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GEORGIA JOURNAL OF SCIENCE

GEORGIA ACADEMY OF SCIENCE

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GEORGIA JOURNAL OF SCIENCE

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

Hello Academy Members and Guests:

Welcome to the 2014 meeting of the Georgia Academy of Science!

The Academy thanks Dr. Ricardo Assiz, President of Georgia Regent's University, for the invitation to meet on this campus. The Academy is also grateful to Andy Hauger and his committee for organizing this meeting.

About 100 oral talks and almost 60 poster presentations will be given at this meeting. I want to invite everyone to the poster session which will be held on Friday afternoon between 5 pm and 6:30 pm.

This year we have a special talk which will be given by Hong Qin. He will speak at 10:30 right after the Section I meeting (Biology). You will want to bring your laptop computer since he will be talking about R (an open-source computer language). You may find more information about this language at http://www.sr.bham.ac.uk/~ajrs/R/why_R.html

Please also be sure to visit some of the local attractions which make Augusta a unique place. If you have any questions, feel free to talk to me.

Sincerely,

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



"Somewhere, something incredible is waiting to be known."
- Carl Sagan

That tantalizing promise has been the motivator of scientists, researchers, and discoverers since the beginning of time. The certainty that if we just keep exploring, just keep questioning, just keep learning—incredible truths will reveal themselves. Truths that cure disease, propel rockets, create energy, ... or simply further human understanding.

All of us at Georgia Regents University are pleased to welcome scientists, researchers, and discoverers from the Georgia Academy of Sciences for the GAS 2013-2014 annual meeting. As Georgia's newest broad-based research university and only public academic health center, GRU is fully committed, along with GAS, "to the promotion of science education and the fostering of scientific research in the state of Georgia."

Research and education in the math and science disciplines have never been more vital to the future health and prosperity of our state, our nation, and our world. Innovation is the key to survival and success in an increasingly global economy, and encouraging our young people to study and work in the STEM disciplines is critical to secure our collective future.

At GRU, science and research are fundamental to our mission, values, and curriculum. We offer undergraduate programs and degrees in Biology, Chemistry, Computer Science, Nursing, Management Information Systems, Math, Physics, and more. We house the nation's 13th oldest medical college and the state's sole dental college, along with an aligned and integrated health system.

Our expanding research portfolio provides students research opportunities at both the graduate and undergraduate levels in nearly every program. Our faculty scientists are renowned for groundbreaking translational research in areas like cancer, neuroscience, cardiovascular biology, regenerative/reparative medicine, public and preventive health, and molecular/personalized medicine.

So we look forward to learning with you over the next couple of days—from the many member and student presenters and from keynote speaker, Dr. John Mateja, who promises to provide thought-provoking commentary from his wide-ranging STEM background both inside and outside of higher education.

Thanks go out to our faculty organizers from the College of Science and Mathematics, the College of Allied Health Sciences and our staff from our Special Events team, who have devoted countless hours to ensuring its success. Please enjoy your time on our campus and in our city, and may your meeting be both productive and successful.

Ricardo Azziz
President, Georgia Regents University
CEO, Georgia Regents Health System

GAS 2014 PROGRAM

Friday, March 28, 2014

| | | |
|----------------|---|---|
| 12:00 PM | Registration | Jaguar Student Activity Center Ballroom |
| 1:00 PM | Oral Presentations | |
| | Section I Biology | Science Hall W1002 |
| | Section II Chemistry | Science Hall E1051 |
| | Section IV Physics, Mathematics, Computer Science, Engineering and Technology | Science Hall W1008 |
| 1:00 - 5:30 PM | Poster Presentations | Jaguar Student Activity Center Ballroom |
| 6:00 PM | Dinner | Douglas Barnard Amphitheater |
| 7:00 PM | Keynote Address | Performing Arts Theater |

Saturday, March 29, 2014

| | | |
|-----------------|---|---|
| 8:00 - 11:59 AM | Poster Presentations | Jaguar Student Activity Center Ballroom |
| 8:15 AM | Oral Presentations | |
| | Section I Biology | Science Hall W1002 |
| | Section II Chemistry | Science Hall E1051 |
| | Section III Earth and Atmospheric Sciences | Science Hall E1047 |
| | Section IV Physics, Mathematics, Computer Science, Engineering and Technology | Science Hall W1008 |
| | Section V Biomedical Science | Science Hall E1049 |
| | Section VI Philosophy and History of Science | Science Hall W1004 |
| | Section VII Science Education | Science Hall W1001 |
| | Section VIII Anthropology | Science Hall E1053 |
| 12:00 PM | Student Awards/Lunch/Business | Jaguar Student Activity Center Ballroom |

