOXOSTOMA SP*. TO MEASURE ANNUAL GROWTH RATES**,** Benjamin A. Farley*, W.H. Leatherwood and J.G. Davis, Young Harris College, Young Harris, GA 30582. The sicklefin redhorse (SFR) *Moxostoma sp*. is a rare, potadromous species of Catostomid fish of Towns County that is currently under review for listing on the endangered species list. Status reviews rely on the best available scientific data but age data, which is used to estimate population survival, growth rates, and recruitment for SFR, is difficult to collect and usually involves sacrifice of sampled individuals. We tested the utility of aging SFR with pectoral fin rays, which is a non-lethal procedure, and compared estimated ages to ages obtained via scales. Scales and pectoral fin rays were analyzed with the use of a blinded method in which two readers did not know fish length or the other reader's assigned age. Whereas readers had high agreement in ages for scales, agreement for ages from pectoral fin rays was low (20%). However, as previous research found, scales appear to greatly underestimate SFR ages, especially for SFR older than 8 years. After readers agreed upon an age, annual growth increments were marked and measured with the use of ImageJ software. Yearly variation in annual growth will be compared to mean discharges and temperatures during the spring spawning season to determine if this affects growth. SFR are long-lived (the maximum lifespan is 23 years) and experience slow growth after reaching sexual maturity.

4:30 **REIN TENSION DURING TROT AND CANTER IN DRESSAGE HORSES OF VARYING LEVELS**,** Ashley Davenport[1*], B.K. Hull[1], D.S. Hanson[2], J.G. Davis[1], and A. Roy[1], [1]Young Harris College, Young Harris, GA 30582 and [2]Safe and Sound Equine Services, Newnan, GA 30264. The dressage horse uses a combination of balance, suppleness, power, and obedience throughout all levels of dressage competition. Connection between horse and rider is achieved through the reins and use of rein tension. Excess rein tension shifts bit position and bit angle, changing oral behaviors in the horse and affecting the horse's overall ability to perform, therefore it is imperative to understand if rein tension varies for horses and/or riders of different levels. One objective of this research is to measure rein tension and determine if there is a differ-

ence in average rein tension between horse and rider combinations of different dressage levels. Another objective is to determine if differences exist between the individual rider's inside and outside reins. The rein tension was measured as the horse and rider completed a series of twenty-meter circles in both the clockwise and counter-clockwise directions. Each set of circles consisted of a full trot circle, followed by a full canter circle ridden in both directions. The Mark-10 tension sensor was first placed on the rider's left rein to complete the first set of circles at the trot and canter. The sensor was then placed on the rider's right rein to complete the second set of circles. Twenty-one horses of six competitive levels and 13 riders of five competitive levels have been measured with four more horses and riders to be completed. Preliminary rider results show that rider's dependence on the inside and outside reins not only reflects the rider's level, but the horse's level as well.

Section II: Chemistry
Health Sciences Building, Room 105
Ghislain Mandouma, Presiding

3:15 **DETERMINING THE GLASS TRANSITION OF POLYSTYRENE NANOSPHERES UNDER HARD AND SOFT CONFINEMENT**,** Nicole M. Sikes*, Rubicelys Torres Guzman and D. Wade Holley, Columbus State University, Columbus, GA 31907. The temperature at which a polymer undergoes a change from a brittle, glassy state to a rubbery, elastic state is known as the glass transition temperature (T_g). The glass transition temperature is one of the most important characteristics of a polymer. Using temperature varied fluorescence spectroscopy the glass transition temperature of polystyrene nanospheres under both hard and soft confinement was determined. The nanoparticles were formed using semi-continuous microemuslion polymerization. In the case of hard confinement, the nanoparticles were added to an 18% SDS solution. For soft confinement, the nanoparticles were dialyzed.

3:30 **EXPLORING SUPPLEMENTAL INSTRUCTION USAGE BY ORGANIC CHEMISTRY STUDENTS,** Oneida E. Muniz* and Suzanne R. Carpenter, Armstrong State University, Savannah, GA 31419. Supplemental Instruction (SI) research has affirmed that it increases grades and retention rates in organic chemistry. However, factors affecting SI usage have not been explored. Our purpose was to try to determine the reasons why students do not utilize SI. In this study, SI instruction was available 3 hours a week outside of regular class time. Special events were designed and incorporated into the regularly scheduled SI sessions. Additionally, an extra credit set (with varied difficulty levels) was administered. The lecture students were surveyed after each exam to assess attendance practices, reasons for non-attendance, exam grade, and level of satisfaction with SI. SI attendance ranged from 1-13 students with special events causing a transient spike in attendance. The number one reason for non-attendance was a lack of need for help (even after failing an exam). For 67% of the students that did not use SI, work commitments were cited as the reason. Another interesting finding was that although 60% of the students enrolled in Organic Chemistry I are females this semester, 93% of the SI attendees were female. In summary, this research provides insight into two aspects of SI: why students don't attend and a gender differential in its usage at our institution. Perhaps some students begin the semester aiming for a C. An end of the semester survey is expected to provide insight on this. The gender differential was unexpected and will be explored in the future.

3:45 **A NOVEL AND GREEN SYNTHESIS OF SUBSTITUTED BENZO[*c*] CINNOLINES AND DIBENZO[*c,h*]CINNOLINES AND THEIR CYTOTOXICITY SCREENING**,** Tahera Nembhard* and Ghislain Mandouma, Department of Natural & Forensic Sciences, Albany State University. Benzo[*c*]cinnoline and its derivatives are important heterocyclic compounds with antirheumatoid, as well as antimitotic properties. These compounds can be accessed through biarylation of nitroaryls followed by diazotization. Biaryl compounds play an important role in medicinal chemistry and drug discovery. Synthetic methods of biarylation have been dependent on expensive transition metal catalysts as well as lengthy isolation steps often involving the use of toxic solvents. In order to circumvent these issues, a novel two-step synthetic method to prepare benzo[*c*] cinnoline 18 and its chlorinated derivatives 19-22 as well as dibenzo[*c,h*]cinnolines 23-24 is proposed. The procedure is "green" involving no use of solvent or added catalysts for the first step of this novel Ullmann-type biarylation of halogenated nitroarenes (compounds 1-6) at room temperature. The following step is a classical diazo moiety forming cyclization at low temperature to generate the benzo[*c*]cinnolines 18-22 as well as the benzo[c,h]cinnolines 23-24. The new procedure is suitable for self- and cross-coupling condensations demonstrating its general scope. Cross-coupling of different halogenated nitroarenes is moderate to high yielding in comparison to self dimerization as shown in the preparation of biarylated compounds 14-17. The yields of reactions are quantitative as no polymerization is observed in this solvent-less process.

4:00 **DEVELOPING A CALIBRATION MATRIX FOR DETERMINING ACTIVES IN CHILDREN'S DIMETAPP USING UV DATA AND TARGET FACTOR ANALYSIS,** Huggins Z. Msimanga*, Truong Thach Ho Lam, Mihyang Song and Newsha Tavakoli, Department of Chemistry and Biochemistry, Kennesaw State University, Kennesaw, Georgia 30144. Children's Dimetapp (CDT) contains brompheniramine maleate, phenylephrine hydrogen chloride, and dextromethorphan hydrogen bromide as active ingredients. It also contains excipients such as sodium benzoate, FD&C Blue #1, and FD&C Red #40, all of which are UV-active. Under such circumstances, spectral interference must be accounted for in the calibration matrix. A spiking technique, where the analytes are mixed with the sample to make up for interference was used. Trial calibration solutions were prepared, and any mismatch between the calibration and sample solutions spectra were monitored by calculating score plots using principal component analysis. The predictor model was calculated via target factor analysis, and tested with CDT and synthetic samples. In this talk, the results during the development of the calibration and the final results on real and synthetic samples are discussed. Based on the label claims of CDT, the final calibration matrix gave concentrations of 207mg/L ± 3 %RSD for brompheniramine maleate, 506 mg/L ± 1 % RSD for phenylephrine hydrogen chloride, and 958 ± 4 %RSD for dextromethorphan hydrogen bromide, all of which gave relative errors of less than 5%.

Section IV: Physics, Mathematics, Computer Science, Engineering and Technology
Health Sciences Building, Room 207
Hasson M. Tavossi, Presiding

1:00 **TOROIDAL MOMENT CONTRIBUTIONS TO THE MULTIFERROIC ACOUSTIC SUSCEPTIBILITY,** Alexander Price* and Trinanjan Datta, Georgia Regents University, Augusta, GA 30912. We consider the effects of toroidal moment corrections to the acoustic susceptibility tensor of a material that is simultaneously ferroelectric and a canted antiferromagnet (multiferroic). Using the Landau-Lifshitz equation of motion for the magnetization, the Landau-Khalatnikov relaxation equation for the electric polarization, and an equation of motion for the toroidal moment we analytically compute the corrections to the acoustic susceptibility tensor. In the presence of toroidal moment coupling we find that the previously vanishing susceptibility components in the multiferroic channel are now non-zero. Additionally, the toroidal corrections give rise to nonzero, asymmetric susceptibility components in the magnetic, electric, and multiferroic channels with both real and imaginary corrections to the susceptibility. Funding from Georgia Regents University Small Grants Program is gratefully acknowledged.

1:15 **TRANSVERSE DISTORTION EFFECTS ON THE KASTELEYN AND KDP TRANSITION IN SPIN ICE,** CurtisLee M. Thornton* and Trinanjan Datta, Georgia Regents University, Augusta, GA 30912. Geometrically frustrated pyrochlore oxides containing a rare-earth ion and a transition metal ion form a network of corner-sharing tetrahedra. Prominent examples include $Dy_2Ti_2O_7$ and $Ho_2Ti_2O_7$. Magnetic frustration in these compounds suppresses the formation of a long-range ordered ground state resulting in an exotic phase of matter called spin ice. Elucidating the role of external perturbations such as pressure and magnetic field is an important step towards understanding the novel KDP and Kasteleyn phase transitions arising in these classical spin ice materials. Utilizing an analytical approach based on the Husimi tree approximation, we investigate the effects of both transverse and uniaxial pressure distortion of the spin ice tetrahedra on both the KDP and Kasteleyn transition in the presence of an external magnetic field. Compared to the uniaxial distortion scenario, we find that including the effects of transverse distortion leads to further suppression of magnetization and heat capacity in both the Kasteleyn and KDP cases.

1:30 **MAXIMALLY EXPOSED OFFSITE INDIVIDUAL WORST-CASE SECTOR DETERMINATION FOR NESHAP COMPLIANCE AT THE SAVANNAH RIVER SITE,** K.R. Moore*[1], R.A. Stahman*[1], G.T. Jannik[2], K.L. Dixon and J.R. Newton[1], [1]Georgia Regents University, Augusta, GA 30912 and [2]Savannah River National Laboratory, Aiken, SC 29808. The Environmental Protection Agency requires the use of the computer model CAP88 to estimate doses for demonstrating compliance with 40 CFR 61, the National Emission Standard for Hazardous Air Pollutants (NESHAP). The model requires the input of various parameters that influence how the radioactivity produced onsite is dispersed and distributed to the surrounding areas outside the boundaries of the Savannah River Site. The worst-case sector is the sector and distance where an individual would receive the highest dose due to a potential release from an onsite facility. The worst-case sector analysis addresses potential ground-level and stack releases from 20 operational areas. Weather patterns were analyzed at each of these areas relative to sixteen compass points over a five year time frame. The results of the calculations identified the 20 worst-case sectors that were compared to 16 worst-case sectors determined in

2009. An overall increase in relative air concentrations and changes in worst case sector distance and location were observed and will be discussed further in this presentation.

1:45 **EXPLORATION OF THE INTENSITY SIGNAL OF A JDSU 1145P HELIUM-NEON LASER,** Owen L. Angleton*, Jr. and Dr. Tom Colbert, Georgia Regents University, Augusta, GA 30912. The waveform from a JDSU 1145P He-Ne laser is analyzed to determine the amplitude and number of longitudinal modes present. Using a high bandwidth oscilloscope and high speed detector, we observe steady optical beats due to mixing of several longitudinal modes in the laser. The beats can be used to indicate specific longitudinal modes present in the laser. The signal is analyzed using a parameter grid search to produce numerical simulation of the signal. The grid search spans all possible relative longitudinal mode amplitudes assuming a symmetrical arrangement to the center frequency. A best fit analysis determines the mode structure. Finally, comparing this grid search result to the theoretical gain curve, the lasing threshold is determined to find that the signal as observed consisted of seven longitudinal modes with relative output amplitudes of 0.01, 0.33, 0.05, 1, 0.05, 0.33, 0.01.

2:00 **DEVELOPMENT OF AN INEXPENSIVE TRACKING DEVICE FOR MOCK MRI TRAINING SESSIONS USING RASPBERRY PI**,** J.C. Stephens*[1], J.A. Hauger[2] and N. Yanasak[2], [1]Davidson Fine Arts Magnet School, Augusta, GA and [2]Georgia Regents University, Augusta, GA 30912. Functional Magnetic Resonance Imaging (fMRI) studies are important for assessing brain activity of children participating in trials investigating the efficacy of exercise programs intended to mitigate symptoms of Attention Deficit Hyperactivity Disorder (ADHD). In order to ensure high quality fMRI experiments, a training protocol designed to reduce motion of participants during scanning is necessary. We have developed a simple electronic device for quantifying motion during training sessions. The system measures and tracks motion on the order of a mm using video capture technology interfaced to a Raspberry Pi computer. Participant motion is identified by computing the centroid of the edge detected image at a rate of approximately five frames per second. Short-term (~0.2 sec) and long-term (~5 minute) motion exceeding 2 mm is considered a trial failure and is used to guide participant training. The design, construction and effectiveness of the device will be presented.

2:15 **INTERFEROMETRIC MEASURMENT OF THE THERMAL EXPANSION COEFFICIENT OF BK7 GLASS,** Matt Herren* and Dr. Tom Colbert, Georgia Regents University, Augusta, GA 30912. A novel and simple technique is used to measure the linear thermal expansion coefficient of BK7 glass. This glass is typical material used for most visible range optics. The measurement technique uses reflection of Helium Neon Laser light from the front and back surfaces of the lens. The reflections form a simple Michelson-like ring interference pattern. The lens is inside an oven and heated, causing thermal expansion. An accurate measure of change in thickness of the lens can be determined by observation of fringes moving on the interference pattern. Our results yield $\alpha=(8.2\pm0.4)\times10^{-6}/C°$ which is in good agreement with the standard value of $8.3\times10^{-6}/C°$ for the temperature range investigated. In order to determine the thermal expansion coefficient, the index of refraction of the material must be known.

2:30 **MEASUREMENTS OF LOW ENERGY GAMMA RAYS WITH METALS COMPARED TO LEAD FOR APPLICATIONS IN GAMMA CAMERA COLLIMATORS**,** Thomas F. Lynam*, Jessica S. Robinson* and Gregory G. Passmore, Georgia Regents University, Augusta, GA 30909. Interactions between lower energy

photons and K-shell electrons of different metals were viewed using a Sodium Iodide detector. In nuclear imaging, measuring a lower energy photon (Tl-201) in the presence of a higher energy photon (Tc-99m) is very difficult due to Compton scattering. Compton scattering is the emission of a characteristic X-ray due to a vacancy, caused by the ejection of an inner shell electron by photons, being filled by an outer shell electron. Pb is the most commonly used attenuator for gamma camera imaging. However, because of the interaction between Tc-99m's photons and Pb's K-shell electrons, interference is seen when measuring Tl-201's photons due to the characteristic X-ray. Because of this interaction, various metals were tested to replace Pb as the attenuator in nuclear imaging in order to utilize a dual isotope method. A minimum number of counts were established to provide a 0.01% error. Calibration of the detector occurred daily with a Cs-137 rod source and Eu-156 rod source. Decay rates of the sources were taken into account through a cyclic rotation of the metals. Tungsten (W), Hafnium (Hf), and Lutetium (Lu) all provided better attenuation of the Tc-99m photons: W (10.9%), Hf (0.6%), and Lu (1.3%). Also instead of adding counts to the Tl-201 window, each metal attenuated photons in that channel: W (16.1%), Hf (1.8%), and Lu (3.0%).

2:45 **PORPHYRIN-GRAPHINE OXIDE FIELD EFFECT TRANSISTOR BIOSENSOR**,** Akilah I. Mateen* and Thomas A. Searles, Atlanta Metropolitan State College, Atlanta, GA 30310 This project details the fabrication of an aptamer-modified field effect transistor (FET), using a porphyrin-graphene composite and a silicone/silicon dioxide substrate. Both porphyrin and graphene oxide display a high sensitivity to electrochemical changes within cells. In order to create the composite, porphyrin is added to an aqueous solution of reduced graphene oxide and N,N-Dimethylformamide (DMF), resulting in a stable structure from its π-π bond. The FET is used to detect the presence of E6 and E7 proteins, viral proteins commonly associated with the development of HPV-infected cells into cervical cancer cells. By analyzing the change in resistance when the proteins bind to the receptor molecules attached to the composite, the concentration of the proteins can be measured and quantified.

3:00 **Break (Posters on display until 5:30)**

3:15 **SIMULATION OF CUBESAT ORBITAL MOTION AND THE ITS POWERSUBSYSTEM**,** DeAndre C. Penn* and Thomas A. Searles, Atlanta Metropolitan State College, Atlanta, GA 30310. A major limitation slowing the widespread use of CubeSat technologies is the lack of long lasting power sources available. We propose a new power subsystem incorporating the use of Li-ion super capacitors in conjunction with solar cells. Adding to the popular use of solar cells as a reliable energy source, super capacitors will theoretically add the element of recharge to the repertoire of CubeSats' power source. The weight of the capacitor, as well as other factors of the Nanosatellite including the effect on the total mass and space constraints, will also play a key part. Orbital rotation and time spent harvesting energy on all sides will be simulated using MATLAB software. A model will be created using 6V solar cells without the super capacitors to test the simulation in real life. The purpose of this experiment will ultimately be to test the capability of solar cells and li-ion super capacitors as alternative methods to long lasting power sources.

3:30 **LOW COST SOURCE MEASUREMENT UNIT FOR THE CHARACTERIZATION OF DYE-SYNSITIZED SOLAR CELLS USING INTEL GALILEO DEVELOPMENT BOARD**,** B. Erin Davy* and Thomas A. Searles, Atlanta Metropolitan State College, Atlanta, GA 30310. Solar energy is an abundant renewable resource

which can be harnessed through many types of photovoltaic devices. One such device is a dye-sensitized solar cell (DSSC). DSSCs are electrochemical devices that use the electrolysis of water to mimic photosynthesis and are comprised of a sensitized photoelectrode (semiconductor) and a counter (catalytic) electrode. Commonly, platinum is used as the photocatalyst in the counter electrode because it possesses high catalytic activity, but the high cost of platinum puts it at an economic disadvantage. Graphene and other conductive polymers have also been used as an alternative, due to more cost effectiveness. Thus far, maximum efficiency acquired through DSSC applications is approximately 15% which is too low to be viable for economic applications. The efficiency of a solar cell can be tested through a source measurement unit. A source measurement unit, or source meter is capable of both applying a constant voltage or current source, as well as reading a voltage or current source from another device. In this study, a SMU will be constructed using an Intel Galileo development board and compared to one developed using an Arduino Uno Controller board. Using MATLAB, the Galileo board will be programmed to read and sort information given to it regarding the electron flow through the DSSC's counter electrode. As a result of this work, we have developed a characterization system for solar cells 5% of the cost of a commercial system.

3:45 **MAXIMALLY EXPOSED OFFSITE INDIVIDUAL WORST-CASE SECTOR DETERMINATION FOR NESHAP COMPLIANCE AT THE SAVANNAH RIVER SITE,** K.R. Moore*[1], R.A. Stahman*[1], G.T. Jannik[2], K.L. Dixon and J.R. Newton[1], [1]Georgia Regents University, Augusta, GA 30912 and [2]Savannah River National Laboratory, Aiken, SC 29808. The Environmental Protection Agency requires the use of the computer model CAP88 to estimate doses for demonstrating compliance with 40 CFR 61, the National Emission Standard for Hazardous Air Pollutants (NESHAP). The model requires the input of various parameters that influence how the radioactivity produced onsite is dispersed and distributed to the surrounding areas outside the boundaries of the Savannah River Site. The worst-case sector is the sector and distance where an individual would receive the highest dose due to a potential release from an onsite facility. The worst-case sector analysis addresses potential ground-level and stack releases from 20 operational areas. Weather patterns were analyzed at each of these areas relative to sixteen compass points over a five year time frame. The results of the calculations identified the 20 worst-case sectors that were compared to 16 worst-case sectors determined in 2009. An overall increase in relative air concentrations and changes in worst case sector distance and location were observed and will be discussed further in this presentation. Acknowledgements go to the Department of Energy for funding for this work

4:00 **A SIMULATION AND MODELING OF REFLECTIVITY FOR TWO PERIOD BRAGG REFLECTOR**,** Jared W. Thacker*, J. E. Hasbun and Ajith DeSilva, Department of Physics, University of West Georgia, Carrollton, GA 30118. The wave propagation in a periodically stratified medium, which we will call a stack for the sake of brevity, has many uses in applied physics and engineering. A complete theory of wave propagation can be derived using the theory presented in *Principle of Optics* by Max Born. We employed the theory to determine the reflectivity of a Distributed Bragg Reflector (DBR). A DBR is a one-dimensional photonic crystal consisting of alternating layers of different refractive index materials. The optical properties of a two-period DBR are studied here. Each period consists of layers of Polyvinyl Carbazole (PVK) and Cadmium Sulfide (CdS), which were constructed on a glass substrate. Further we used the Cauchy equation for the theoretical simulation of the refractive index for CdS in the wavelength ranging from 400 – 1000 nm. The calculations are performed using *MATLAB* and show the results of fitting the experimental data with the theory. The theoretical calculations

predict that a center wavelength ~600 nm and reflectivity ~40 % for the two period DBR which is in good agreement with the experimental results. The authors would like to acknowledge the financial support from UWise and SRAP programs at UWG.

4:15 **THE EFFECT OF PRESSURE AND TEMPERATURE ON THE ELECTRICAL RESISTANCE OF GRAPHITE AND NANODIAMOND**,** Evan Reed*, Calleigh Hitt* and Ben de Mayo, University of West Georgia, Carrollton, GA 30118. We report on the results of a study of the effects of pressure and temperature on the electrical resistance of commercially obtained powdered graphite and nanodiamond materials. A 3-D printer is used to make the sample holders. Temperatures range from liquid nitrogen (-196°C) to room temperature (23°C). A 10 ton hydraulic press supplies pressures up to 40k lb./in^2 (3 MPa). A Labview virtual instrument measures the voltage drop across the sample, the current through the sample, the temperature and the pressure simultaneously at a rate of two times a second. The data are analyzed using Excel software. Work supported by the Georgia Space Grant Consortium-NASA.

4:30 **STUDY OF CADMIUM SELENIDE QUANTUM DOT DISTRIBUTION USING TEMPERATURE DEPENDENT PHOTOLUMINESCENCE**,** Sarah G. Martino* and Ajith DeSilva, Department of Physics, University of West Georgia, Carrollton, GA 30118. Quantum dots (QD) are nano-sized molecules with electronic semiconducting properties. This study uses Cadmium Selenide (CdSe) samples which were synthesizeds though wet chemicals exposed to UV raditation. The dynamics of excitons in CdSe QDs were studied using temperature dependent photoluminescence (PL) in the range from 17 – 300 K. It was shown that an asymmetric PL spectrum at 17 K causes the PL to decompose into two Gaussians. We can attribute the two bands to the existence of two spectrally resolved CdSe QD ensembles. Using TEM images of the sample, it can be seen that there is a bimodal size distribution with the average QD sizes being around 10 and 15nm. The peak energies of the QDs were 2.182 and 2.299 eV and widths of ~40 and 30 meV respectively. The PL yield of the QD sample was reasonably stable from 17K to 300K. Further, it showed that the larger QDs emit stronger at lower temperatures while the smaller QDs are stronger at higher temperatures. The authors would like to acknowledge the financial support from UWise and SRAP programs at UWG.

4:45 **GENERALIZATION AND MATHEMATICAL MODEL DEVELOPMENT FOR THE MAGIC TEN CARD GAME,** Sara L. Hojjatie* and Roxana A. Hojjatie*, Georgia Institute of Technology, Atlanta, GA 30332, The objective of this study is to describe a mathematical model that we have developed to generalize mathematical principle of a card game called magic ten. In this card game a deck of 52 cards is divided into two equal parts by counting 26 cards to the audience face up. The seventh card is memorized then the first part of the cards is placed at the top (both parts face down). A card from the top of the deck is placed in each of three columns (face up) then starting with the number corresponding to the first card in each column, additional cards are added to reach a maximum value of 10 in each column. After adding the numbers corresponding to the first three cards in each column, the corresponding location of a card in the deck can be predicted which is the seventh card memorized. Although the game is described by some people on the internet, however, no generalization and mathematical modeling has been developed for this interesting game. Our model indicates that the game can be expanded to play with variable number of cards (N, *e.g.*, N=52 for 1 deck of cards), variable number of columns (C, *e.g.*, C =1 to 4 for 1 deck and maximum count of 10), variable maximum count at each column (M, *e.g.*, M= 1 to 13), and vari-

able number of cards separated (S, *e.g.*, S=26) subjected to a constrain inequality of $S \geq N-C^*(M+1)$. The number associated with the location of the card that is memorized (P, *e.g.*, P=7) is determined from the following equation: $P = C^*(1+M) - (N-S)$. To make the game more interesting and efficient, we suggest a modified version of the common game.

SATURDAY PAPER PRESENTATIONS

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

Section I: Biological Sciences
Health Sciences Building, Room 144
Paul Arnold, Presiding

8:45 **DETERMINATION OF PHYLOGENETIC GROUPS OF *ESCHERICHIA COLI* IN *SUS SCROFA* AND *BOS TAURUS*,** Brennan Poon-Kwong* and D. Bachoon, Georgia College & State University, Milledgeville, GA 31061. Phylogenetic studies of *Escherichia coli* have subdivided the bacterium into four main phylogenetic groups (A, B_1, B_2 and D). Phylogroup A and B_1 are considered to be sister groups and, with regard to human related pathogens, compromise mainly commensal strains. *E. coli* isolates from phylogroups B_2 and D contain virulence genes and are often pathogenic. Phylogroup assignments for 100 *E. coli* isolates obtained from the fecal material of 5 cattle hosts (*Bos taurus*) and 40 *E. coli* isolates of 2 wild pig hosts (*Sus scrofa*) were determined using an established Evagreen, dye-based, qPCR triplex method. The qPCR analysis determined the presence or absence of two genes (*chuA* and *yjaA*) and a final DNA fragment (TspE4.C2). 55% of *E. coli* isolates of cattle were assigned to phylogroup A, and 45% were placed in phylogroup B_1. Of the 40 wild pig isolates, 35% were assigned to group A, 7.5% to group B_1, 25% to group B_2, and 32.5% to group D.

9:00 **AN ANALYSIS OF NON-GENITALIC CHARACTERS OF THE AULICUS SPECIES GROUP OF *NEOPORUS GUIGNOT* (COLEOPTERA: DYTISCIDAE),** ** Sergio Minchey, G.W. Wolfe, P. Murray, D. Oetter and E.H. Barman, Georgia College & State University, Milledgeville, GA 31061. There are 39 species and nine species groups recognized in *Neoporus*. One of these, the aulicus species group, is analyzed herein. The objective of this analysis was to determine the status of regional sub-groups (taxa). Based on distributional patterns of several other dytiscid genera and morphology, initially it was suspected that there were as many as four taxa. The four suspected taxa were from the southern Atlantic Coast (South Carolina and Georgia), Eastern Gulf Coast (Alabama and Florida), Western Gulf Coast (Texas), and populations collectively found in Arkansas, Indiana, and Tennessee. An extensive analysis of 22 morphological characters was performed. The results indicate that there are three taxa instead of four. The three taxa are distributed along the southern Atlantic/Eastern Gulf Coast, Texas and Arkansas, and Indiana and Tennessee. The most important non-genitalic characters defining these taxa were elytral punctation density and metacoxal punctation density. These values were quantified by determining the number of punctures in a square of 600 pixels by 600 pixels. Although the final status of these taxa is not conclusively established, regional sub-groups are more clearly defined and the most important geographic areas for future collections is clarified.

9:15 **AN ASSESSMENT OF THE ALGAL COMMUNITY COMPOSITION OF STREAMS IMPACTED BY ACID MINE DRAINAGE**,** Laura Aycock* and K.M. Manoylov, Georgia College & State University, Milledgeville, GA 31061. Algae are often bioindicators due to their high biodiversity, wide range of habitats, and sensitivity to anthropogenic influences. Some streams located in the Western Allegheny Plateau of southeast Ohio suffer from impairment caused by acid mine drainage (AMD). Ionic compounds from run-off of abandoned mines drain into streams and cause low alkalinity, high

conductivity, low pH levels (*e.g.*, <3) and a high concentration of dissolved metal ions, all of which can cause changes in the algal community composition. Samples were collected from a previous study of AMD impacts on diatom species composition. We studied other algal assemblages and the physiology of algal cells under ionic stress. A standard protocol was used to identify 300 live algal units to the lowest taxonomic level possible. Dead algal units and associated cells were not included in the 300 unit cell counts. About 80% of algae in samples were diatoms, followed by green algae. High nutrient representatives from genera like *Gomphonema*, *Cymbella*, and *Navicula* were abundant. About 75% of algae in samples were alive. Morphological alterations in diatoms and chrysophyte spores were recorded and analyzed.

9:30 **PHYTOPLANKTON ASSOCIATIONS IN THE NORTHEASTERN GULF OF MEXICO: CHANGES IN THE NET PLANKTON ASSOCIATION, 2011 – 2014,** Courtney M. Bryller*[1], J.A. Nienow[1] and S. Wise[2], [1]Valdosta State University, Valdosta, GA 31698 and [2]Florida State University, Tallahassee, FL 32104. The Macondo blow-out almost certainly impacted the structure of the plankton association in the northern Gulf of Mexico. The extent and duration of the impact are not clear. We report our preliminary analysis of net plankton samples collected during 19 cruises conducted between January 2011, and June 2014, along transects extending 80 km from the coast of Florida to the head of DeSoto Canyon. At each station, net-plankton samples (vertical tows of up to 100 m, using a 25µm mesh net) were collected for analysis of larger forms. The relative abundance of 12 categories was determined by light microscopy. The structure of the plankton association fluctuated dramatically, with reduced diversity and dominance of individual groups. Greater fluctuations occur in the first half of 2011 than in subsequent years. Ecosystem modeling will determine whether observed fluctuations in association structure is explained by naturally occurring changes in the physical/chemical environment or represent an echo of the impacts caused by the blow-out. Funding for this project was provided by BP/Gulf of Mexico Research Initiative through the Deep-C Consortium

9:45 **EFFECTS OF MILITARY ACTIVITY ON GOPHER TORTOISE MOVEMENT USING RADIO-FREQUENCY IDENTIFICATION**,** Brittany A. Mixon*[1], J.M. Lockhart[1], C.M. McDonough[1], C.D. Anderson[1], P.C. Vincent[2] and G.W. Lee[3], [1]Department of Biology, Valdosta State University, Valdosta, GA 31698, [2]Department of Physics, Astronomy, and Geosciences, Valdosta State University, Valdosta, GA 31698 and [3]CES/CEIE, Moody AFB, GA 31699, USA. Gopher tortoise movement was monitored at Moody Air Force Base (MAFB), Lowndes/Lanier Counties, GA. A research site was located approximately 345 meters from a heavily used airstrip on MAFB, while a second site was in a restricted access gunnery range that is part of Grand Bay Wildlife Management Area. Objectives for this study included 1) determining if gopher tortoise movement is affected by military training activity within the weapons range, 2) comparing seasonal inter-burrow movement, 3) assessing gender difference in inter-burrow movement, 4) determining overwinter burrow sharing, and 5) determining nocturnal movement. Captured tortoises were sexed and tagged internally with 125 kHz RFID (radio frequency identification) tags and 134 kHz RFID tags that were attached to the carapace. 10-20 RFID readers were utilized to monitor burrow entrance. Initial results suggest nocturnal activity by tortoises as well as male tortoises exhibiting more inter-burrow movement than females.

10:00 **Section Business Meeting**

POSTERS

EFFECTS OF STARVATION TREATMENT ON SEX RATIOS OF *GEUKENSIA DEMISSA*, THE ATLANTIC RIBBED MUSSEL,** David M. Arancibia* and C. Calestani, Valdosta State University, Valdosta, GA 31698. The effects of environmental stress on the population sex ratio of marine bivalves remain largely unexplored. A previous study on an invasive mussel species to North America, *Mytella charruana*, suggests that this species undergoes sex reversal from female to male in response to starvation conditions. Our study aims to test if the ability to reverse sex is also present in the native North American species *Geukensia demissa*. Healthy sex ratios in this species of mussels tend to maintain close to 1:1. Mussels were collected from two locations (about 420 individuals per trial): Thunderbolt, GA and Jekyll Island North Fishing Pier. Individuals were found attached to bulkheads along marina walls and in ripraps along the shoreline respectively. Collected organisms were brought to Valdosta State University, distributed in 6 tanks evenly and acclimated for 4 days. An initial dissection was used to observe an initial sex ratio and compared to subsequent dissections throughout the trial. Half of the tanks were subjected to a starvation treatment, while the other half were fed a diluted algae paste. Experimental tanks' sex ratios differed from initial sex ratios more than the control indicating sex change or loss of gametes. The change in the sex ratio suggests a change either from female to male, or female to the lack of gametes. A possible reason for this sex reversal in this mussel would be to reuse the energy placed in egg production and may be a mechanism employed by *Geukensia demissa*. Funding was provided by Valdosta State University.

INVESTIGATION OF THE PROPERTIES OF STEM LOOP DNA,** Delphine R. Baumert* and A.C. Spencer, Georgia Regents University, Augusta, GA 30912. A stem loop is a strand of DNA containing a double stranded self-complementary region (the stem) and a single stranded region (the loop). This self-complementary region can be denatured using methods that disrupt the base pairs in the double stranded region. We have been studying a number of properties of stem loop DNA including its mobility in native and denaturing polyacrylamide gels. We have shown that we are only able to denature stem loops of certain stem and loop sizes on traditional denaturing gels. We have also used various polymerase chain reaction (PCR) parameters in attempt to amplify these stem loops. Upon analysis by polyacrylamide gel electrophoresis, it appears that the amplification of these stem loops is temperature and primer dependent.

AN EXAMINATION OF THE SEX RATIO OF LAB-REARED EMERGING ADULT *SASAJISCYMNUS TSUGAE* BEETLES, Crystal J. Bishop* and P.T. Arnold, Young Harris College, Young Harris, GA 30582. *Sasajiscymnus tsugae* (Coleoptera: Coccinellidae) has been reared as a predator that specifically targets the Hemlock Woolly Adelgid (HWA, Hemiptera: Adelgidae: *Adelges tsugae*), a very destructive pest of the Eastern and Carolina Hemlock. Many thousands of these beetles have been released into designated areas of the Chattahoochee National Forest with the goal to control the rapidly-reproducing HWA. *S. tsugae* is a native predator of HWA in Japan, and reproduces only when HWA is also actively reproducing. *S. tsugae* is typically bivoltine, with 4 larval instars before pupation, however, it can be induced to have multiple generations in a year in the laboratory by manipulating conditions for optimal egg-laying. Although much of this beetle's life history has been examined, the sex ratio of emerging adults has not. In this study, 1260 eggs of *S. tsugae* were divided among 7 3.8 L oviposition jars containing bouquets of densely HWA-infested hemlock twigs. These jars were incubated under the optimal conditions (25C, 55% relative humidity, 16:8 photoperiod) until adult emergence

(from 23 – 35 days after the eggs were laid). Upon emergence, the beetles were sexed and the sex ratio was determined. Out of the 1260 initial eggs, 333 adults ultimately emerged, 216 of them females and 117 males, resulting in a 1.85:1 ratio of females to males. Chi-square analysis showed that this deviation was significantly different ($p<0.01$) from the expected 1:1 ratio.

PREFERENCE OF *MEGACOPTA CRIBRARIA* ACROSS FOUR SOYBEAN VARIETIES (INOCULATED VS UNINOCULATED), Carson Bowers*, A. Grimes*, K. Guyton*, S. Whitehouse* and C. Zehnder, Georgia College & State University, Milledgeville, GA 31061. *Megacopta cribraria*, the kudzu bug, was first discovered in Georgia in 2009. Soybeans (*Glycine max*) are a profitable agricultural crop and a host plant for kudzu bugs. The purpose of this experiment was to determine if kudzu bugs would exhibit a preference between rhizobia-inoculated and un-inoculated treatments across four different soybean varieties (butterbean, viking, black jet, and tohya). Rhizobia bacteria allow nodulation and nitrogen fixation in soybeans. Kudzu bug preference was determined by placing 6-10 kudzu bugs into a bug dorm with one inoculated and one uninoculated plant. Soybean varieties were examined separately. For two days, the number of kudzu bugs present on each plant was counted and recorded twice a day. There were 10-20 replicates for each soybean trial. There was no significant difference in preference between inoculated and control treatments for butterbean and tohya. For the black jet variety, kudzu bugs significantly preferred inoculated over control soybeans throughout the trial; the kudzu bugs on the viking variety demonstrated a significant preference for inoculated plants during one count of the trial. It was expected that kudzu bugs would have preferred inoculated soybeans across all varieties; however, the varied preferences in the experiment was unexpected because soybeans with nodules are assumed to have a higher nutritional content than those without.

CONSTITUTIVE EXPRESSION OF THE BARLEY DEHYDRIN GENE *DHN1* ENHANCES *ARABIDOPSIS* GERMINATION IN RESPONSE TO SALT STRESS, Cristina Calestani[1,2,3], M.S. Moses[1], E. Maestri[2], N. Marmiroli[2] and E.A. Bray[1], [1]Department of Botany and Plant Sciences, University of California, Riverside, CA 92521, [2]Dipartimento di Bioscienze, Università degli Studi di Parma, Parma 43124, Italy and [3]Department of Biology, Valdosta State University, Valdosta, GA 31698. Dehydrins (DHNs) are a sub-family of the late embryogenesis abundant proteins (LEAs) generally induced during development of desiccation tolerance in seeds and water deficit or salinity stress in plants. Nevertheless, a detailed understanding of the DHNs function is still lacking. In this study the coding sequence of a *Dhn1* gene from *Hordeum vulgare* (L.) was constitutively expressed in transgenic lines of *Arabidopsis thaliana* (L.). Germination rate, cotyledon expansion and greening during salt stress were greatly improved in the transgenic lines as compared to the wild type. Nearly 100% of the transgenic seeds germinated in media containing up to 250 mM NaCl, and 90% at 300 mM NaCl. In conditions of 200 mM NaCl, 93% of the transgenic cotyledons had greened after 2 weeks; outperforming the wild type by 45%. Our study provides further evidence that DHNs have an important role in salt stress tolerance. The production of plants constitutively expressing DHNs could provide an effective strategy to improve the chances for a sustainable agriculture. This work was supported by Ministero delle Risorse Agricole, Alimentari e Forestali, Consiglio Nazionale delle Ricerche, Ministero dell'Università e della Ricerca Scientifica e Tecnologica, and the University of California-Riverside.

EVOLUTION OF *HOX* PG2 GENE REGULATION AND EXPRESSION IN THE JAPANESE MEDAKA (*ORYZIAS LATIPES*), Adam Davis[1] and E. Stellwag[2], [1]Gordon State College, Barnesville, GA 30204 and [2]East Carolina University, Greenville, NC 27858. Hox paralog group 2 (PG2) genes function to pattern structures derived from the hindbrain and pharyngeal arches (PAs) in the developing heads of animal embryos. Previous studies have shown that while *hoxa2a* of the Japanese medaka (*Oryzias latipes*) shows a conserved expression pattern in the hindbrain and PAs to other osteichthyan *Hoxa2* genes, medaka *hoxa2b* was shown to be a pseudogene, ψ*hoxa2b*, which is expressed in non-canonical *Hox* PG2 domains, including the embryonic trunk and the pectoral fin buds. Based on these expression results, we hypothesized that the *cis*-regulatory elements (CREs) that direct gene expression for medaka *hoxa2a*, but not ψ*hoxa2b*, are conserved in function with orthologous sequences of *Hoxa2* genes in other osteichthyans. This hypothesis was tested using transient and stable-line transgenic analysis of reporter gene constructs containing wild-type and deletion derivatives of the r3/5 enhancer region upstream of medaka *hoxa2a* and ψ*hoxa2b*. This enhancer region has been shown to direct chick and mouse Hoxa2 gene expression in rhombomeres 3 and 5 of the hindbrain and the pharyngeal arches. Amazingly, our results have shown that the r3/5 enhancer regions for both medaka *hoxa2a* and ψ*hoxa2b* direct reporter gene expression in the hindbrain and pharyngeal arches. These results are unexpected for ψ*hoxa2b* and suggest that sequences outside of the r3/5 enhancer region function to repress medaka ψ*hoxa2b* expression in the embryonic hindbrain and pharyngeal arches.

PHYLOGENETIC ANALYSIS OF 5 RANAVIRUS ISOLATES FROM RANID FROGS BASED ON THE COMPLETE MAJOR CAPSID PROTEIN SEQUENCE, Amanda R. Davis*, Ashley W. Dean* and A.L.J. Duffus, Department of Biology, Gordon State College, Barnesville, GA, 30204. Ranaviruses are emerging pathogens of ectothermic vertebrates with a global distribution. The emergence of ranaviruses in amphibian populations has sometimes been associated with large scale declines (*e.g.* the UK and Spain) in the populations where they have occurred. One of the most susceptible groups of amphibians to these viruses are the ranid frogs (Family Ranidae). While much experimental attention has been paid to these frogs and ranaviruses, little attention has been granted to the phylogenetic relationships of ranaviruses isolated from morbidity and mortality events in these animals at a large scale. In this study, we examine the phylogenetic relationships between five different ranavirus isolates that originated from ranid frogs using sequences obtained from GenBank. The sequences were analyzed using MEGA6 and two types of phylogenetic trees were created. Both the Maximum-likelihood and Neighbor-Joining trees are compared and contrasted. We also discuss the apparent absence of geographical associations in the phylogenies in the context of viral introductions.

ASSESSMENT OF THE MACROINVERTEBRATE COMMUNITY IN POTATO CREEK FOLLOWING A FISH KILL,** Megan Dedge* and M.J. Bender, Gordon State College, Barnesville, GA 30204. Pollutants in aquatic systems typically have short residence times making them difficult to detect directly, but macroinvertebrate life histories and differential sensitivity to pollutants often make them ideal indicators of water and habitat quality. Following a documented fish kill in Potato Creek in Lamar County, Georgia, we began sampling macroinvertebrates following general protocols used by the Georgia Adopt-A-Stream and Environmental Protection Division stream assessment programs for low gradient streams. Twenty jabs with a D-frame dip net were used to sample a variety of aquatic habitats on each sampling occasion. Macroinvertebrate samples were identified to order and we calculated richness, diversity, and sensitivity metrics. Our objective is to compare the macroinvertebrate community in Potato creek to a reference stream

with no known impairment. We have collected six samples from each stream and plan to continue monthly sampling for one year. Analyses of macroinvertebrate samples collected thus far suggest no significant difference between the two streams in regards to the composition and diversity of the macroinvertebrate community. Additional samples, further analyses, or identification of macroinvertebrates to lower taxonomic levels may reveal differences between the two streams by the conclusion of the project. Alternatively, the macroinvertebrate community may not have been influenced by the pollutant that caused the fish kill.

ANALYSIS OF PHYTOPLANKTON PROFILES IN THE NORTHEASTERN GULF OF MEXICO USING IMAGING FLOW CYTOMETRY,** Tiffani S. Dinkins*[1], C.M. Bryller[1], C.D. Horruitiner[1], J.A. Nienow[1] and S. Wise[2], [1]Valdosta State University, Valdosta, GA 31698 and [2]Florida State University, Tallahassee, FL 32104. The Deepwater Horizon blow-out and subsequent oil spill was instrumental in exposing gaps in our knowledge of the basic hydrological and ecological processes at work in the northeastern Gulf of Mexico. We are working with other members of the Deep-C Consortium to fill some of those gaps in the vicinity of DeSoto Canyon. In particular, we are looking at the dynamic structure of the phytoplankton association in the region. Here we report on the use of imaging flow cytometry to analyze vertical profiles through the photic zone. Samples were collected from 18 stations distributed along 2 transects extending up to 80 km from the shore. At each station 125-ml samples were collected at 25 m intervals to a depth of 150 m. These were fixed in Lugol's iodine and returned to the lab. In the lab the samples were analyzed using an imaging flow cytometer (FlowCam®, Scarborough, ME) equipped with 4x, 10x and 20x lenses; the system counts and stores images of each particle, and allows the images to be sorted using user-defined image libraries. The results of these analyses will be compared to results obtained through more traditional methods (direct counts using SEM, pigment analysis using HPLC) to determine the efficacy of the system in terms of the taxonomic resolution of the data and the cost-savings in terms of the time spent processing samples. Funding for this project was provided by BP/Gulf of Mexico Research Initiative through the Deep-C Consortium.

CONSTRUCTION AND DEVELOPMENT ON A COLLEGE CAMPUS REDUCES NATIVE FISH DIVERSITY IN MOUNTAIN HEADWATER STREAM, Benjamin A. Farley*, B.N. Henry*, A.J. Knox, A.J. Spiegel and J.G. Davis, Young Harris College, Young Harris, GA 30582. Young Harris College has recently expanded and completed multiple on-campus construction projects including building projects and geothermal wells. Since localized watershed development may impact native fish diversity, we investigated the response of the fish community in nearby Corn Creek to construction. Multiple sites were sampled upstream of, at, and downstream of construction activities using seining methods to test the hypothesis that community diversity would decrease. Environmental data for each site including stream width, stream depth, substrate composition, and stream velocity were gathered and compared to fish community data using BiodiversityR software that calculated multiple biodiversity metrics. Biodiversity was lowest at on-campus sites but had recovered to upstream levels by approximately 1.5 km downstream, suggesting that impacts to biodiversity were localized. Hierarchical clustering and ecological distance matrices further supported the dissimilarity between fish communities located on-campus and downstream of campus.

INFLUENCE OF MYCORRHIZAL FUNGI ON COWPEA GROWTH, Betsy Gladden*, M.J. Bender and J. Klaus, Gordon State College, Barnesville, GA 30257. Symbioses between plants and fungi are common in nature and evidence suggests these

interactions have existed for millions of years. Generally, the relationship is mutualistic with the fungi receiving sugars and the plants benefiting from increased uptake of nutrients and water. The potential benefit of fungi on plant growth has led to commercially available mycorrhizal inoculants as an organic alternative to synthetic fertilizers. Our primary objective was to assess the influence of a commercial mycorrhizal inoculant on the growth of cowpea plants. Secondarily, we were interested in comparing growth of cowpea plants inoculated with fungi to growth associated with a synthetic fertilizer. We predicted that greater growth would be observed in plants treated with mycorrhizal fungi when compared to untreated controls, but that synthetic fertilizers would result in the greatest growth. To test our prediction, we conducted a randomized complete block experiment with four treatments (MiracleGro©, mycorrhizal fungi at suggested rate, micorrhizal fungi at twice suggested rate, and untreated control). We measured height and weight of 160 plants after seven weeks of growth in a greenhouse and analyzed data using ANOVA followed by Tukey's HSD tests. We found no significant influence of micorrhizal fungi inoculant on height or weight, but plants grown with MiracleGro© were significantly larger ($P < 0.0001$) than all other treatments. Although mycorrhizal fungi generally exhibit mutualistic interactions with plants, the symbiotic relationship can be neutral or even parasitic when soil nutrients and water availability are not limiting factors for plant growth, which may partially explain our results.

INSECTICIDAL EFFECT OF SALICYLIC ACID AND ITS PRECUSORS ON THE ARGENTINE ANT (*LINEPITHEMA HUMILE*),** Gaylin Gladden[*1], Emily Harden[*1], Megan Babb[*1], C. Kang[2] and C. Lee[1], [1]Gordon State College, Barnesville, GA 30204 and [2]Washington State University, Pullman, WA 99164. The Argentine ant, *Linepithema humile* (Mayr), is a serious pest in the southern United States. To develop safe methods of controlling the Argentine ant, the lethal effect of salicylic acid and its precursor molecules, cinnamic acid and benzoic acid, to worker ants was tested to compare the relative lethal effects of these precursor molecules. In addition, salicylic acid in combination with ascorbate, acetylsalicylic acid (aspirin), and acetaminophen (Tyrenol, a synthetic hydroxyphenyl derivative) were tested to investigate any plausible lethal effect of salicylic acid through a catabolic quinone or phenoxy radical formation. Cumulative mortality of Argentine ants was determined after a 3-day exposure to salicylic acid and other target powder compounds. Three containers with twenty ants were tested for each compound and each experiment was repeated three to six times. Preliminary results strongly indicated a severe lethal effect of salicylic acid, benzoic acid, and cinnamic acid, in this order. Minor lethal effects of either acetylsalicylic acid or acetaminophen, in addition to a lack of rescuing effect of ascorbate on salicylic acid indicate that apparent lethal effect of salicylate is probably not due to oxidase- or oxygenase-mediated quinone or radical formation. However, upstream precursors, such as phenylalanine and p-coumaric acid, were not effective, encouraging us to look for the other downstream products/analogs.

GLOBAL GENE EXPRESSION CHANGE IN *ARABIDOPSIS THALIANA* UNDER SHADE AVOIDANCE CONDITION AT DIFFERENT TEMPERATURES, Byung-hoon Kim, K. Peets, J. Grant, J. Hicks, D. Zellous and D. Anderson, Albany State University, Albany, GA 31705. We tested whether a plant response to an environmental factor can be affected by the context of another factor using the shade avoidance response at different temperatures. Depleting the red light (660 nm) and/or enriching the far-red light (730 nm) in the environment causes a set of reactions called shade avoidance response, which include elongation of petioles and reduction of plant pigments. The pattern of gene expression response to supplemental far-red light at two different temperatures (22°C and 26°C) was investigated through microarray analyses, which revealed

similar but distinct gene expression patterns between the shade avoidance responses at two different temperatures. This may be due to the influence of temperature in the shade avoidance response. However, the expression of previously studied shade responsive genes did not exhibit significant difference between the two conditions. Also, petiole length, chlorophylls, carotenoids and anthocyanins contents did not support any statistically significant interaction between light quality and temperature effects, suggesting that the temperature effect and the light quality response are simply cumulative effects of two independent responses. Nevertheless, noticeable gene expression changes that are dependent on the temperature were discovered in this study. Many of them are known to be involved in plant response to pathogen, suggesting interactions among light, temperature and pathogen defense signals. This study was supported by NSF.

EVALUATION OF SAMPLING STRATEGIES FOR THE SICKLEFIN REDHORSE *MOXOSTOMA SPP.*, William H. Leatherwood*, B.A. Farley* and J.G. Davis, Young Harris College, Young Harris, GA 30582. The Sicklefin Redhorse (SFR) *Moxostoma spp*. is an undescribed, candidate species for listing on the endangered species list that occurs in north Georgia within only Brasstown Creek in the Hiwassee River watershed. This project surveyed the population within Georgia and determined sampling techniques for use in future SFR monitoring. Representative 100-meter reaches (n=12) were sampled in spring 2013 and 2014 using three sampling techniques (e.g. visual surveys, seining, and snorkeling) to determine the method that most likely detects SFR presence. Seining methods performed poorly in detecting SFR presence (4%) in 2013, but implementation of block nets in 2014 increased seine detections (29%) as well as for other methods. Streamside visual surveys were most effective (57%) for detecting SFR presence. SFR were detected in Georgia from mid-April to late May when water temperatures ranged 12-18°C. New records for SFR were documented at stream crossings at Brasstown Creek Road and Townsend Mill Road Although visual survey methods are effective for detecting SFR, these surveys are not useful for collecting fisheries data such as length, weight, sex and aging structures.

MOLECULAR GENETIC ANALYSIS OF A *SACCHAROMYCES CEREVISIAE* MUTANT THAT GROWS BROWN IN THE PRESENCE OF COPPER,** Joshua D. May* and B.W. Schwartz, Columbus State University, Columbus, GA 31907. Certain mutants of *Saccharomyces cerevisiae* produce brown colonies in the presence of copper sulfate, while the normal lab strain produces white colonies. Mutations in at least four genes produce this phenotype, but the identities of these genes are not yet known. One such gene was designated previously as *BRN1*. Whole genome sequence analysis of pooled brown and white segregants from a *BRN1/brn1* diploid suggests that a mutation in *SAM2* is responsible for the brown phenotype. *SAM2* encodes an enzyme that catalyzes the formation of S-adenosylmethionine, an important cofactor in cellular transmethylation reactions. The goal of the research reported here is to confirm that the mutation in *SAM2* results in brown growth on copper sulfate. First, we will determine the DNA sequence of the relevant portion of the *SAM2* gene in 20 to 30 brown and white segregants to confirm that the brown phenotype segregates with the mutation, as expected. Second, we will use PCR-mediated gene disruption to knock out the *SAM2* gene to determine if elimination of *SAM2* activity produces the brown phenotype. Third, we will use PCR-mediated gene replacement to re-create the *SAM2* mutation in the original "wild-type" strain in order to test definitively the hypothesis that the mutation in *SAM2* causes the brown phenotype. This research is funded by a grant from the George E. Stanton Enrichment Fund and the Department of Biology at Columbus State University.

ANALYSIS OF MOLECULAR RELATEDNESS IN *ASPERGILLUS FLAVUS* IN PEANUTS USING POLYMERASE CHAIN REACTION, Natalie C. Mellem* and P.N. Achar, Department of Biology and Physics, Kennesaw State University, Kennesaw, GA 30314. Georgia, Florida and Alabama are known for their peanut cultivation. Georgia alone produces approximately 45% of peanuts in the United States with several hundred million dollars in revenue. In spite of strict control measures, the peanut industry is still facing economic loss due to aflatoxin contamination from *Aspergillus flavus* and *Aspergillus parasiticus*. Understanding genetic diversity among *A. flavus* populations may be of major importance in developing a suitable aflatoxin control strategy for the peanut industry. Polymerase Chain Reaction (PCR) methods have proven to be fast, sensitive and reliable for determining genetic relationships among fungi. Moreover, the ITS regions are good targets for phylogenetic analysis. In this study, the genetic variability among isolates of *A. flavus* from peanut-growing areas in three different states (Georgia, Florida & Alabama) were analyzed. We hypothesize that these isolates will show some degree of molecular relatedness. We investigated the morphology of *A. flavus* using traditional microscopy and DNA was isolated using a MO BIO Microbial Isolation Kit. To compare the DNA profile of these isolates, basic PCR techniques were used employing an Epicenter FailSafe PCR Premix Selection Kit and ITS primers 1 & 4. The PCR products for A. flavus isolates from the three different geographic areas showed a common banding pattern at 550-600bp on a 3% agarose gel, indicating similarities. Hence, future study will focus on sequencing of amplified PCR products and the aflatoxin producing genes.

PREVALENCE OF RANAVIRUS IN TERRESTRIAL AND AQUATIC TURTLES IN SOUTH GEORGIA,** Brittany A. Mixon*, J.M. Lockhart, D.L. Bechler and J.W. Hall, Valdosta State University, Valdosta, GA 31698. Ranavirus, a virus thought to occur through ingestion or direct contact with infected organisms, has been observed as the leading cause of numerous recent amphibian and reptilian disease outbreaks and mortality events. Clinical signs associated with ranavirus infection include: palpebral edema, ocular discharge, fluid drainage, respiratory distress, nasal discharge, cutaneous abscesses, anorexia, and lethargy. Turtles were collected and sampled for ranavirus from January-December 2014 at Lake Louise Field Station in Lowndes County, GA and a private residence in Lowndes County, GA which contained a captive turtle enclosure. Upon capture, turtles were measured, weighed, and sexed. Oral swabs were collected using cotton-tipped applicators and stored at -20°C until further analysis. 70 oral swabs were collected from four turtle species including, Eastern Box turtles (*Terrapene carolina*), Loggerhead Musk turtles (*Sternotherus minor*), Common Musk Turtles (*Sternotherus odoratus*), and Yellow-bellied Sliders (*Trachemys scripta*). Ranavirus testing will include an ELISA test to detect antibodies reactive to ranavirus. We hypothesize that the terrestrial and aquatic turtles will not test positive for ranavirus due to the fact that this virus has not been found within wild or captive populations of amphibians and reptiles in south Georgia. However, we think that the Eastern box turtle population within the enclosure may experience higher levels of stress, thus allowing for potential infections to occur.

STRESS RESPONSE IN THE SOCIAL, PARASITIC INSECT *COPIDOSOMA FLORIDANUM* (HYMENOPTERA), A.A. Shirley*, N.M. Vargas*, E.E. Barding and M.S. Smith, University of North Georgia, Dahlonega, GA 30597. Environmental stress in insects can have major ecological impacts. Endoparastic insects face a unique set of challenges because their environment is defined by their host during at least a portion of their life. *Copidosoma floridanum* is an endoparasitic, polyembryonic, social wasp that can lay its eggs in the eggs of the moth host, *Trichoplusia ni* (cabbage looper). *T. ni* is a common crop pest in the Southeast, including Georgia. From a single *C. floridanum*

egg, thousands of genetically identical offspring develop. From these clonal siblings, two larval castes arise, a sterile soldier caste and a reproductive caste. Previous research indicates that soldier number increases in response to competition from other parasites that share the same host. It is unclear if this increase in soldier number is specifically a result of competition or a response to stress in general. Heat is a common stressor experienced by insects in the southeastern United States. To mimic summer temperature conditions, we reared *T. ni* hosts parasitized by *C. floridanum* at 43°C for 2 hours. Hosts were then dissected to count the number of *C. floridanum* soldiers produced. An increase in soldier number would suggest a general response to stress, while no change in soldier number may indicate a specific response to competition. There was no significant difference in soldier number between control and heat shock groups ($df=1$, $F=0.90$, $p>0.34$) indicating that soldier number increase may be a specific response to competition. This research was funded by the UNG Biology Department and the UNG CURCA FUSE program.

HUMAN FACIAL RECOGNITION BY NORTHERN MOCKINGBIRDS (*MIMUS POLYGLOTTOS*),** Jessica A. Stehlin*, N.A. Tinoco* and J.R. Crook-Hill, University of North Georgia, Dahlonega, GA 30597. A number of studies have examined the ability of various animal species to recognize individual humans, but only a few have focused on native, non-captive birds. Previous research demonstrated that American Crows learn to recognize individual human faces. Other research indicated that Northern Mockingbirds learn to discriminate among individual humans, but did not examine the factors involved in the discrimination. We have begun a study of Northern Mockingbirds on the University of North Georgia campus in Dahlonega, GA, to test the hypothesis that Northern Mockingbirds learn to distinguish among individual humans based on facial recognition. Our field tests involve approaching and touching mockingbird nests on successive days and recording the responses of parent birds. We use masks of human faces which we interchange among researchers to determine if birds key on faces as a discriminating factor. We will also explore the possibility that birds may respond differently depending on proximity of nest sites to human pedestrian activity. Here we report on one preliminary field season; we plan to continue the project during future breeding seasons. Our research has received funding from the UNG Center for Undergraduate Research and Creative Activities and from the UNG Department of Biology.

DETECTION OF CHYTRIDIOMYCOSIS FROM FIELD SAMPLES IN NORTH GEORGIA AMPHIBIAN POPULATIONS,** Carmen Tsui*, T. Tran, M. Lopez, K. Ortiz, N.L. Hyslop and J.M. Morgan, University of North Georgia, Oakwood, GA 30566. Global decline in ecological diversity has emerged as one of the most pressing biological problems over the past century. Of particular concern are amphibians, which have experienced severe population declines and extinctions. Contributing to these declines is the fungal pathogen *Batrachochytrium dendrobatidis* (*Bd*), the causative agent of Chytridiomycosis, an infectious skin disease that targets the keratinized skin cells in some amphibian species. Chytridiomycosis may be sporadically fatal to various amphibian species and has been identified as a major cause of global amphibian decline. Although *Bd* has been heavily investigated over the past decade, very little research has been conducted on north Georgia's amphibian populations; an area of significant amphibian diversity in North America. To survey for the presence of *Bd*, we collected skin swab samples from wild amphibians caught in the field from one site in the north Georgia Piedmont region (University of North Georgia Tumbling Creek Preserve) from the spring to late fall, 2013. Following field sampling, DNA extractions were taken from the samples and nested PCR was performed to detect the occurrence of *Bd* bands. Two sequential sets of primers were used to amplify the internal transcribed spacer (ITS) region which produced strong

amplified band that allowed for detection of *Bd* DNA. We will present preliminary results on the level of *Bd* currently found in the Tumbling Creek area. This work has been funded by a Faculty Scholar Grant from University of North Georgia.

MAYFLY LARVAE ABUNDANCE IN RELATION TO CHANGE OF SEASON IN AQUATIC HABITATS OF NORTH GEORGIA, C.L. Vaeth*, C.D. Garner*, L. Mcduffie*, R. Ownbey and M. Horton, University of North Georgia, Dahlonega, GA, 30533. Aquatic insects have been widely used as indicators of habitat quality. The vulnerability of the nymph stage of a sensitive species, such as a mayfly, provides a more accurate indication of environmental changes in the habitat. This study investigates the stability of a mayfly nymph (*Baetis*) population with change of season (September to October) in the varying habitats namely: run, riffle, and pool of the Chestatee River in North Georgia. It is hypothesized that there is no significant difference in mayfly nymph abundance as the season changes in the different habitats of the river. Mayfly nymphs were collected bi-weekly within one square meter in the three habitats of the Chestatee River in three replicates using D-nets. Collected samples were counted individually and images were taken for classification. Results showed that mayfly nymph abundance increased in the run while those in the riffle and pool decreased as the season changed during the sampling period. Analysis of variance showed that the difference observed is significant ($p<0.05$) and therefore the null hypothesis is rejected. Water velocity was measured but did not show any correlation with abundance. Other factors seem to influence the mayfly nymph population. Stoneflies, which are potential predators of mayfly nymphs, were observed in the stream habitats.

Section II: Chemistry
Health Sciences Building, Room 105
Ghislain Mandouma, Presiding

8:30 **METHYL KETONES AND OBSERVATIONS OF IODOFORM TESTS******,** Ali Goode* and Richard W. Schmude, Jr., Gordon State College, Barnesville, GA 30204. In a recent experiment I have been conducting on methyl ketones, I have put 2-Pentanone and 3-Pentanone through an iodoform test in which I observed the results to see if 2-pentanone was in fact a methyl ketone compared to 3-pentanone. After finding that 2-pentanone did in fact have a methyl group resulting in a positive test, I compared it to the well-known methyl ketone acetone. When put through an iodoform test, acetone produced more precipitate than 2-pentanone. I am now in the process of comparing the molar masses of acetone and 2-pentanone as well as their solubility in water to determine the reasoning behind the extra amount of precipitate in the results of acetone. In conclusion, my experiment will consist of the use of a spec-20 and a centrifuge, as well as testing the purity of the ketone solutions I used within my experiment. By March, I plan to have my experiment completed with all results and procedures used to present to the Academy.

8:45 **POLYAZA[N]PHENACENES: SYNTHESIS AND CHARACTERIZATION******,** ZaKeyvia McCoy* and Ghislain Mandouma, Department of Natural and Forensic Sciences, Albany State University, Albany, GA. [N]phenacenes, such as pentacene 1 and heptacene 2, are well known semiconductors with high carrier mobilities. In an effort to provide fine tuning of their properties, we have undertaken to synthesize polyaza[N] phenacenes 5-6. The latter, yet unknown, have been envisioned to display ambipolar organic properties, which are not found with actual inorganic- and metal-based semi-

conductors that are so prominent in modern electronic devices. Such improvements will be associated with lower power consumption and fabrication costs as well as enhanced possibilities for miniaturization. Thus heterocyclic organic polymers with ambipolar semiconducting properties will usher a new era in the semiconductor industry. We have synthesized 3,8-diiodo-4,7-dinitro benzo[c]cinnoline 3 as a monomer for the controlled polymerization to 5-6. Using an iterative approach consisting of an Ullmann Cross Coupling reaction between 3 and 1,4-diiodo-2,3-dinitrobenzene 4. We isolated the dimer 5 and the trimer 6 by LAH-mediated diazotization of the corresponding biphenyls. Future plans consist in using compounds 5-6 as building blocks for longer oligomers using a tandem of Ullmann Coupling and diazotization reactions in the subsequent steps.

9:00 **COMPUTATIIONAL STUDIES OF HOW SERTRALINE INHIBITS THE REUPTAKE OF SEROTONIN**,** Kathryn E. Morris* and Robert W. Zurales, Georgia Military College, Milledgeville, GA 31061. We used computational chemistry to investigate how the antidepressant sertraline inhibits the human serotonin transporter (hSERT), potentially increasing available serotonin levels, dealing with depression or alleviating disorders such as OCD and PTSD. As the membrane-bound hSERT is difficult to study directly, we examined the crystal structures of sertraline and seven other drugs bound to a bacterial amine transporter mutated to mimic hSERT. To assess the effectiveness of the amine-binding subsite, we compared the crystal structures to calculated salt bridges formed by simple primary, secondary and tertiary amines. A second subsite has been described as a nonpolar pocket with a groove to accommodate polar groups. We explored binding at this subsite using the small molecules fluorobenzene, (trifluoromethyl) benzene, chlorobenzene, 1,2-dichlorobenzene, phenol and 1,3-benzodioxole. We explicitly included the small molecule and a few critical amino acid residues and we treated the rest of the protein or an aqueous environment implicitly using the polarized continuum model. We utilized the software *Gassian09W* to perform all calculations.

9:15 **Break**

9.30 **ELECTROCHEMISTRY OF EUROPIUM AND SAMARIUM IN BIS(TRIFLUOROMETHYLSULFONYL)IMIDE IONIC LIQUIDS,** Michael S. Stephens* and Christopher L. Klug, Georgia Regents University, Augusta, GA 30912. Many prominent solvent extraction processes in science and industry rely on volatile organic materials which present very high and specific health and flammability hazards. Room Temperature Ionic Liquids (RTILs) are unique materials which may present a solution to existing hazards of extraction phases, as in used nuclear fuel partitioning and transmutation schemes. The coordination of europium, a lanthanide, with DTPA in various RTIL solvents has been characterized by electrochemical and spectroscopic methods. Formal reduction potentials for the Eu 2+/3+ redox couple have been calculated when possible, and plating potentials for europium in these RTILs have also been found. Steady-state CV is now being used to explore the extent of the electroplating in order to determine the remaining active electrode area and the deposition behavior of the metal on various electrodes, to include Au, Pt, and glassy carbon. Additionally, the electrochemical behavior of samarium has been characterized using similar techniques. The viscosity of the non-aqueous RTILs has presented a challenge in studying the electrochemical behavior of these compounds and provides a future property to explore using both classic and novel techniques.

9:45 **SYNTHESIS OF CYCLOBUTATE DERIVATIVES USING GREEN CHEMISTRY**,** Taylor A. Schmit* and Koushik Banerjee, Georgia College & State University, Milledgeville, GA 31061. Solid state photochemistry is an attractive field of green chemistry. We have developed a new method to carry out [2+2] cycloaddition reaction under these conditions. Trans-Cinnamic acids are known to dimerize by [2+2] cycloaddition. Sterically hindered trans-Cinnamic acids are however highly reluctant to dimerize [2+2] cycloaddition reaction. Lewis acids attract electronegative atoms as well as perturb the orbitals of unsaturated carboxylic acids. Herein, we present our efforts toward dimerization of sterically hindered alkenes.

10:00 **Section Business Meeting**

POSTERS

SYNTHESIS, CHARACTERIZATION AND ANTIBACTERIAL ACTIVITY OF PHENOXY-IMINE TRANSITION METAL COMPLEXES, Ashaunte Davis*, Xiaomei Zheng and Louise Wrensford, Albany State University, Albany GA31705. Schiff bases and their transition metal complexes have been found to play a vital role in medicine, as there has been an increase in the number of complexes with therapeutic value. In particular, these compounds have shown potential antibacterial properties. In order to investigate these potential properties, four new Schiff base phenoxyimine (PHI) ligands were synthesized from the Schiff base condensation reaction between substituted salicylaldehyde and substituted aniline: 1) ligand1: N-(salicylidene)-3,5-dichloroaniline (L^1), 2) ligand2: N-(3,5-dichlorosalicylidene)-3,5 dichloroaniline (L^2), 3) ligand 3 N-(3,5-dichlorosalicylidene)-3,5-bis(trifluoromethyl)aniline (L^3), and 4) ligand4: N-(3,5-dichlorosalicylidene)-3,5- dimethylaniline (L^4). Six Cu (II), Co (II) and Zn^2+ -PHI complexes were also synthesized. The ligands were characterized by NMR, IR and GC-MS. The metal-PHI complexes were identified by FT-IR. Antibacterial activity of PHI ligands and their metal complexes was examined against three bacterial strains (*Escherichia coli*, *Bacillus cereus*, and *Micrococcus luteus*) using agar disc diffusion method. The results indicated that all ligands and their metal complexes showed a stronger activity against *Micrococcus luteus* and little activity towards *E. coli*. Ligand 2 (L2), ligand 3 (L3) and ligand 4 (L4) showed greater activity against *Bacillus cereus* and *Micrococcus luteus* bacterial strains than their metal complexes. Amongst the six metal complexes, Zn-L^2 complex showed the best antibacterial activity.

SYNTHESIS OF BRANCHED *CIS,CIS,CIS,CIS*-1,2,3,4-CYCLOPENTANE TETRA-CARBOCYCLIC ACID–BASED PEPTIDE-MEDIATED DRUG DELIVERY SYSTEMS FOR FLUOROQUINOLONE ANTIBIOTICS,** Genevieve Coe*, Kelsey Moore and Iryna O. Lebedyeva, Department of Chemistry and Physics, Georgia Regents University, Augusta, GA, 30912. The fluoroquinolones are a family of broad spectrum, systemic antibacterial agents that have been used as therapeutic agents for respiratory and urinary tract infections. Fluoroquinolones are active against a wide range of aerobic gram-positive and gram-negative organisms and are believed to act by inhibition of type II DNA toposiomerases (gyrases) that are required for synthesis of bacterial mRNAs (transcription) and DNA replication. One of the major patient complaints during their treatment with fluoroquinolones is acid or sour stomach. This project is aimed at prevention of the quinolone drugs release in the stomach by conjugating them to the branched polycarboxylic acid. Several quinolone drugs are conjugated to the *cis,cis,cis,-cis*-1,2,3,4-cyclopentatetracaroxylic acid via flexible and biodegradable peptide links.

INVESTIGATING HEALTH OF SURFACE WATER OF LAKE SINCLAIR,** John Olmstead* and Dr. Catrena Lisse, Georgia College & State University, Milledgeville, GA 31061. Pollution through sewage water contamination, industrial fertilizer, and coal burning power plants can lead to degradation of water quality. Eutrophication, the ecosystem response as a result of the addition of excess nutrients, will further degrade water quality by depleting the oxygen in water. Nutrient levels are measured to access eutrophic conditions. GC/MS is used to test for gas byproducts present in surface water of Lake Sinclair. This presentation highlights the experimental design for nutrient levels and GC/MS procedure and results of the project.

COMPLEXATION OF ERBIUM BY DTPA IN ROOM TEMPERATURE IONIC LIQUIDS, Kiana N. French* and Christopher L. Klug, Georgia Regents University, Augusta, GA 30912. Room Temperature Ionic Liquids (RTILs) are unique materials, that are generally composed of bulky asymmetrical cations and anions, which can be tuned for different purposes by the choice of the component ions. Because of their varied ability, RTILs are being explored as possible replacements for hazardous organic phases in solvent extraction processes. For effective solvent extractions in the nuclear fuel cycle, lanthanides must be separated from actinides in used nuclear fuel for advanced partitioning and transmutation schemes. To further investigate ionic liquids as a non-aqueous solvent extraction phase, erbium salts have recently been used with DTPA in ionic liquids, as well as in aqueous solutions, to study changes in the hypersensitive visible absorbance peaks. Additionally, electrochemical studies have been used to investigate reduction potentials for erbium (Er) in ionic liquids and to explore the possibility of reducing trivalent erbium to the divalent state for possible oxidation state adjustment in solvent extraction processes. Absorption spectra have shown nearly identical behavior for Er in the ionic liquids and in aqueous solutions, as well as a markedly lower solubility for Er upon addition of DTPA to the ionic liquid system. Cyclic voltammograms have shown multiple reduction peaks for Er; possible assignments will be discussed.

SYNTHESIS AND CRYSTAL STRUCTURE OF CALCIUM SALT OF 4-NITROPHENOL,** James N. Padgett*[1], Kenneth L. Martin[1] and Russell G. Baughman[2], [1]Berry College, Mount Berry, GA 30149 and [2]Truman State University, Kirksville, MO 63501. In 2005, an initial attempt at the synthesis of the calcium salt of 4-nitrophenol was made. An X-ray diffraction data set was obtained, however significant disorder within the unit cell prevented the crystal structure from being solved. That crystal's unit cell dimensions (a = 23.591 Å, b = 9.915 Å, c = 29.029 Å, α = 90°, β = 110.68°, γ = 90°) significantly deviated from the known unit cell dimensions of the dihydrate of $Ca(C_6H_4NO_3)_2$ (a = 13.1109 Å, b = 3.6481 Å, c = 17.2601 Å, α = 90°, β = 92.608°, γ = 90° according to S. J. Das *et al*.), suggesting that there was an included impurity within the matrix, and it could not be modeled. In 2014 a repeat attempt at the synthesis was conducted. This method employed degassed deionized water and successive gravity filtrations to remove carbonate from a calcium hydroxide solution. Volumetric methods were used to add the calcium hydroxide to ethanolic 4-nitrophenol in a 1:2 stoichiometric ratio. Slow evaporation followed by recrystallizations in degassed deionized water led to yellow, long and thin "fibrous" needles. The crystals were shipped to Truman State University for an X-ray diffraction data set to be collected. Upon receiving the data set, the crystal structure will be determined. If the crystal structure warrants it, a charge density analysis will be performed on the 4-nitrophenolate moiety.

"CLICK"-ENHANCED FRET ASSAY FOR THE PEPTIDE-LINKED SUBSTITUTED COUMARINS,** Alexander Plotkin, Lin M.Chen and Iryna O. Lebedyeva, Department of Chemistry and Physics, Georgia Regents University, Augusta, GA, 30912. In this project, 7-methoxy-2-oxo-2H-chromene-3-carboxylic acid was conjugated with 3-amino-7-(diethylamino)-2H-chromen-2-one *via* a peptide and triazine linkers. Donor-acceptor coumarin-labeled native peptide biosensors are being developed with taking into account donor-acceptor relative orientation as well as the distance-dependent parameters in order to predict the energy transfer rate for a given donor-acceptor separation. The fluorescence of the two fluorophores (7-methoxy coumarin as electron donor and 3-amino-7-(diethylamino)-2H-chromen-2-one as electron acceptor) was enhanced by linking the moieties to the N-terminus of a peptide linker via a 1,2,3-triazine ring. Peptides were assembled using benzotriazole methodology. Azido group was introduced into the molecule either with acylation of amino acids or di-, tri-peptides with benzotriazolyl azides, or through the nucleophilic substitution of chlorine atom with sodium azide. Coumarins represent the family of dyes that often play a role of the electron donor in electron-charged systems. The combination of the donor and acceptor in one molecule can be provided by copper(I)-catalyzed azide-alkyne cycloaddition (CuACC) since this method has proved to be one of the most effective bio-orthogonal conjugation techniques.

SYNTHESIS OF GOLD (III) PORPHYRIN NANOPARTICLES AS AGENTS AGAINST TUMORS, Kristopher A. Nelson*, Rosalie A. Richards and Catrena H. Lisse, Georgia College & State University, Milledgeville, GA 31061. Gold(III) porphyrin nanoparticle complexes that target tumor cells in humans are our focus. To date, we have prepared nanoparticles of the gold(III) derivatives of meso-tetrakis(2,3,4,5,6-pentafluorophenyl)porphyrin and meso-tetrakis(N-methyl-4-pyridyl)porphyrin under an inert atmosphere using methods reported by Lv et al. and others. The synthesis and spectroscopic properties of the gold(III) porphyrins will be presented. K.A.N. gratefully acknowledges the Chemistry Scholars Program at Georgia College & State University for project funding.

SYNTHESIS OF CHIRAL AMINES ON SILICA SURFACES,** Eboni Skerrit*, Kahdejah Patrick, Tyonna Hill and John T. Barbas, Valdosta State University, Valdosta, GA 31698. We have devised simple, facile, and greener methods in the synthesis of several new chiral amines on silica surfaces. Several of these amines have the pyridyl, furyl, and other moieties in their molecular structures, thus affording additional ligands for coordination with other chiral molecules. Specific rotations were obtained of pure samples of all amines. In the synthetic procedure, typically 2.0 g of activated silica were added to 10 mL of an ethereal solution of equimolar quantities (2.0x10-3 mol) of an aldehyde and a primary chiral amine. The flask was equipped with a stirring bar and a drying tube. The mixture was stirred briefly and allowed to stand for 15 minutes to 30 minutes at room temperature. Completion of the reaction to the imine stage was monitored by GC-MS. The reduction step was carried out in the same pot by adding 0.15 g of sodium borohydride, followed by the addition of a few drops of water, periodically, each time stirring briefly. Progress of the reduction was monitored by GC-MS. Upon completion, the sample was filtered, and the silica was washed five times with 5 mL aliquots of ether. Yields of the amines were quantitative. Traces of the starting aldehyde or amine if present, were removed by column chromatography. Products were analyzed by IR, GC, GC-MS, and proton and C-13 NMR, and by polarimetry.

CHEMICAL REDUCTION'S EFFECT ON THE SENSITIVITY OF GRAPHENE MODIFIED FOR ELECTROCHEMCIAL DEVICES,** Natalie Cox* and Thomas A. Searles, Atlanta Metropolitan State College, Atlanta, GA 30310. *Graphene Oxide* (GO) has attracted a plethora of attention in the scientific community because it is a precursor for the production of *Graphene*, a material with many promising uses. The purpose of this research assignment is to observe how various chemical reduction methods of *graphene oxide* effect the structure and characteristics of the resulting *graphene* in order to produce a variety of electrochemical devices such as sensors, dye sensitized solar cells, etc. It is hypothesized that each different method of reduction has an effect on the overall structure of the *graphene* product produced and these slight changes in product structure make the resulting *graphene* products sensitive to specific types of analytes or increases in the efficiency. The hypothesis was tested by taking *graphene oxide* synthesized by the Tour method and by electrochemical synthesis. Electrochemical synthesis consisted on electrolyte solution with a sheet of graphite partially submerged while running a voltage across it and allowing exfoliation. Then, we implemented the following reduction methods: NaBH4 and Vitamin C. The resulting graphene was then characterized using FT-IR, X-ray diffraction and Raman Spectroscopy. After confirmation of the reduction to *graphene*, the material was drop casted onto the surface of a glassy carbon electrode and evaluated using cyclic voltammetry and electrochemical impedance spectroscopy.

REGIOSELECTIVITY IN DINITRATION OF p-DIHALOBENZENES,** Victoria Stephens* and Ghislain Mandouma, Ph.D., Department of Natural and Forensic Sciences, Albany State University, Albany, GA 31705. 1,4-Dihalo-2,3-dinitrobenzenes have been synthesized from corresponding p-dihalobenzenes in mixed acids at low temperature. Maximum yields were obtained with optimized conditions for each halo group. The importance of electrophilic aromatic nitration as an industrial process cannot be overstated. Nitroaromatics continue to be indispensable intermediates in synthetic applications ranging from pharmaceuticals to explosives. Nitro-activated aryl halides are precursors to biaryl compounds which constitute the cornerstone of pharmaceutical industry, either through the century old Ullmann coupling or the more recent C-H functionalization methods. Nitration at ortho position to the ring's halo group(s), hereto referred as selective ortho-nitration, has been anything but selective and literature has no record of examples of adjacent dinitration of aryl dihalides. The mechanism of this reaction has been extensively investigated but is still the subject of animated discussion. Selectivity of the electrophilic aromatic nitration has been intriguing and difficult to predict. Attempts to rationalize the results are still a source of disagreement. Upon examination of several *para*-substituted aryl dichlorides, dibromides and diiodides using slightly similar nitration conditions, we report on the preparation of several *ortho*-dinitrated aryl dihalides.

Section III: Earth & Atmospheric Sciences
Health Sciences Building, Room 207
Samuel Mutiti, Presiding

8:00 **EVALUATION OF MICROBIOLOGICAL WATER QUALITY IN POINT JUDITH POND (RHODE ISLAND, USA): QUANTIFICATION OF FECAL POLLUTION AND PRESENCE OF HUMAN PATHOGENIC BACTERIA,** Ralph Scott Rozier[1], Jose A. Amador[2], Dave S. Bachoon[*1] and Jessie Dyer[2], [1]Georgia College & State University, Department of Biological and Environmental Sciences, Milledgeville, GA 31061 and [2]University of Rhode Island, Laboratory of Soil Ecology and Microbiology, Kingston, RI 02881. Water and sediment samples were collected in the Bluff Hill Cove area of Point Judith Pond from 12 stations along three parallel transects, and eelgrass samples were taken at two sites per transect. Fecal enterococci (FE) in the water samples exceeded USEPA regulatory limit of 100 MPN/100 mL for safe recreational and shellfish harvesting use in 24 out of 41 samples. Sediment samples had the lowest FE counts, whereas eelgrass had the highest counts. Using qPCR, *H. pylori* was detected in 8 out of 41 samples, but *E. coli* O157:H7 was not detected. Overall, higher levels of *H. pylori* were detected in 33% of the eelgrass samples and 33% of the sediment samples as compared to 9% in the water column. Microbial source tracking, using the Bacteroides marker HF183, indicated the presence of human fecal bacteria in 7 out of 41 samples, four of which were positive for *H. pylori*.

8:15 **INVESTIGATING THE TRANSPORT OF RHODAMINE WT AND SODIUM CHLORIDE THROUGH CLAY SLUDGE**,** Taylor Upole* and Samuel Mutiti, Georgia College and State University, Milledgeville, GA 31061. One of the by-products of drinking water treatment is a clay sludge that currently has no value and is, therefore, disposed of in landfills. Landfilling of the sludge costs money and has other environmental costs. It is for this reason that alternative uses for this material are desperately needed. This study investigates the potential of using this material to clean up contaminated water, especially microbial and nanoparticle contamination. To accomplish the goal of this project, clay sludge was collected from a local drinking water treatment plant and characterized in the lab. Sludge geochemical composition was analyzed using X-ray fluorescence (XRF) and other standard laboratory soil characterization techniques. Contaminant transport experiments were conducted on the sludge by running Rhodamine WT dye through soil-columns (column experiments). Sorption characteristics were obtained from batch experiments. Sodium chloride was used as a conservative tracer to compare the contaminant breakthrough curves in the clay and estimate retardation factors. Inverse modeling was carried out using CXTFIT computer code to optimize transport characteristics obtained from the column experiments. Preliminary results indicated that Rhodamine-coated nanoparticles moved slower through the clay sludge than the conservative tracer. Percent filtration of nanoparticles will also be determined in the lab, while a predictive field-scale model will be created using MODFLOW computer code for a site where all the other flow parameters are well known.

8:30 **ASSESSING THE POTENTIAL OF PLANTS TO TRANSPIRE METALS AND OTHER CHEMICALS**,** Jenna Forte*, Alyssa Thomson and Samuel Mutiti, Georgia College and State University, Milledgeville, GA 31061. Numerous studies have been conducted on the use of plants in remediating contaminated sites (phytoremediation). Certain plants are known to take up heavy metals directly from the soil through their roots and into their leaves. However, there are no studies in the literature on whether these plants are able to transpire these contaminants once they get to the leaves. This

study, therefore, investigates the ability of common hyperaccumalators of heavy metals, *Hydrangea paniculata* and *Tithinonia diversifolia*, to translocate heavy metals and salts from the soil through the plant to the atmosphere. The metals and salts of choice were Lead, Arsenic, Copper and Sodium Chloride. The full experiment includes 10 pots of each plant being watered with the solutions containing the above mentioned chemicals for 4 weeks. During this time transpiration is collected and analyzed for the chemicals. The soil and plant material from each pot will also be collected at the end of the study and analyzed. This will allow us to determine the translocation factor. In a preliminary study, a fully grown hydrangea plant was watered with 200 mg/L solution of copper oxide and a 1000 ppm lead solution for one week. During this week, transpiration was collected from three branches and analyzed for the metals. Transpiration water from two of the three branches showed a presence of copper between 0.1 and 0.5 ppm. Water from the third branch showed a presence of copper between 0 and 0.1 ppm.

8:45 **ASSESSMENT OF WATER QUALITY AND MIXING IN LAKE SINCLAIR**,** Megan Corley*, Gabriel Stone, John Morgan, Raleigh Burch and Samuel Mutiti, Georgia College and State University, Milledgeville, GA 31061. Lake Sinclair, located in middle Georgia, is the result of man-made dams on the Oconee River during the 1950's. Today, the lake serves as a source of electricity and as a popular tourist attraction for swimmers, fishers, boaters, hunters and many more. The current services require the lake to be in a healthy state and able to support these competing demands. The primary goal of this study was to monitor water quality and understand water mixing in a small section of the lake. Mixing is suspected to have a significant impact on algal blooms and their formation, which is important to understand for lake management. During times when the coal power plant is generating electricity, water is taken from the lake in one cove and discharged in an adjacent cove. The section of the lake where the water is withdrawn and released back into lake was selected as the focus of this study. The reason for choosing this site was to determine the effect of water abstraction and release on mixing patterns within the deeper and shallow portions of the Lake. Rhodamine WT fluorescent dye, specific conductance, oxidation-redox potential, pH, nitrate, phosphate and temperature were used in this study. A device for rapid and continuous measurement of the above-mentioned parameters was also designed and tested during the study. During times when the power plant was not generating electricity, flow was observed to be mostly in the longitudinal direction, with very little transverse and vertical flow. The device was found to work well when utilizing equipment with short sampling rates (seconds), as well as a slow moving tracer.

9:00 **PALEOECOLOGICAL RECONSTRUCTION OF EARLIEST OLIGOCENE UNGULATES FROM NEBRASKA: COMBINED EVIDENCE FROM MESOWEAR, HYPSODONTY, AND STABLE ISOTOPE ANALYSES,** Theron M. Kantelis* and Grant S. Boardman, Berry College, Mount Berry, GA 30149. Understanding ancient ecosystems, especially in regions or during intervals of time with a dearth of paleobotanical remains, hinges on an understanding of the vertebrates present. In particular, herbivorous mammals (ungulates), being large and mobile, are useful in characterizing types of plants present (C3 versus C4), habitat openness, and water-stress in a fairly large area. In this study, we reconstructed the paleoecology of five ungulate species common to the area of Toadstool Geologic Park (Sioux County, Nebraska) during the earliest Oligocene (*Hyracodon nebraskensis, Subhyracodon occidentalis, Mesohippus bairdi, Merycoidodon bullatus*, and *Agriochoerus antiquus*). Using Discriminant Function Analysis (DFA) of mesowear scores and hypsodonty index values, along with the stable carbon ($\delta^{13}C$) and oxygen ($\delta^{18}O$) ratios from tooth enamel, we determined the

most likely diets for each species, along with their water needs, and habitat preferences. Stable carbon ratios indicate that all species shared an open, water-stressed habitat, consistent with a woodland savanna setting receiving ≤500 mm annual precipitation. Of the species examined, *A. antiquus* and *H. nebraskensis* have the highest oxygen ratio values, suggesting they got their needed water from food rather than drinking, whereas all other species were dependent on drinking. DFA results suggest all of the species were leaf browser, except *H. nebraskensis*, which was determined to be a mixed-feeder. Combined evidence of diet and habitat is concordant with expectations based on local phytolith data.

9:15 **UTILIZING GIS TO CREATE A 3D MAP OF GROUNDWATER AND SURFACE WATER INTERACTION**,** DeMichael Winfield*, Trevor Alexander, Lena White, Christine Mutiti and Samuel Mutiti, Georgia College and State University, Milledgeville, GA 31061. Geographic information system (GIS) is a tool that is widely used in various fields and has become a standard tool in studies that require spatial analysis. In this study GIS tools (Groundwater, ArcHydro and Spatial Analyst) are used to study groundwater flow and contaminant transport at a local farm, Salamander Springs Farm, in Milledgeville, GA. The farm relies on groundwater for drinking and irrigation. A surface water stream that runs through the property is also utilized but mostly for recreation purposes. Understanding the connection between groundwater and surface water at this site is important because there is some evidence of surface water contamination, which could impact the groundwater. Physicochemical and other water quality parameters (nitrate, phosphate, nitrite and chlorine), together with fecal coliform are being monitored (since September 2014) in both groundwater and surface water. This study also seeks to identify the sources of fecal bacteria using molecular techniques. Temperature and fluorescent dye are used to identify areas of upwelling and patterns of groundwater flow. All physicochemical parameters, except for chlorine, are within the limits set by the Environmental Protection Divisions (EPD). Fecal coliforms were detected in all water samples except samples from a drinking water spring. Groundwater flow closely follows the topography despite the presence of some pumping wells in the area.

9:30 **UNDERSTANDING THE SOURCES OF NUTRIENT IN A FARM POND USING FLUORESCENT DYE AND CHLOROPHYLL-a**,** Katie Garth*, Taylor Upole and Samuel Mutiti, Georgia College and State University, Milledgeville, GA 31061. Algal blooms are one of the serious problems affecting aquatic environment in the world. This has been true in the geologic past (even during the Devonian Period when no humans existed) and is still true today when human impacts are significant. The main cause of algal blooms is understood to be elevated levels of nutrients in aquatic environments, especially during warm periods. There many sources of nutrients in the world today. Agriculture is one of the biggest contributors of nutrients and is usually blamed for stream and lake impairments. A history of agricultural land use and recently observed algal blooms in a pond at Andalusia Farm, in Milledgeville GA, prompted this research. The goal of the project is to understand the hydrologic system and assess the quality of the water at this farm. This study investigates the levels (and their changes over time) of nutrients in both groundwater and surface water at the farm. The study focuses on a wetland system that has a pond in the middle and a surface channel that connects to a local creek (Tobler Creek). In this study, surface water runoff from the upland areas and the hay field is also collected (during rain events) and analyzed for phosphorous, nitrates and chlorophyll-a. To fully understand groundwater flow paths, Rhodamine WT and fluorescent dye are also utilized. Preliminary results showed phosphorus to be the limiting factor and that it was directly correlated to observed algalblooms during spring 2014.

9:45 **ALGAE DIVERSITY IN GEORGIA FARM PONDS**,** Hunter E. Gay*[1], Spencer W. Salter[1], Regan A. Phillips[1], Dana M. Bedgood[1], Jimmy Wedincamp, Jr.[1], Michael F. Chislock[2], Brianna K. Olsen[2], Alan E. Wilson[2] and J.E. Schneider, Jr.[1], [1]East Georgia State College, Swainsboro, GA 30401 and [2]Auburn University, Auburn, AL 36849. Farm ponds provide eutrophic conditions ideal for algal growth. For the past 3 years students at East Georgia State College have participated in a project led by Alan Wilson to survey water sources in the Southeastern United States for the purpose of identifying conditions predictive of harmful algal blooms (see support acknowledgement below). We report here some of the findings of samples taken from farm ponds near East Georgia State College in Emanuel county, Georgia. In particular, we present data from three ponds located on the same farm, all within a quarter mile of each other, yet possessing dramatically different algae profiles. Representative photographs of algae preserved in Lugol's reagent show that two of the three ponds have a dominant population of a species of algae, a different species for each pond, and that a third pond does not show a dominant algal form. Pond A is dominated by the cyanobacterium *Dactylococcopsis*. Pond B is more diverse in its algal populations, and pond C is dominated by a filamentous chlorophyte. Measurements of additional parameters of the ponds, such as a nutrient content and chlorophyll levels, are in progress. The support of Alan Wilson and the USGS - National Institutes for Water Resources grant to him is gratefully acknowledged.

10:00 **Section Business Meeting**

10:30 **IMPACTS OF METALLIC ENGINEERED NANOPARTICLES ON SOIL BACTERIAL NITROGEN TRANSFORMATIONS,** Allison Rick VandeVoort, Georgia College & State University, Milledgeville, GA 31061. The nitrogen cycle in agricultural soils was investigated with consideration of nanoparticulate contaminants. Both silver and copper nanoparticles were studied with respect to their impacts on the bacteria responsible for nitrification and denitrification processes. These novel soil contaminants have been shown to be toxic to bacteria in pure culture settings, but are not widely investigated in the heterogeneous soil matrix. Nanoparticle dissolution was investigated in the presence of a variety of ligands common in soil environments. Sorption onto soil surfaces and chemical interactions on soil surfaces were also studied. While these nanoparticles were shown to have diminished bioavailability compared to documented values in literature on aerobic and anaerobic bacteria in the absence of soil, the presence of soil is likely to provide a variety of sorptive opportunities for nanoparticles and/or the products of nanoparticle dissolution. Even when nanoparticles are nearly completely sorbed, they still may have some bioavailability at high concentrations. The implications of nanoparticulate toxicity at the soil-water interface are investigated in this study.

10:45 **MILLEDGEVILLE ON THE BOUNDARY: HISTORY AND GEOLOGIC SETTING WITH EXCERPTS FROM THE 'ROADSIDE GEOLOGY OF GEORGIA',** Pamela J. W. Gore, Georgia Perimeter College, Clarkston, GA 30021. Milledgeville, a former State Capital of Georgia, sits on west bank of the Oconee River, at the former boundary of Indian Territory, not far from Rock Eagle and Rock Hawk effigy mounds. It also lies on the Fall Line, a geologic boundary between ancient igneous and metamorphic rocks of the Piedmont to the north, and younger sedimentary layers of the Coastal Plain. Within a few miles of Milledgeville, you can see folded igneous and metamorphic rocks exposed along US 441/GA 24, and visit kaolin mines to the south. A major tectonic boundary lies between Milledgeville and I-20: a fault separating the Cat Square terrane to the northwest from the Carolina superterrane, a volcanic island chain that collided with North America about 350 million years ago. And Milledgeville lies in the

Central Georgia Seismic Zone, the most earthquake-prone part of Georgia. Milledgeville is also at the boundary between conventional and alternative energy generation. Plant Branch, a coal-fired electricity-generating power plant, slated to close by the end of 2015 due to changes in the economy and environmental regulations, lies along the shores of Lake Sinclair, north of Milledgeville. To the south, a 7.7 megawatt solar energy farm recently opened. And in Milledgeville, Georgia College and State University boasts a natural history museum with one of the largest exhibits of vertebrate fossils in the southeast.

POSTERS

A GEOCHEMICAL SURVEY OF VEGETABLES AND TOP SOILS FOUND IN MILLEDGEVILLE GA,** Samantha Mutiti*[1], M.R. Corley*[2], M. Tembo[2], C.M. Mutiti[2] and S. Mutiti[2], [1]Oak Hill Middle School, Baldwin County School District, Milledgeville, GA and [2]Georgia College & State University, Milledgeville, GA 31061. The World Health Organization defines health as the "state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity". Daily lifestyle choices have a long-term effect on health. At the center of these choices is food, which is consumed specifically to supply the body with necessary nutrients. Some opt for locally produced organic foods while others choose particular food groups that are generally accepted as being healthy. This project surveyed vegetables (cabbage, ginger, onion, mustard, broccoli, carrots, beets, leaks, kale and celery) and top soils (including compost) sold in Milledgeville, GA for the amount of metals, especially heavy and trace metals. This study compared organic vegetables to conventional ones, as well as various top soil brands. The soils and vegetables were analyzed for their elemental contents using an X-Ray fluorescence machine. Microsoft Excel and SPSS statistical packages were utilized to compare the metal contents. Results to date show no significant difference in metals found in organic foods when compared to conventional produce. Cabbage and broccoli showed presence of heavy metals, manganese, cobalt, vanadium, and zinc. Broccoli had the highest amounts of cobalt and vanadium. The top soils had no alarming levels of any heavy metals or trace elements except for a local top soil (obtained from a local garden) that had relatively higher levels of Vanadium (235 ppm) and Lead (28 ppm). Two of the commercial brands had arsenic present but at levels not greater than 5 ppm.

HISTORICAL CHANGES IN WATER QUALITY OF A MIDDLE GEORGIA LAKE,** Raleigh Burch*, Gabriel Stone, Christine Mutiti and Samuel Mutiti, Georgia College & State University, Milledgeville, GA 31061. This study investigates changes in Lake Sinclair's water quality over time. Data provided by Georgia Power was utilized to show the three dimensional distribution and water quality changes for the past ten years. The water quality parameters analyzed were nitrite, nitrate, ammonium, bacteria, dissolved oxygen and specific conductance. Most of the parameters analyzed are consistently (with a few exceptions) below the water quality limits set by the Environmental Protection Division for surface water and Lake Jackson, GA. There were temporal and spatial changes observed during the last ten years with most significant changes observed in the coves where streams enter the lake. These coves also had relatively higher levels of nutrients than the rest of the lake. The few algal blooms that have been observed in the lake have also been mostly in these coves. In addition to historical data, new data on nitrate, phosphate and ammonium were also collected in September and October 2014. The new data showed levels that were much higher than data from previous years. This requires further investigation at a much finer scale than previously used. A spatial distribution map is being created using GIS and remote sensing.

CALCULATED CARBON SEQUESTATION LEVELS AMONG TREES ON CAMPUS USING STATISTICAL ANALYSIS AND GEOGRAPHIC INFORMATION SYSTEMS,** Ashlee R. Burkett* and Dr. S. Rose, University of West Georgia, Carrollton, GA 30118. Analyzing carbon storage limits of trees at the University of West Georgia and also carbon storage levels among different species of mature trees. Factors for calculation include dry weight, canopy area and tree diameter. The relation between the total amounts of carbon dioxide emissions to carbon storage capabilities on campus were observed to provide data for future sustainability efforts. The findings suggest the tree inventory on campus does not provide enough carbon storage to adequately sustain healthy levels of emitted carbon. GIS technologies were used to import tree coordinates for a visual.

ASSESSMENT OF WATER QUALITY AND EFFICACY OF WATER TREATMENT INFRASTRUCTURE IN SOUTHWESTERN PUERTO RICO, Brennan Poon-Kwong*, Sarah Horwitz, David Sotomayor and Dave Bachoon, Georgia College & State University, Milledgeville, GA 31061. Water quality of 40 freshwater sites in the Lajas and Guánica areas of southwestern Puerto Rico were assessed using IDEXX to enumerate fecal indicator bacteria (FIB). Insufficient or ineffective wastewater treatment is a threat to both public health (human pathogens) and aquatic resources (nutrients). Detection of fecal contamination exceeding the U.S. EPA's recommended threshold for recreational water quality prompted the use of real-time PCR to identify the source of fecal contamination by molecular source tracking (MST) techniques. Taqman probe based qPCR assays were utilized in the targeting of *Bacteroides* human -specific (HF183) marker, and a cow-specific (BacCow-UCD) *Bacteriodales* 16S rRNA gene. The human-specific HF183 assay detected the presence of human fecal contamination in 15% of the sampled locations, whereas the cow-specific assay confirmed cow fecal contamination in 25% of the locations sampled.

CLAY 'SLUDGE' AND GYPSUM MIXTURES EFFECT ON FECAL BACTERIAL IN ENVIROMENTAL SAMPLES,** Lillie Brannen* and Dave Bachoon, Georgia College & State University, Milledgeville, GA 31061. Clay 'sludge' from a water treatment plant and gypsum from a coal burning power plant were evaluated for their ability to inhibit the growth of fecal bacteria from cattle, pig, and goose. Flasks containing clay and/or gypsum were inoculated with *E. coli* and fecal bacteria from animals. The treatments were run in duplicate in a 250ml flask containing 200ml of 0.9 saline solution. After which, *E. coli* and was enumerated using IDEXX Collilert-18. This was done every two days for eight days. The clay 'sludge'/ gypsum inhibited the *E. coli* growth more than the others, and the clay 'sludge' inhibited growth second best. The gypsum and the autoclaved sand had the same rate of inhibition.

ALGAL COMMUNITY ECOLOGY OF SPECIES FROM A SHALLOW SALINE MEROMICTIC LAKE,** Daniel Chung* and K.M .Manoylov, Georgia College & State University, Milledgeville, GA 31061. Growth of organisms in artificial environments seems simple on paper. Cultured algae are valuable model systems, but few taxa with ability to survive extreme environments are unavailable in commercial culture collections. Samples from a hypersaline Hot Lake, Washington were used for cell isolations. The lake is meromictic, received high amounts of freshwater run-off with snow melt. Bolds freshwater medium and marine medium were prepared following standard protocol. Diatoms were allowed to grow in different vial sizes with and without agitation on agar surface within the vials agar plates. All inoculated vials and petri dishes were then placed in an incubator under standard conditions (14:10 h light, 17°C temperature, and 90% humidity)

and then checked every two days for growth. Over an eight week period of time, 30% of the samples have shown growth of cultured algae. Preliminary data shows that diatoms grew better with agar base compared to liquid medium; this was due potentially of having both benthic and planktonic diatoms. Potentially new to science and common representatives of the genera *Achnanthidium, Navicula*, and *Nitzschia*, thrived in freshwater artificial environment and representatives of the genera *Nitzschia* grew successfully in the saline recreated conditions. Documenting growth and reproduction in artificial environments was an important part of the several collaborative molecular, physiological, and ecological projects for extreme environments.

Section IV: Physics, Mathematics, Computer Science, Engineering and Technology
Health Sciences Building, Room 201
Hasson M. Tavossi, Presiding

8:00 PRE-SERVICE TEACHERS' UNDERSTANDING OF NUMERATION, Iwan R. Elstak and Benjamin M. Wescoatt, Valdosta State University, Valdosta, GA 31698. How do pre-service teachers learn and understand the process of numeration of integers when the base of the place value is not ten? What are the obstacles they face and how do they handle those challenges? Are students able to execute arithmetic operations in other bases? How does this new knowledge influence the students' understanding of algorithms in Base-Ten? A study was conducted to explore these questions. Fifteen students in a mathematics course for pre-service elementary teachers participated in a study to document and analyze how the learning of numeration with different bases occurs and which areas constitute conceptual obstacles. Pre-and post-tests and three interviews per student were conducted by the researchers. Findings show that students struggled with multiple components of a numeration system. An important challenge was the coordination among powers of the base, the concept of digit and the naming of numerals. Addition and subtraction with new bases were eventually mastered. However, more effort was necessary to understand multiplication and long division. Students generally struggled with converting what was learned into better base-ten reasoning or handling manipulatives, suggesting that their knowledge was procedural rather than conceptual.

8:15 **GENERAL INTEGRAL SOLUTION FOR THE ONE-DIMENSIONAL DIFFUSION PDE FOR BOUNDED SPACE REGIONS,** 'Kale Oyedeji[1] and Ronald E. Mickens[2], [1]Morehouse College, Atlanta, GA 30314-3773 and [2]Clark Atlanta University, Atlanta, GA 30314. The one-dimensional, linear, diffusion, partial differential equation provides an adequate model for many phenomena in natural and engineering sciences. It has two major types of solutions: (a) those for finite intervals of the space variable x, and (b) those where the space interval is unbounded. We derive an integral relationship for solutions in class (a). In addition to proving the validity of our ansatz, a number of other mathematical properties of the solution are confirmed/checked. For the equation, $U_t = U_{xx}$, U = U(x,t), the solution is

$$U(x,t) = \int_{-\infty}^{\infty} C(k)\left[\exp(-k^2 t + ikx)\right] dk,$$

where C(k) is real and such that the integral exists. Note that the real and imaginary parts of U(x,t) are solutions. Background information is given in R. Ghez, "A Primer of Diffusion Problems" (Wiley, 1988).

8:30 **A SPECIAL CASE OF TRANSFORMATION OF RANDOM VARIABLES,** Andreas Lazari, Valdosta State University, Valdosta, GA 31698. Consider the probability density function (pdf), *f(x)*, on the interval $a \le x \le b$; $\forall\ a,b \in \Re$. Then *F(x)* is the cumulative distribution function (cdf) of the random variable X. If we let $Y = F(x)$, then the cdf of Y is always

$G(y) = \begin{cases} 0\ ; & y < 0 \\ y\ ; & 0 \le y < 1 \\ 1\ ; & y \ge 1 \end{cases}$, and the pdf of Y is always the Uniform Distribution where

$0 \le y \le 1$; i.e $g(y) = 1$; $0 \le y \le 1$, zero elsewhere.

8:45 **RANDOM PRESSURE FLUCTUATIONS BY NON-LINEAR DAMPING INDUCED EXCITED OSCILLATIONS IN A REACTOR-COLUMN,** Hasson M. Tavossi, Valdosta State University, Valdosta, GA 31698. Self-excited non-harmonic pressure oscillations that result from non-linearity in the system are generated in an air-flow in a reactor column. The uniform steady flow is converted spontaneously into an oscillatory flow, under the especial experimental conditions in a reactor column that includes a thin layer of dissipative porous medium. The resulting large-amplitude non-harmonic pressure fluctuations in the air-flow are similar to the bifurcation in chaotic systems; where two or more energy states can occur simultaneously, with the system oscillating between them. Experimental results will be presented to demonstrate this abrupt change in flow-regime, from steady-flow to chaotic turbulent vibrations. Our results show that a low-pressure shock-wave-front is established in the column and precedes the self-excitation oscillations in the system. Results show that there exists a threshold for flow-rate, beyond which the transition from steady-flow to pulsating-flow occurs. A numerical model is developed to express this behavior in terms of system variables, such as; dominant frequencies, obtained from fast-Fourier-transforms of time-domain pressure signals, flow-rate, dimensionless aerodynamic characteristic numbers, relaxation-time, and energy dissipation in the system.

9:00 **NEAR-INFRARED BRIGHTNESS MEASUREMENTS OF MARS IN 2014,** Richard W. Schmude, Jr., Gordon State College, Barnesville, GA 30204. An SSP-4 photometer and filters transformed to the Mauna Kea J and H system were used in measuring the brightness of Mars. The J and H filters are sensitive to wavelengths of 1.25 and 1.65 micrometers. Unlike Jupiter and Saturn, Mars undergoes substantial brightness changes as it rotates. Over three dozen measurements were made between late April and late August, 2014. The selected mean normalized magnitudes of Mars are J(1,0) = -3.37 ± 0.05 and H(1,0) = -3.69 ± 0.05. Mars varies by 0.3 magnitudes in both filters as it rotates. It is brightest when 150° W longitude is facing the Earth and is dimmest when 0° W is facing the Earth. These normalized magnitudes are consistent with geometric albedos of 0.312 and 0.315 for the J and H filters respectively. This work was supported by a faculty development grant awarded by Gordon State College.

9:15 **NEAR-INFRARED BRIGHTNESS MEASUREMENTS OF JUPITER AND SATURN,** Richard W. Schmude, Jr., Gordon State College, Barnesville, GA 30204. An SSP-4 photometer and filters transformed to the Mauna Kea J and H system were used in measuring the brightness of Jupiter and Saturn + rings in 2014. The selected normalized magnitudes extrapolated to a solar phase angle of 0° are J(1,0) = -9.55 ± 0.05, H(1,0) = -9.09 ± 0.03 for Jupiter and J(1,0) = -10.67 ± 0.03 and H(1,0) = -10.40 ± 0.03 for Saturn plus rings at a ring tilt angle of 22°. The Jupiter results are consistent

with geometric albedos of 0.222 and 0.109. The ratio of Jupiter's J and H filter albedos to that in the V filter are 0.415 and 0.204, respectively. The respective albedo ratios for Saturn are 0.847 and 0.497. The higher albedo ratios for Saturn are consistent with reflectance spectra. The writer gratefully acknowledges a Faculty Development Grant awarded to him by Gordon State College.

9:30 **DETERMINING THE LOCATIONS OF DUST SOURCES IN *FELO-BAL* QUASARS**, Jay P. Dunn, Branden Wasik*, Christin L. Holtzclaw*, David Yenerall and S. Harper Dutton*, Georgia Perimeter College, Dunwoody, GA 30338. We conduct a spectroscopic search of quasars observed by the Sloan Digital Sky Survey (SDSS) with broad absorption line (BAL) troughs due to *Mg II* and troughs due to *Fe II* that simultaneously exhibit strong *Balmer* narrow emission lines. We find that in a redshift range of $0.4 > z > 0.9$ approximately 23 of the 70 *Mg II BALs* and 4 of a subset of 15 *Fe II BALs* exhibit strong *Balmer* emission. We also find significant fractions of *Mg II BALs* (approx. 23%) and those *Mg II BALs* with *Fe II* troughs (approx. 27%) have strong continuum reddening, $E(B-V) > 0.1$. From measurements of the *Balmer* decrement in three objects, we find similarly significant reddening of the narrow emission line region in 3 of the 4 objects, and the narrow emission lines in the fourth object are not measurable. We also include one object in this study not taken from the SDSS sample that shows *Fe II* absorption and strong narrow emission, but due to measurement uncertainty and low continuum reddening the comparison is consistent but inconclusive. Because the narrow line reddening is consistent with the continuum reddening in every object in the SDSS sample for both *Mg II* and *Fe II BALs*, it suggests that the reddening sources in these objects likely exist at larger radial distances than the narrow line regions from the central nucleus.

9:45 **REFLECTIVITY STUDY ON A TYPE OF BRAGG REFLECTOR,** Javier E. Hasbun and Ajith DeSilva, University of West Georgia, Carrollton, GA 30118. In this study we apply the Born theory [1] of wave propagation on a stratified medium to obtain the reflectivity and transmissivity of a series of distributed Bragg reflectors (DBR). The DBR's are made of pairs of identical alternating layers. Each pair of layers is referred to as a period. We can grow DBR's of varying number of periods and study their reflectivity properties. Since each layer of a period has a different refractive index, constructive interference from the total reflected portion of light can be investigated to create effective reflectors. The DBR's can be made to act as optical mirrors to enhance certain wavelengths of light to be highly reflected. In this study, we find that it is possible to obtain an analytic expression applicable to a single layer system. We work with a layer of polyvinyl carbazole (PVK) and calculate its reflectivity which we compare to experiment. Theoretical fits are generated which closely match the experimental curves. The fits are used to obtain the theoretical layer widths for the single layer systems. [1] "Principles of Optics: Electromagnetic theory of propagation, interference and diffraction of light," M. Born and E. Wolf, 7th Ed. (Cambridge UP, UK, 1999.) Acknowledgement: The authors wish to thank the UWG-UWISE minigrant program for their support.

10:00 **Section Business Meeting**

10:45 **FUTURE WISE CARS WITH COOPERATIVE DRIVING ASSISTANCE,** Chunlei Liu, Taray Eady*, Viktor Graczyk*, David R. Gully*, Dalton Gurley*, Willie Lawrence*, Kinard Thomas* and Christopher Whelan*, Department of Mathematics and Computer Science, Valdosta State University, Valdosta, GA 31698. Driving is one of a few tedious, mechanic and dangerous tasks that have not been carried out by

computers and machines. The large number of driving-related deaths and huge property loss worldwide each year are solemn witnesses of the need for safer and more automated driving. Current research on "intelligent self-driving cars" relies on expensive roof-top cameras, sophisticated radar, GPS and powerful computers, and therefore, will not likely to become affordable for most consumers in the near future. In this study, we present an approach of future wise cars that uses "social networks" of vehicles and "wisdom of crowds" to provide a low-cost and yet more accurate and reliable driving solution. Instead of treating nearby vehicles as dangerous moving objects, this approach lets vehicles and infrastructure to communicate with each other to form cooperative peer-to-peer networks using Radio Frequency Identification tags, readers and short-range wireless communicators. As a result, a more accurate and reliable assessment of the surroundings can be provided to the driver. With the help of sensors and communication networks, this approach also opens doors for many new location-based communication, commercial and entertainment applications that will make the driving experience safer and more enjoyable. This study is supported by Valdosta State University Quality Enhancement Program, Faculty Research Seed Grant, and Innovative Design.

11:00 **CHARACTERIZATION OF HYSTERETIC EFFECT OF CARBON COATEDFERRITE NANO PARTICLE SOLUTION,** Arun K Saha, Dept. Of Natural & Forensic Sciences, Albany State University, Albany, GA 31705. Carbon Coated Ferrite Nano Particles (CFNs) exhibit hysteretic property under microwave radiation (MR). Due to this property, CFNs get heated when exposed to alternating magnetics fields. Recently this temperature-rise property of CFNs under MR has been a subject of great attention to cancer researchers. Because MR is harmless to human body and its penetrability into human body is much higher than that of conventional radiation therapy. So, it is now necessary to characterize CFN's hysteretic property in terms of complex permittivity ($\varepsilon_1 - j\varepsilon_{22}$) and permeability ($\mu_1 - j\mu_{11}$) to predict its heat generation capability under MR. In this research, CFN solution is prepared by mixing with sodium cholate and distilled water and characterized by waveguide refection/transmission method where multivariable Newton-Raphson method is used to solve two complex equations containing four variables – ε_1, ε_{22}, μ_1, μ_{11}. In future, this characterization will be used in CFN dose calculation to treat cancer with microwave radiation

11:15 **USING ARDUINO AND AUDIO TO INVIGORATE THE FRESHMAN EXPERIENCE,** J. A. Hauger, Georgia Regents University, Augusta, GA 30912. Analog and digital circuits provide an inexpensive way to bring a high level of hands-on engagement to introductory physics and first-year seminar courses. In addition to working with traditional series and parallel circuits, students in the introductory physics courses now have the opportunity to complete a mini-project which consists of constructing, testing, and demonstrating a low power audio amplifier. Also, for the past year, the Arduino microcontroller platform and associated electronics have been used as the foundation of a freshman inquiry-based course. The curriculum and associated equipment used in these courses will be described along with the challenges and rewards of introducing these seemingly advanced topics to novice users. Student feedback and lessons learned will also be discussed.

POSTERS

INVESTIGATION OF CADMIUM SULFIDE THIN FILMS PREPARED BY SPIN COATING,** LeQuardis English Jr.*, Ajith DeSilva, R.R. Gadipalli and J. E. Hasbun, Department of Physics, University of West Georgia, Carrollton, GA 30118. Quantum

dots (QD) are semiconducting nano-particles. They have a variety of applications in optical and electronic devices. We use simple methods such as spin coating technique and the wet chemical process to fabricate Cadmium Sulfide (CdS) QDs. Cadmium Nitrate and Thiourea were used for synthesizing the CdS nano-particles with different thicknesses on a Glass substrate. The sample thickness of CdS varies from 50 – 80 nm. The film thickness was simulated using a MATLAB program and the refractive index is modeled for the wavelength range of 400 – 1000 nm. The sample was further investigated using SEM and spectroscopy methods. The authors would like to acknowledge the financial support by UWise and SRAP programs at UWG.

A DEEP OPTICAL SPECTRUM OF THE PLANETARY NEBULAE NGC 6741,** Hannah-Marie Wieser and Nicholas Sterling, University of West Georgia Carrollton, GA 30108. We present a study of the chemical composition of the planetary nebula (PN) NGC 6741. More than 200 emission lines were identified in a deep optical spectrum of NGC 6741 obtained with the 2.7-m telescope at McDonald Observatory. PN are gaseous nebulae ejected at the end of a low-mass star's (1-8 solar masses) red giant phase, ionized by the hot stellar core. We are computing the abundances of all detected elements, but we are particularly interested in neutron(n)-capture elements (atomic number Z>30). Nuclear fusion produces energy in stars only up to the formation of iron, and therefore heavier elements cannot form via fusion. Instead, n-capture elements form in environments where free neutrons are produced. The neutrons are captured by iron and heavier nuclei to form successively heavier elements. Neutron-capture nucleosynthesis can occur during the second giant phase of low-mass stars, near the core where the helium is partially converted to carbon. The nuclear-processed material can be conveyed to the outer layers of the star via convection, and ejected in the PN phase. Therefore enrichments of n-capture elements in PN are signatures of carbon production in low-mass stars, and can reveal poorly understood properties of convective mixing and the interiors of red giant stars. We have detected multiple ions of the n-capture element krypton in NGC 6741 for the first time, providing more a more accurate abundance than previous results. Xe is also tentatively identified, and we place upper limits on the fluxes of other n-capture elements such as Se, Br, and Rb to constrain their abundances.

HEAVY ELEMENTS IN THE NEAR_INFRARED SPECTRA OF SOUTHERN HEMISPHERE PLANETARY NEBULAE,** D.V. Wood and N.C. Sterling, University of West Georgia, Carrollton, GA 30118. We present near-infrared spectra (2.0-2.4 μm) of six southern hemisphere planetary nebulae (PN), obtained with the OSIRIS spectrograph on the 4.1-m SOAR telescope in Chile. A PN is the ionized ejecta of a low-mass star (1-8 solar masses), marking the end of the star's life. The primary objective of these observations is to detect the neutron(n)-capture elements (atomic number Z > 30) selenium and krypton, to study the production of heavy element nuclei in low-mass stars. Nuclear fusion of elements heavier than iron does not produce energy, and therefore does not occur in stars. Nuclei heavier than zinc are instead formed via n-capture nucleosynthesis, which can occur in low-mass giant stars, the stage of evolution preceding the PN phase. Iron nuclei undergo a series of neutron captures and beta decays (i.e., a neutron in the nucleus decays into a proton) to transform into heavier elements. The nuclear- processed material can be transported to the outer layers of the giant star along with carbon (from partial helium fusion), and expelled into space during PN ejection. Nebular spectroscopy provides access to n-capture elements that cannot be detected in stellar spectra, and therefore provides unprecedented insight into heavy element nucleosynthesis. Moreover, the abundances of n-capture elements in PN can reveal poorly-understood details of giant

stars such as convective mixing, the structure near the stellar core, and carbon production (a key ingredient of life as we know it). We have detected selenium and krypton in multiple objects, and present a preliminary abundance analysis of these PN.

TESTING THE FEASABILITY OF A BLADELESS WIND TURBINE DESIGN,** Jonathon Gardner, Austin Card, Jairus Elarbee, Brett Card, Michael Crawford, Anderson Kendrick and Hauke Busch, Georgia College and State University, Milledgeville, GA 31061. The design of a bladeless wind turbine offers potential improvements such as cost savings, reduction of operating noise level, simplification of the manufacturing process, reduction of maintenance costs, and incorporation of eco-friendly features. In order to analyze various turbine designs, a wind tunnel with a 30.3cm x 30.3cm test section was constructed at Georgia College, in which several different wing sections are being evaluated to determine the turbine design and engineered for optimal aerodynamic efficiency over a range of Reynolds numbers. Other factors like pressure coefficients, overall drag profile and power generation of the designs will also be analyzed as well.

A FINITE TEMPERATURE THEORY FOR UNIVERSAL FERMIONIC SYSTEMS,** Michael Stocker* and Theja De Silva, Georgia Regents University, Augusta, GA 30912. Incorporating Tan's universal relations into basic statistical mechanics, we develop a finite temperature theory for strongly interacting universal fermions. We present our equation of motion as a self-consistent integral equation. We discuss approximate solutions to our integral equation and test the validity of our theory using recently available experimental data.

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

8:00 **EFFECTS OF RESVERATROL AND QUERCETIN COMBINATION TREATMENT ON CYP1A1 TRANSCRIPTION IN MOUSE HEPATOCYTES**,** Mary L. Calderon* and Jennifer C. Schroeder, Young Harris College, Young Harris, GA 30582. Bioflavonoids and environmental procarcinogens have similar molecular structures and can often act as ligands for the same aryl hydrocarbon receptor (AHR). Certain environmental procarcinogens, such as benzo[a]pyrene (B[a]P), can contribute to the development of cancer if they become metabolically activated by the enzyme CYP1A1. B[a]P also acts as a ligand for the AHR, which regulates the transcription of cyp1a1. However, bioflavonoids have been shown to act as chemopreventive compounds by competitively binding to the AHR, inhibiting the transcription of the cyp1a1 gene. The two bioflavonoids used in these experiments are resveratrol and quercetin. Previous studies using 100μM resveratrol displayed minimal reduction in B[a]P-induced transcription of a cyp1a1 luciferase reporter gene in a mouse hepatocyte cell line. Treatment with 100μM quercetin was significantly more effective in inhibiting this transcription. In this study we examine the effects of various concentrations (50-100μM) of these two bioflavonoids and combinations thereof. We hypothesize that the combination treatment will synergistically reduce the transcription of cyp1a1 caused by B[a]P. Preliminary results indicate that this is true. Additionally, low concentration (50μM) of resveratrol with B[a]P unexpectedly seems to increase luciferase activity, as compared to B[a]P treatment alone. Funded by the Young Harris College Science Research Initiative.

8:15 **THE EFFECTS OF PERFLUOROOCTANOIC ACID ON CELL VIABILITY AND PEROXISOME PROLIFERATOR-ACTIVATED RECEPTOR GENE EXPRESSION IN MCF-7 CELLS**,** April N. Smith* and J.D. Cannon, Georgia Regents University, Augusta, GA 30904. Perfluorooctanoic acid (PFOA) is an endocrine disrupting compound found in food, drinking water, paper products, and clothes, among several other items. It consists of a chain of carbons bonded to fluorine atoms and is known to accumulate in the environment. It can be taken up by the body through ingestion, inhalation, or skin contact and has a half-life of nearly four years in humans. PFOA has been shown to bind and activate peroxisome proliferator-activated receptors (PPARs), which are nuclear transcription factors found in mammalian cells. PPARs regulate genes involved in proliferation, differentiation, and other cellular activities. Activation of PPARs has been shown to positively regulate PPAR expression. This study aimed to examine the effects of PFOA on cell viability and on PPAR expression in MCF-7 breast cancer cells. Cells were treated for 24h and 48h with 100nM to 100μM PFOA and viability was determined using the CellTiter-Blue® Viability Assay. While there was no decline in viability at 24h with any of the PFOA treatments, there was a significant decrease in viability in cells treated with 100μM PFOA for 48h. At both the 24h and 48h time points, cell lysates were collected and RNA isolated using Ambion's RNaqueous®-Micro kit. Primers for PPARα, PPARβ, and PPARγ have been ordered and are being optimized for real-time RT-PCR to determine mRNA levels of those genes. The authors wish to acknowledge GRU's Center for Undergraduate Research and Department of Biological Sciences, for funding this project.

8:30 **THE PREVALENCE OF PRESUMPTIVE PATHOGENS IN COMMERCIAL AND FARMERS MARKET MEATS**,** Paige L. Stanley*, Taylor Winslow and Indiren Pillay, Department of Biological and Environmental Sciences, Georgia College & State University, Milledgeville, GA 31061. This study investigates whether specific pathogens are more prevalent in retail meat sold by commercial supermarkets compared to locally sourced markets. Ground beef samples were obtained from commercial, 'big box' stores and local, farmers markets and examined for the presence of the presumptive pathogens, *Escherichia coli* O157:H7 and Salmonella. For the detection of *E.coli* O157:H7, meat samples were homogenized using a stomacher and enriched overnight in Modified EC media with novobiocin. The enriched cultures were selected onto MacConkey agar with sorbitol, cefixime and tellurite. Presumptive positive colonies were subcultured onto Tryptic Soy Agar with Yeast Extract and further tested for positive indole and motility, and negative oxidase reactions. For Salmonella detection, meat samples were homogenized in a stomacher and incubated first in Universal Pre-enrichment Broth, then enriched overnight in Rappaport-Vassiliadis broth, and further plated onto Hardy-CHROM™ Salmonella selective media. Suspicious Salmonella colonies were further incubated on Triple Sugar Iron Agar, and Lysine Iron Agar to confirm glucose fermentation, sulfide production and lysine decarboxylase. Oxidase assays were conducted on all presumptive strains. Presumptive colonies of both *E. coli* and Salmonella will be confirmed by Rapid API20E assays and serological tests. Confirmed colonies will then tested for antibiotic sensitivity using the Kirby-Bauer assay. From our preliminary results, serological tests indicated the presence of *E. coli* O157:H7 in one sample of meat sourced from the supermarkets, and none from any of the farmer's market sources. However, it appears that other non-O157 strains of *E. coli* were present in samples from both sources. Salmonella was detected in ground beef purchased from a retail supermarket. Currently, research on bacterial enumeration, identification and antibiotic sensitivity continues.

8:45 **THE ROLE OF THE ENDOCANNABINOID SYSTEM DURING ZEBRAFISH DEVELOPMENT**,** Bryan A. Ordonez* and Linda G. Jones, Young Harris College, Young Harris, GA 30582. Endogenously produced endocannabinoids that activate the G-protein coupled receptors, CB1 and CB2, are known to influence neurogenesis and axonal pathfinding during vertebrate development. In this study we are using embryonic zebrafish (Danio rerio, which demonstrates conservation of the endocannabinoid system) to determine whether exposure to an endocannabinoid agonist (WIN 255.212-2 mesylate) or to an endocannabinoid antagonist (AM251) alters development of zebrafish embryos, and in particular, neural development. In experiments thus far, eggs were collected in the morning from a breeding chamber and exposed to various concentrations of each drug in order to determine the optimal sublethal dose to use in comparison with control embryos. Preliminary evidence suggests that AM251 doses from 1nM to 100 nM were not lethal to a significant extent though at the higher doses, the hatch rate at five days post fertilization (5dpf) was somewhat decreased. On the other hand, exposure to the agonist (1nM to 1μM) resulted in 100% lethality at concentrations ≥ 500 nM and the hatch rate at 5dpf was also inhibited at the higher concentrations. In addition, at 300 nM embryos appeared to be stunted with shorter tail lengths. This work is ongoing to quantify these changes. We also plan to use immunohistochemistry to examine the effect of these drugs on the development of the sensory posterior lateral line as a marker for neuronal outgrowth and pathfinding. Funding for this project was from the Young Harris College Undergraduate Research Initiative.

9:00 **Break**

9:15 **DISASSEMBLY DYNAMICS OF THE YEAST PRION SUP35P**,** Matthew L. Oliver*, J.A. Tierno, G.N. Karadkhele, M.O. Carter, R.A. Peeler, K.T. Bradley and M.L. Gleason, Georgia College & State University, Milledgeville, GA, 31061. The mammalian prion disease protein refolds into a beta-strand rich structure to become an infectious aggregate (PrP^{Sc}) whose monomers are assembled into an amyloid fibril via intermolecular cross-beta interactions. Likewise an aggregate of β-amyloid (Aβ) peptide is similarly linked to Alzheimer's disease (AD). Yet these plaques appear to be more symptom than cause of the disease, instead it appears that the accumulation of oligomeric aggregates trigger the disease pathology. Using a model for early amyloid formation, our lab is studying the in vitro aggregation of the yeast (Saccharomyces cerevisiae) protein Sup35p that aggregates in vivo to form the [PSI^{+}] prion phenotype in yeast. We have recently shown that an extract of cinnamon (CEppt) will block and reverse cross-beta assembly of the yeast prion amyloid fiber *in vitro*. The protein is obtained by nickel affinity chromatography as a truncated version of the yeast prion, Sup35NM-6His that has been expressed in *E. coli*. Aggregation is measured by fluorescence spectroscopy using the dye thioflavin T (ThT), that selectively binds to sites formed by the cross-beta amyloid assembly. Here we report our efforts to study the distribution of monomer, oligomer, and fibril forms through the use of boiled-gel SDS-PAGE and semi-denaturing detergent-agarose gel electrophoresis (SDD-AGE). These techniques can distinguish amyloid from monomer and in the latter case also gauge the range of oligomer sizes present. By understanding the mechanism by which CEppt disaggregates Sup35NM fibers we hope to improve our ability to assess cross-beta blocking agents as potential therapeutic agents.

9:30 **ASC AIDS IN PROTECTION AGAINST INFERTILITY POST CHLAMYDIA INFECTION,** D.N. McKeithen*[1,2], Y. Omosun[1], K. Ryans[2], F. Eko[1], C.M. Black[3], J.U. Igietseme[1,3], G.A. Ananaba[2], V.M. Dixit[4], U. Blas-Machado[5] and, Q. He[1], [1]Morehouse School of Medicine, Atlanta, GA 30310, [2]Clark Atlanta University, Atlanta,

GA 30314, [3]CDC, Atlanta, GA 30333, [4]Genentech Company, South San Francisco, CA 94080 and [5]University of Georgia, Athens, GA 30602. Chlamydia trachomatis infection is the most common bacterial sexually transmitted infection (STI) within the US, and when left untreated leads to tubal factor infertility (TFI). Apoptosis-associated speck-like protein containing a C-terminal caspase recruitment domain (ASC) studies have implicated the inflammasome adaptor protein in the stimulation of pro-inflammatory cytokines critical to host defense of pathogens. This study investigates the role of ASC on TFI after Chlamydia infection. Wild type (WT) and ASC KO mice were infected, infectivity, fertility, and, histopathological studies of the upper genital tract (UGT) were performed. Chlamydia infected ASC KO mice had significantly higher number Chlamydia inclusion bodies, as well as increased risk of infertility, exhibited by decreased average pups/pregnancy number compared to infected WT mice. A higher number of hydrosalpinx occurred within infected ASC KO UGT mice compared to infected WT mice. Histopathological studies showed infected ASC KO mice genital tract exhibited severe tissue damage compared to infected WT mice. Our data showcases the importance of ASC during the course of the Chlamydia infection and its role in protection against Chlamydia induced TFI. Research support: Title III Grant #22210J, RISE Grant #5R25GM060414-11, NSF-CREST HRD-0630456, and, NIH Grant #1SC1AII03041-01A1.

9:45 **THE ROLE OF EXOSOMES IN CHLAMYDIA PATHOGENESIS**,** Raedeen Russell*[1], Joseph Igietseme[2] and Francis Eko[1], [1]Morehouse School of Medicine, Atlanta, GA 30309 and [2]Centers for Disease Control and Prevention, Atlanta, GA 30329. Exosomes are extracellular vesicles originating from the intracellular membranes of cells, and have been shown to regulate gene expression in target cells. Although the role of exosomes in cancer and HIV AIDS disease progression has been reported, the role of exosomes in Chlamydia pathogenesis is currently unknown. Chlamydia trachomatis is the most common bacterial cause of sexually transmitted diseases. The aim of this study is to determine the role of exosomes in Chlamydia pathogenesis. To address this, $5.5x10^5$ HeLa cells grown to confluence were infected with C. trachomatis serovar D at a multiplicity of infection of 5. Exosomes were collected and purified from infected and uninfected cells 72h post-infection by ultracentrifugation and analyzed using Nanosight's LM10 optical microscope in combination with the Nanoparticle Tracking Analysis software and mass spectrometry. The results showed that infected cells released $2.82x10^8$ exosome particles/ml compared to $4.37x10^8$ exosome particles/ml released by uninfected cells. The total number of proteins incorporated in exosomes from infected cells (384) was however higher than uninfected cells (296). Notably, about 6% of the total proteins incorporated in exosomes released from infected cells were Chlamydia proteins and 94% were host proteins. Incorporated Chlamydia proteins included outer membrane associated proteins and those involved in signaling, metabolism and DNA/protein synthesis while the host cell proteins included those involved in transcription, DNA repair and cell signaling. These results indicate that Chlamydia infection causes a decrease in the amount of exosomes released from infected cells and changes the composition of proteins incorporated in exosomes. This research was supported by NIAID RO1 grant IA41231.

10:00 **Section Business Meeting**

POSTERS

THE EFFECT OF BIOFLAVANOIDS AND STILBENOIDS AS AGONISTS OF THE AHR AND THEIR EFFECT ON LEVELS OF LACTIC ACID AS A MODEL OF DIABETES, Emily D. Adair* and Jennifer C. Schroeder, Young Harris College, Young Harris, GA 30582. Diabetes is a disorder where insulin is not able to regulate glucose transport from the bloodstream into the cells. Previous studies have shown that exposing mouse hepatocytes to β-naphthoflavone (BNF), a known AHR ligand, causes a decrease in glucose metabolism. These levels of metabolism could be restored by introducing GW6471, a compound that is known to act as a PPAR-α inhibitor. In these studies, we examine the effects of bioflavonoids and stilbenoids, which also act as ligands to the AHR pathway and possibly the PPAR-α pathway, to see if GW6471 could also act to restore glucose metabolism that is lowered in their presence. Three bioflavonoids (apigenin, kaempferol, and quercetin) and two stilbenoids (pterostilbene and resveratrol) were examined. While these finding did not reach statistical significance, there were observable trends with the bioflavonoids and stilbenoids co-treated with GW6471. In cells treated with apigenin, resveratrol, or kampferol, lactate levels were decreased. The addition of GW6471 to these treatments increased lactate levels, likely due to inhibition of the PPAR-α and/or AHR pathway. Similar findings were not observed with BNF treatments in the presence and absence of GW6471. Funded by the Young Harris College Science Research Initiative.

DETERMINING IF MUSHROOM EXTRACTS CAN PREVENT THE TRANSCRIPTION OF *CYP1A1* IN THE PRESENCE OF BENZO[*A*]PYRENE,** Madison L. Perdue* and Jennifer C. Schroeder, Young Harris College, Young Harris, GA 30582. Metabolic activation of benzo[a]pyrene into a highly reactive carcinogen is regulated by *CYP1A1*. Medicinal mushrooms may help prevent the development of cancer by competitively binding to the aryl hydrocarbon receptor, the regulator of *CYP1A1* transcription, thus preventing the conversion of B[*a*]P into a diol epoxide. Extracts from two mushroom specimen, Trametes versicolor and Ganoderma lucidum, were used to treat cell cultures that were simultaneously exposed to B[*a*]P. Multiple incubation times were explored for the preparation of the mushroom extracts, ranging from 1 – 48 hour(s). Preliminary results indicate that extracts from neither mushroom were successful in stopping the upregulation of cyp1a1, as determined by a luciferase reporter gene. Based on these findings, we predict that future experiments will confirm the inability of these mushrooms to prevent damage under the conditions of this experiment. Funded by the Young Harris College Science Research Initiative.

INITIAL STUDIES TO EXAMINE AGING IN *C. ELEGANS*,** M. Morris*, Adanna Njoku* and Fran Norflus, Clayton State University, Morrow, GA 30260. This research proposal is about aging, diseases that affect aging, and the role of antioxidants in the aging process. Aging is defined as the failure of the body to replace one time vibrant cells with new cells in proportional amounts. Cells are the building block of life and make up all major organ systems. The bodies mechanisms behind cell replacement begins at birth, slow as we age, and stops when we die. There are theories as to what causes the bodies mechanisms to decelerate the replenishment of new replacement cells. The Free Radical Theory suggests that the continuous buildup of oxygen radicals leads to an assault of the cellular replacement mechanisms. As we age the toxicity increases up to lethal levels causing all of the outward appearances of aging as well as the disease proses associated with aging such as hypertension and cardiac disease. Hutchinson-Gilford Progeria Syndrome is a genetically rare and fatal disease that strikes children on average from a few months

of age up to eighteen years of age. Progeria speeds up the aging process. Genetic stains of *C. elegans* are being considered for a treatment group of antioxidants. In order to prepare for the project we have been reviewing the preparation of bacterial food sources, preparation of NGM petri plates, seeding NGM plates, culturing *C. elegans* on petri plates, transferring worms on NGM plates, cleaning contaminated *C. elegans*.

EXAMINING SUGAR TRANSPORT VIA THE PHOSPHOENOLPYRUVATE SUGAR PHOSPHOTRANSFERASE SYSTEM IN *FUSOBACTERIUM NUCLEATUM*,** Roman Martin* and A.L. Kwiatkowski, Young Harris College, Young Harris, GA 30582. *Fusobacterium nucleatum* is a bacterium known to cause dental plaque and periodontal disease because of its secretion of a biofilm during growth. Recently, studies at Young Harris College have discovered that xylitol, a sugar alcohol found in some chewing gums, inhibits the growth of *F. nucleatum* and may increase biofilm formation. Other studies have shown that *F. nucleatum* cells can weakly ferment fructose, and produce fructose 1-phosphate, indicating that fructose may enter the cell via a phosphoenolpyruvate (PEP) sugar phosphotransferase system (PTS). PTS systems transport both fructose and xylitol in other oral pathogens like Streptococcus mutants. The objective of this study was to determine how xylitol enters *F. nucleatum* cells and if there is a PTS system that can transport fructose or xylitol in this species. *F. nucleatum* cells were grown anaerobically for 72 hours in Schaedler broth containing 0.1% fructose, 0.1% xylitol, or with no sugar and were harvested by centrifugation. Cells were lysed with toluene-acetone, and a PTS assay analyzing the transport of fructose or xylitol was performed on whole-cell lysates under aerobic and anaerobic conditions. By studying how xylitol is transported into *F. nucleatum* cells, future research can be done to inhibit growth of this bacterium as well as other bacteria through their own similar pathways. This can lead to discovering ways to prevent the formation of dental plaque and other dental related diseases. The funding for this project was provided by the YHC research grant.

THE ANTI-BACTERIAL EFFECTS OF BLOODROOT EXTRACT AGAINST SELECTED ORAL MICROFLORA,** Lisset Olavarria*, P.T. Arnold and A.L. Kwiatkowski, Young Harris College, Young Harris, GA 30582. One possible way to combat antibiotic resistance is to look for new antimicrobial drugs among native plant species. *Sanguinaria canadensis* L., commonly known as bloodroot, is one such plant. It contains a red alkaloid, sanguinarine, that supposedly exhibits antifungal, antitumor, and antibacterial properties. In this experiment, we tested the effect of bloodroot extract on the growth of certain oral microflora. A *S. canadensis* root tincture was created by mixing 2.5 grams of dry pulverized rhizomes with 10 grams of 75% ethanol. The resulting tincture was used in a disk diffusion assay procedure. Sterile filter paper disks were soaked in the tincture and placed in petri dishes containing Brain-Heart Infusion agar inoculated with a lawn of one of four bacterial species: *Streptococcus mutans, Streptococcus salivarius, Neisseria sicca,* and *Staphylococcus aureus*. After 14 hours of incubation at 37°C, zones of inhibition were measured and compared to control disks that only contained 75% ethanol. Results indicated that the S. canadensis root extract significantly suppressed bacterial growth when compared to the control. Average zones of inhibition were 24.8 mm for *S. mutans*, 22.6 mm for *S. salivarius*, 20.2 mm for *N. sicca*, and 20.6 mm for *S. aureus*. All of these zones were significantly greater than the control disks for each bacterial species ($p < 0.001$). The next step in this study will be to examine the minimum inhibitory concentration of the root tincture against the same bacterial species.

EFFECTS OF ALTERNATIVE IRRIGANTS USED IN ROOT CANAL TREATMENTS ON DISRUPTION OF FUSOBACTERIUM NUCLEATUM BIOFILMS,** S. Caitlin Ramsey* and A.L. Kwiatkowski, Young Harris College, Young Harris, GA 30582. *Fusobacterium nucleatum* is a bacterium that helps destroy oral tissue by joining with other more harmful bacteria, forming biofilms and even infecting root canal pulp. Infected root canals can be treated by removing infected pulp and administering irrigants to eliminate bacteria. Any bacteria or biofilm that remains after treatment can keep the tooth from healing. Today's irrigants are harsh chemicals that if administered incorrectly can damage surrounding tissue. This experiment tested how more natural substances compare to the common irrigants against *F. nucleatum* biofilms. Ninety-six well plates were inoculated with 1 x 10^6 *F. nucleatum* cells/ml Schaedler broth and then were grown anaerobically for 72 hours at 37°C. Growth of the cells was determined by reading the OD at 600 nm using a spectrophotometer. The cells were then treated with irrigants for 5 minutes at 37°C including the most commonly used ones: 3% and 6% NaOCl and chlorohexidine, and natural substances including 0.2% farnesol, 5% or 20% xylitol, 20mM salicylic acid, mixtures of the natural substances, and saline (control). The remaining biofilm was stained with safranin, solubilized with 95% ethanol, and quantified by reading absorbance at 492 nm. By testing the alternatives against the common irrigants, this research will help determine the effectiveness of natural substances in endodontic medicine. The funding for this project was provided by the Young Harris College research grant.

A PRELIMINARY ASSESMENT OF THE CORRELATION BEWTEEN THE HEALTH SCORES OF RESTAURANTS IN THE CSRA AND COLIFORM-COUNTS IN TEA,** Zachery Fryer*, Rahil Syed*, Harnish Trivedi*, Lindsey Vernon, Samuel Whitten and Chris Bates, Georgia Regents University, Augusta, GA 30904. Coliforms are defined as gram-negative rod shaped bacteria that ferment lactose producing both acid and gas. Coliforms are frequently found in the intestinal tracts of mammals and birds, and can often be identified in soil samples. Most municipalities limit or prohibit the number of coliforms in drinking water as they are often associated with a contamination event potentially involving human pathogens. Tea and especially sweet tea are popular beverages served at many restaurants in the Central Savannah River Area (CSRA). In this study, we hypothesize that there is an inverse correlation with the health score of a restaurant and the amount of coliforms present in tea served by the restaurant. To test samples for bacteria, tea without ice is purchased from restaurants and transported to the laboratory on ice. Serial dilutions of tea are inoculated onto petrifilms and incubated for forty eight hours. Total gram-negative bacteria, coliforms, and *Escherichia coli* are counted and compared to the health score for that particular restaurant. Preliminary data indicates that coliforms can indeed be identified in some tea samples from restaurants but more samples are needed to do any correlation statistics.

Section VI: Philosophy and History of Science
Health Sciences Building, Room 121
E.T. McMullen, Presiding

9:00 **SHELL BLUFF – A FOSSILIFEROUS RIDGE, THE SITE OF THE EXTINCT OYSTER *CRASSOSTREA GIGANTISSIMA* AND HISTORY OF ITS IDENTIFICATION,** Elliott O. Edwards, Jr., Bartram Trail Conference, Savannah, GA 31410. After John Bartram was appointed King's Botanist, his first assignment was to travel to Florida to collect plants and describe parts of SC, GA, and Florida for the King.

The expedition would last almost 10 months, between July 1, 1765 to April 10, 1766. John and his son William left Phila. Penn. on July 1, 1765, and they would stop off at Shell Bluff to explore the bluff and observe the fossil oysters while on their way to Savannah. On September 9, 1765 they arrived at this bluff which overlooks the Savannah River. John and son were the first to visit Shell Bluff and document it. John recorded his observations in his journal and made meticulous notes on the bluff and oysters. He described the strata, monstrous oysters, the soil and the unique flora. The Georgia Geologic Survey, in 1911, described the site as a classic locality and stratigraphically one of the most important exposures in the Georgia Coastal Plain. The British naturalist, John Finch described a fossil oyster taken from the site in 1824 as *Ostrea gigantissima*. In 1834, T.A. Conrad described the oyster as *Ostrea georgiana*. Recently the species has been assigned to the genus Crassostrea and now recognized as *Crassostrea gigantissima*. This paper will review the natural history of the oyster's identification, the bluff, and the importance of the oyster and its name. A description of the unique flora will be given and an update on the States Natural Landmark status, which recommended Shell Bluff.

9:30 **COLUMBIAN CATASTROPHES: FLOOD BASALTS, OUTBURST FLOODS, AND BRETZ,** E.T. McMullen, Georgia Southern University, Statesboro, GA 30460. The massive flood basalts around the Columbia River region are, in some places, more than 10,000 feet thick and cover mainly eastern Washington and Oregon, western Idaho, and part of northern Nevada. They are from catastrophic eruptions where extraordinary volumes of lava poured from fissures along the Washington/Oregon/Idaho border. An outburst flood can happen when water dammed by a glacier is released. J Harlan Bretz saw the many coulees, including the 50-mile-long Grand Coulee, and massive potholes that were carved into the Columbia Plateau basalt. Other places were scoured or had gravel deposits that contained boulders 3 to 4 feet in diameter. Bretz concluded that these, and other features such as the enormous Dry Falls, were caused by a catastrophic flood that sweep through Eastern Washington and eventually made its way down the Columbia River to the Pacific. He published his idea in a series in of papers in the 1920s. Other geologists, without going to see for themselves and driven by uniformitarian dogma, absolutely refused to accept a catastrophic explanation. For example, one said that every effort should be made to account for the existing features without employing so violent an assumption. Bretz battled uniformitarian geologists for over 30 years until new data, such as giant ripple marks and evidence of a monster glacial lake in Montana, forced them to go and see for themselves. After a well attended 1965 field trip to Washington, most geologists accepted a catastrophic flood. It took over four decades, but once the idea succeeded, geologists then recognized obvious traces of other outburst floods.

10:00 **Section Business Meeting**

10:30 IDEOLOGY (MASQUERADING) AS SCIENCE: THE LAFFER CURVE, Ronald E. Mickens, Clark Atlanta University, Atlanta, GA 30314. The social sciences have certain aspects which incorporate scientific methodology. However, other features are focused on authoritarian forms of knowledge acquisition. Thus, ideological considerations may control and determine what should be believed to be "true," how these "truths" are to be interpreted, and what are the consequences following from these "truths." Often the starting point begins with the statement of "a priori" truths, and consequently, theoretical structures are then constructed to give back the already (a priori) desired conclusions. An example of this is the Laffer curve. We give a summary of its genesis, the influence that it had on economic thinking and policy, and the reaction coming from laypersons (mainly politicians), economists, and those trained in mathematics/

mathematical economics. In summary, we show (as many others have previously done) that the construction and analysis of the Laffer is an ideological based construct having no foundation in either valid mathematical conceptualization or available data, and thus is scientifically meaningless. Background information is given in M.H. Spencer, Contemporary Economics (Worth Publishers, 1986), pps. 293 and D-32.

11:00 **THE ROLE OF HISTORY IN SCIENCE,** Charmayne E. Patterson and Ronald E. Mickens, Clark Atlanta University, Atlanta, GA 30314. What are the roles that history plays in the sciences? While many responses may be given, the following provide important clues to a proper answering of the question: (1) Historical analysis allows the conclusion that science is associated with "progress." (2) Further, this analysis gives guidance as to how this progress may be measured and evaluated. (3) An important consequence of these activities is provided by the insights gained by examining how research programs are established, by whom, and for what purposes. A major conclusion is that the historical analysis of science tells us that "something" must be discarded for progress to occur.

Section VII: Science Education
Health Sciences Building, Room 209
Mike Sakuta, Presiding

9:30 **USING VOLUNTEER WORKSHOPS TO IMPROVE STUDENT SUCCESS IN INTRODUCTORY PHYSICS,** Adam Pullen and Ajith DeSilva, University of West Georgia, Carrollton, GA 30118. It is common in the USA that algebra based Introductory Physics courses are taught in a traditional format, which includes three hours of lecture for a three credit-hour course and two hours of separate laboratory class for one credit-hour per week. The UWG Physics department introduced an optional workshop outside the regular class time in an effort to increase students' engagement, collaborative work, and problem solving skills. Results indicated that the percentage of students earning a D, F, or withdrawing (DFW) from the course was much lower for students who attended the workshops. The statistics presented in this study included DFW rates since workshops began in 2010, a breakdown of the final letter grade achieved by students participating in workshop and those not, and the pre- and post-test scores on a conceptual survey in Force and Motion Concept Evaluation (FMCE). When compared to 10 years of institutional data, the DFW rate was reduced by 10% for those classes offering the optional workshop. This data was measured over a period from 2001–2012. The sample size of years 2001–2009 was 1102 students, and the sample size from 2010–2012 was 607 students. The data was taken from information provided by the registrar's office at the University of West Georgia. A major outcome of this project is the institutionalization of workshops for all students enrolled in introductory physics. In the future, these workshops will be available for registration on the university's Banweb system to reduce the time conflicts keeping some students from attending. The authors would like to thank the West Georgia UWISE program for their financial support for this research.

10:00 **Section Business Meeting**

10:30 **DESIGN AND IMPLEMENTATION OF AN UPPER LEVEL BIOLOGY COURSE WITH AN EMPHASIS ON EXPOSURE TO PRIMARY LITERATURE,** Chris S. Bates, Georgia Regents University, Augusta, GA 30912. Molecular Pathogenesis is a course that is designed for upper level Biology majors. It was imple-

mented first in 2012 and again in 2014. The purpose of this course was to expose upper level biology majors to mechanisms of pathogenesis at the molecular level as well as introduce students to the primary literature. Topics covered in the course included concepts in immunology, viral and bacterial pathogenesis, as well as the molecular mechanisms of selected bacterial toxins. A portion of the laboratory component of the course was utilized for students to present recent articles in the primary literature that focused on some aspect of pathogenesis at the molecular level. With an average class size of 17, students worked in small groups to identify relevant articles. After instructor approval, students led class discussions on their selected articles. Students often identified with the authors when they agreed with conclusions in the articles, and distanced themselves when they disagreed with the authors. Students were successful at presenting experimental design, results, and conclusions as judged qualitatively by other faculty as well as quantitatively by using a rubric for evaluations. Examinations at the end of the semester indicated that students were successful in understanding the experimental techniques and results from each of the papers presented. The class averages of these exams were similar to the class averages on cumulative final exams covering lecture content. While this method of exposing undergraduates to the primary literature has some limitations, it does provide opportunities for content immersion and critical thinking.

10:45 **PEDAGOGIC CHALLENGES IN TECHNOLOGY INTENSIVE QUANTITATIVE ONLINE CLASSES,** Ulrike G. Lahaise, Georgia Perimeter College, Clarkston, GA 30021. Pass/Withdrawal-Fail Data collected by Georgia Perimeter College's Office of Institutional Research from all science sections from Fall 2011 through Fall 2012 show that Online Astronomy Laboratory classes suffer from a significantly higher percentage of "W"s and "F"s than their on-campus counterparts. However, a comparison of passing and failing grades of online Astronomy lab students versus college-wide averages reveals that online students who persist to semester end perform at least as well as on-campus students on comprehensive course assessments. Non-science majors taking introductory online science labs face the same learning challenges as on-campus peers (unfamiliarity with scientific thinking, math anxiety, low confidence, difficulties with calculator use and graphing). In addition, online students encounter individual obstacles with personal technology, and balancing work, family, and school. Voluntary student availability data (days and times throughout the week available for study groups) was collected from the author's combined iCollege online astronomy lecture and lab sections from Spring 2013 through Spring 2014. A simple spreadsheet analysis of the data shows that most online students are isolated in time and space from classmates and the instructor. Furthermore, a pool size of at least 60 students is needed for at least four students to be available each week at the same time for a potentially viable, synchronous study group. In conclusion, since persisting online lab students are at least as successful as on-campus lab students, targeted intervention techniques need to be employed to counteract the identified problem issues that cause students to stop participating or withdraw. Several techniques will be suggested involving pre-registration advising, supporting students as individuals, fostering peer support, and frequent, low stakes performance checks involving constructive instructor feedback.

Section VIII: Anthropology
Health Sciences Building, Room 300
Teresa P. Raczek, Presiding

8:30 **DENTAL ANALYSIS OF TWO AREAS FROM A ROMAN CEMETERY IN IERPAPETRA, CRETE, GREECE**,** April M. Tolley and S.K. Smith, Kennesaw State University, Kennesaw, GA 30144. The 24th Ephorate of Prehistoric and Classical Antiquities of the Greek Ministry of Culture excavated two cemeteries in Ierapetra, Crete, Greece. These two cemeteries, Malliotaki and Dialektaki, date to the Roman period of occupation on the island. The dentition from the skeletal remains found in both these cemeteries display caries, antemortem tooth loss, linear enamel hypoplasias, and green staining. Comparing the pathologies of the dentition from the remains from Malliotaki and Dialektaki can help determine whether the individuals from these cemeteries belonged to the same population or whether they belonged to different populations. Additionally, the green staining, which occurs as a result of copper coins being placed in the mouths of the individuals at the time of burial, appears to be present on the teeth and mandibular fragments of only females and juveniles. This research is part of a larger study on human remains from Roman burials from the Ierapetra area, which will be the first full analysis of Roman burials from Crete.

8:45 **HABITUAL LOADING PATTERN INFLUENCE ON METAPHYSEAL MORPHOLOGY IN THE JUVENILE LOWER LIMB**,** Alice E. Fazlollah*, University of Tennessee, Knoxville, TN 37996. Cross-sectional geometric (CSG) properties of the long bones of the human skeleton can be used to interpret subsistence activities individuals may have performed routinely in past societies, such as fishing or long-distance hunting. Although the effects of habitual force application from these activities have been well-documented in the adult skeleton, little is known about their effects on skeletal growth and development. More specifically, the manner in which forces are distributed across the growth plate and their influence on bone growth have not been fully documented. This study investigates the relationships between biomechanical forces and the morphofunctional development of lower limb joints in juvenile humans with habitual locomotor patterns. Retroactive CT scans of the lower limbs of living juveniles that play high-impact sports (n = 573) are used to quantify metaphyseal CSG properties of the femur and tibia at four locations. Imaging software is used to turn the cross-section of the bone into a matrix, which is then analyzed for bone thickness, shape, and displacement from the central axis. Preliminary results suggest a significant correlation between individual locomotor patterns and CSG properties in the femur and tibia of children under 18 years of age. This research fills a needed gap in the anthropological literature and will potentially provide pediatric and sports medicine orthopedic surgeons with a quantified view of limb development and bony response to both internally and externally applied forces.

9:00 **THE SEARCH FOR EVIDENCE OF DOMESTIC OCCUPATION: A SPATIAL ANALYSIS OF MISSISSIPPIAN FEATURES AT THE DABBS SITE, BARTOW COUNTY, GA**,** Emily A. Longacre*, Duncan Balinger, Britt Davis, Jamison Jewitt, Jon Kemp and Jason Whatley, Kennesaw State University, Kennesaw, GA 30144. The Dabbs Site, located in the periphery of the Etowah Indian Mounds, dates from the Middle Woodland to the Middle Mississippian period. This was a time when the chiefdom of Etowah had its great political influence on the region. Dabbs, a multicomponent site, has been undergoing archaeological investigation for the past three years under the direction of Terry Powis of Kennesaw State University. Based on the features that

have been uncovered so far; a burial, post holes, and large storage pits, we are looking for evidence of long-term domestic occupation. In the fall of 2014, the focus was primarily on Phase III excavation of large circular pit features, which were, for the most part, a meter in diameter, and a meter deep. In the previous year, an early Mississippian burial was uncovered, which could be evidence of habitation when associated with the storage pits. In 2012, a large circular storage pit containing an array of artifacts (bird points, chert in various stages of work, botanical remains, as well as ceramic sherds with a variety of decorative motifs) were uncovered. Such notable features coexisting in such a small area are indicators of domestic occupation. Artifacts and soil samples were taken from the features, which were excavated in the 2014 field season, and lab analysis will confirm their domestic nature. Once flotation has been conducted on the features the floral remains will provide insight to the nature of activities at the site. The hope in conducting this research is that it will provide valuable data on the nature of residential occupations during Woodland and Mississippian periods. No funding sources were utilized.

9:15 **MISSISSIPPIAN SETTLEMENT PATTERNS IN THE OGEECHEE RIVER VALLEY: PRELIMINARY FINDINGS FROM A CASE STUDY AT OLD TOWN PLANTATION**,** Rachael V. Cohran*, Georgia Southern University, Statesboro, GA 30458. Discernible patterns of Mississippian period (A.D. 900 – 1600) human settlement in Georgia, and much of the Southeastern United States, are informed by decades of research and constructed models which include influential ecological and social factors. Most of our knowledge, however, is based on Mississippian research in physiographic areas such as the Ridge and Valley, the Piedmont, and the Atlantic and Gulf Coasts. This investigation addresses the Mississippian occupation of the Atlantic Coastal Plain through a case study at Ogeechee Old Town Plantation, a 3,700-acre tract located along the Ogeechee River in Jefferson County, Georgia. Archival and collections research, combined with field survey and testing, reveal information pertinent to our understanding of Mississippian settlement in an under-represented Physiographic Province, with implications for the application of published models explaining and predicting patterns of Mississippian occupation in the greater Southeast. This research is supported by the Georgia Southern University Department of Sociology and Anthropology.

9:30 **MAPPING SOIL PROFILES AND PHOSPHOROUS LEVELS AT CAMP LAWTON (9JS1)**,** William C. Brant, Georgia Southern University, Statesboro, GA 30458. Camp Lawton was a Confederate prisoner of war camp in central Georgia used during the latter part of the Civil War. Previous investigations at the site have identified the locations of the stockade walls and areas of prisoner occupation. This research utilizes relative soil phosphate data gathered through the Mehlich 3 chemical extraction process in order to identify areas of human activity. Soil profiles and relative soil phosphate levels are then mapped and compared with locations of artifacts and buried soil anomalies identified through shovel-test excavations in an effort to discern if phosphate analysis is suitable for detecting these activity areas at Camp Lawton.

9:45 **A PRELIMINARY STUDY ON QUARTZ LITHIC ANALYSIS REPLICABILITY: AN EXPERIMENTAL ARCHAEOLOGY PROJECT**,** Staci Lusk*, Kennesaw State University, Kennesaw, GA 30144. Quartz lithics are commonly found in the archaeological record, even though quartz is a challenging raw material to work. Because it is large grained, quartz is also difficult to analyze. This project assesses the replicability of quartz lithic analysis among archaeologists. It tests voluntary participants of various skill levels on the analysis of chert, obsidian, and quartz lithics to determine the

rate of success in analysis. This paper conjectures that the rate of analytical error is much higher when analyzing quartz than the other materials.

10:00 **Section Business Meeting**

10:30 **PUBLIC AFFAIRS OF THE PRECLASSIC MAYA: INVESTIGATIONS AT PACBITUN'S PLAZA A**,** Blake S. Bottomley, Jeffrey B. Davis and Terry G. Powis, Kennesaw State University, Kennesaw, GA 30144. For sites in the Belize Valley, it is common to find the earliest forms of public architecture lying beneath sequential layers of construction phases at the site's core. One of the oldest known forms of public architecture found in the Belize Valley and the Maya Lowlands is the E-Group and dates to as early as the Middle Preclassic (900-300 BC). Although the functionality is still heavily debated, most agree on its public ritual/ceremonial aspects. The 2013 and 2014 Pacbitun Regional Archaeological Project (PRAP) excavations of the site core (Plaza A) at the ancient Maya site of Pacbitun aimed to locate and investigate these early forms of public architecture. Investigations in Structures 3 and 5 over the past two years have yielded primarily Late Classic (AD 600-900) period architecture, considerably later in date than the beginnings of E-Group complexes across the valley. Furthermore, a magnetometry and ground penetrating radar survey across Plaza A revealed a large, sub-plaza burned temple dating to the Middle Preclassic period, identifying it as one of the earliest, if not the earliest form of public architecture at the site. However, the function of this early temple in relation to the other structures in the plaza has yet to be fully explored. This paper will summarize our research to date, including a look at other architectural complexes in the Belize Valley that were involved early public activities similar to what we have identified at Pacbitun.

10:45 **BANGLES, BEADS, AND OTHER CHALCOLITHIC THINGS: AN ANALYSIS OF THE MATERIAL CULTURE AT PACHAMTA, RAJASTHAN, INDIA**,** Charles K. Brummeler and Antonio D. Mendez-Silva, Kennesaw State University, Kennesaw, GA 30144. Pachamta, an archaeological site in the northwest state of Rajasthan, India, dates back to the third millennium B.C.E. The site consists of a Chalcolithic period deposit that is contemporary with the Harappan culture and was inhabited by farmers and artisans. The excavations at Pachamta, which took place during the months of January and February of 2015, have uncovered a wealth of artifacts ranging from ceramic sherds to lithics, groundstone, faunal remains, and antiquities including beads, oil lamps, terracotta containers, bangles, and figurines. This paper will compare antiquities found here to others found in significant Ahar Culture sites such as those at Gilund, Balathal, and Ojiyana. Comparison of these artifacts will help us to visualize everyday processes and examine the heterogeneity that exists across the society.

11:00 **GHOSTS AND *GHORAS*: AN ARCHAEOLOGICAL PERSPECTIVE ON ORAL HISTORIES AND HERITAGE IN RAJASTHAN, INDIA**,** Antonio D. Mendez-Silva and Charles K. Brummeler, Kennesaw State University, Kennesaw, GA 30144. The southern region of Rajasthan, India has a rich archaeological history which stretches back to the Paleolithic. Previous archaeological surveys and excavations have yielded material culture from all of these time periods, particularly that of the "Ahar Culture" (c. 3000-1700 B.C.E.). We conducted a research project in winter 2015 in which we visited 14 archaeological sites in or near rural villages. In addition to assessing the damage to these sites, we further probed the oral histories of the villagers living near the mounds. This was accomplished through the use of ethnographic interviews as well

as an archaeological census. We found various associations regarding these sites, ranging from the positive to the negative. Deeper reflection upon these associations may yield a better understanding of the cultural heritage and the preservation process, which could help open lines of communication with archaeologists looking to investigate these sites in the future.

11:15 **AN ETHNOGRAPHIC STUDY OF LATIN AMERICAN IMMIGRATION TO THE UNITED STATES**,** Daniel S. Garner*, University of West Georgia, Carrollton, GA 30118. The purpose of this study is to identify and examine the factors affecting the identity and social integration of people who emigrate from Latin America to the United States by comparing and contrasting the experiences of a small cohort of immigrants living in Georgia. Data collection includes structured and informal interviews with participants to discuss topics related to the immigrant experience and resulting cultural adaptation in the United States, including national and cultural self-identification. Information obtained from additional scholarly sources will be integrated with the data collected from interviews to produce a comparative ethnographic account of Latin American immigrant experiences in the United States. This study is approved by the university IRB and one participant has already completed interviews. Early study results suggest that societal pressures encourage immigrants to adopt a hybridized cultural identity in which the culture of their homeland is either downplayed or concealed while in public settings. This study is intended to enrich and expand the current knowledge of Latin American immigrant culture by highlighting the personal experiences of a few individuals. This study has been funded by the Antonio J. Waring Research Scholarship offered by the Anthropology Department at the University of West Georgia.

POSTERS

A PURSUIT OF OCCUPATION: EFFICIENCY OF REMOTE SENSING FROM A MISSISSIPPIAN SITE IN BARTOW COUNTY, GA, Allison C. Smith, Jamison Jewitt, Kennesaw State University, Kennesaw, GA 30144. The cultural and physical landscape reflects a rapidly changing environment. It is important to the field of archaeology that cultural features are investigated before they disappear. This research highlights and examines the use of remote sensing techniques in addition to traditional phases of archaeology in locating and uncovering evidence for occupation by prehistoric native peoples. Magnetometer survey of the Dabbs Site, a Mississippian period village located near the Etowah Indian Mounds, was pivotal in the identification of anomalies and helped guide the placement of excavation units in the targeted area. The magnetometer survey revealed anomalies that the Phase I shovel testing failed to locate. In particular one large circular anomaly, possibly a house, was chosen for excavation. The unit was designated as Mag Unit 1. Large amounts of artifacts were found in the unit but no cultural feature was identified. Negative results were produced through groundtruthing the anomaly which impacts the future decision to utilize magnetometry surveys or shovel testing at the Dabbs Site. Ultimately, the method chosen, and the potential influence it has on the features found, may require the use of additional remote sensing techniques that will allow us to understand the nature of occupation for the people that lived and farmed in the shadow of Etowah. No funding sources were utilized.

SEX DIFFERENCES IN VERTEBRAL PATHOLOGIES FROM A GERIATRIC COLLECTION EXHUMED AT THE ST. NICHOLAS CEMETARY IN LIMASSOL, CYPRUS, Caitlin E. Mayer* and Frank L. Williams, Georgia State University, Atlanta, GA 30303. Sex differences have been reported in vertebral pathologies in several human

populations, such as greater osteoarthritis and osteoporosis in females. The 20th century St. Nicholas Cemetery in Limassol, Cyprus includes hundreds of individuals with known age and sex. Twenty-four individuals divided evenly between the sexes were observed for evidence of thoracic and lumbar pathology and compared using t-tests while eight pathologies were examined using multivariate analysis. The t-tests indicate females exhibit significantly greater lumbar superior and inferior porosity and lipping as well as inferior surface osteophytosis, whereas males show significantly greater lumbar fusion. For the thoracic vertebrae, females show significantly greater superior and inferior lipping, osteophytosis and eburnation, whereas males exhibit a significantly greater number of superior and inferior Schmorl's nodes. A principal components analysis for lumbar vertebrae shows a broad overlap between males and females with males projected more negatively and females more positively on the basis of greater severity of Schmorl's nodes in the former and porosity in the latter. For the thoracic elements, males and females are more distinct and males show less variability than females. Overall females exhibit a greater intensity of vertebral pathologies except Schmorl's nodes and lumbar fusion which are more common in males.

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