FRIDAY PAPER PRESENTATIONS

*Denotes student presenter

**Denotes student research in progress

Section I: Biological Sciences

Science Hall W1002

Paul T. Arnold, Presiding

- 1:00 **CREATING A DRUG-SENSITIVE *PICHIA PASTORIS* YEAST STRAIN THROUGH GENE DELETION OF PUTATIVE DRUG TRANSPORTER TRANSCRIPTION FACTORS****, Shawna McCafferty*, E. Holcomb*, D. Sloan*, S. Aller and B. Dunn
- 1:15 **INFLUENCE OF GENE NETWORK TOPOLOGY ON CELLULAR AGING****, Brittany Jackson* and H. Qin
- 1:30 **SIMULATED PREDATION AND RELEASE OF ALARM CUES BY PLANARIANS**, Jessica L. Winkler*, C.B. Winkler* and F.S. Corotto
- 1:45 **SEASONAL VARIATION IN POPULATION DISTRIBUTION OF *SUS SCROFA* ON COWDEN PLANTATION, JACKSON, SOUTH CAROLINA****, Grace C. Jansen* and B. Saul
- 2:00 **THE USE OF TRAIL CAMERAS TO ESTIMATE EFFECTS OF PREDATOR ACTIVITY ON PREY DISTRIBUTION IN A FLOODPLAIN RIPARIAN WOODLAND**, Jessica Miller* and B. Saul
- 2:15 **FIELD EVALUATION OF WILDLIFE POPULATION RESPONSES TO FATTY ACID SCENTED CHEMICAL ATTRACTANTS**, Kathleen E. Kelley*, R. Lancaster*, L. Justice* and B. Saul
- 2:30 **ECTOPARASITES OF THE WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) IN SOUTHEAST GEORGIA****, Willie Lee Adams, Jr.* and J. Wedincamp, Jr.
- 2:45 **TORTOISE POPULATION PERSISTENCE: 10 YEARS POST CONSTRUCTION****, Cody Osting*, R. Phillips*, B. Simmons, J. Wedincamp, Jr. and J. McGuire
- 3:00 **Break**
- 3:15 **THE ENERGETIC BENEFITS OF HUDDLING IN *OCHROMYS NUTTALLI*****, Alexa N. Gusmerotti*, W.H. Miller*, G.W. Barrett and T.L. Barrett

- 3:30 **METAL TOLERANCE AND ACCUMULATION IN A RARE PLANT SPECIES, *PEDIOMELUM PIEDMONTANUM* (FABACEAE)****, Jessica Padgett*, Elgin N. Hobbs*, J. Ramos and S.T. Bennetts
- 3:45 **INOCULATION WITH *RHIZOBIUM* AND HERBIVORY BY *MEGACOPTA CRIBRARIA* AFFECT SOYEAN PHYTO-CHEMISTRY AND SUCCESSIVE HERBIVORES****, Anne O. Zimmerman* and C.B. Zehnder
- 4:00 **DOCUMENTING CHANGES IN MOTH LIFECYCLE AND ABUNDANCE CAUSED BY URBAN WARMING****, Trung Quach*, Yen Duong*, I.Y. Ricketts, J. Pickering and J.M. Lochamy
- 4:15 **THE DEVELOPMENT OF A NEW BIOLOGICAL CONTROL, THE GIANT WATERBUG (*BELOSTOMA LUTARIUM*), TO CONTROL SNAIL POPULATIONS****, Peter M. Schlueter*, R.A. Fiorillo and M.A. Schlueter
- 4:30 **AN EVALUATION OF GEORGIA'S MASON BEES (*OSMIA SPECIES*) AND THEIR NESTING PREFERENCES****, Nicholas G. Stewart* and M.A. Schlueter
- 4:45 **OBSERVING AND MEASURING THE POLLINATION EFFECTIVENESS OF *ANDRENA CRATAEGI* AND OTHER BEES IN COMMERCIAL APPLE ORCHARDS**, Catherine G. Schlueter*, N.G. Stewart and M.A. Schlueter

Posters will be displayed through 7:00

**Section II: Chemistry
Science Hall E1051
Ghislain Mandouma, Presiding**

- 3:15 **THE MORPHOLOGY OF MOLYBDENUM TRIOXIDE NANOPARTICLE DEPOSITION ON CARBON NANOTUBE NETWORKS****, Liqiu Zheng*, Jerry Li and K.C. Chan
- 3:30 **SYNTHESIS AND CHARACTERIZATION OF OLIGO-BENZO[c]CINNOLINE ETHYNYLENES AS MOLECULAR JUNCTIONS****, Bridgette Sands*, Danielle Mitchell and Ghislain Mandouma

Posters will be displayed through 7:00

**Section IV: Physics, Mathematics, Computer Science and Technology
Science Hall W1008
Hasson M. Tavossi, Presiding**

- 1:30 **SITE PERCOLATION IN TRIANGULAR AND KAGOME LATTICE**, John Calhoun Stephens and Trinanjan Datta
- 1:45 **DYNAMIC PHASE TRANSITION IN THE CLASSICAL ANISOTROPIC XY MODEL ON A SQUARE LATTICE**, Jones E. Jenkins, William D. Baez and Trinanjan Datta
- 2:00 **DISTORTIONS IN 2p4d PARTIAL FLUORESCENCE YIELD FOR 4d ELEMENTS**, Alexander Price, Frank de Groot and Trinanjan Datta
- 2:15 **OBSERVATIONS OF CHANGES IN FLUORESCENCE DECAY TIMES IN RUBIDIUM VAPOR EXPOSED TO MAGNETIC FIELDS**, Chris Cutler and Tom Colbert
- 2:30 **MODELING INCANDESCENT BULB SPECTRA**, Austin B. Kerlin, J.E. Hasbun and Ajith DeSilva
- 2:45 **BROADENING THE REACH OF SCIENTIFIC EDUCATION: THE MILLIKAN OIL DROP EXPERIMENT – A SIMULATION**, Benjamin E. Hogan and Javier E. Hasbun
- 3:00 **Break**
- 3:15 **MODELING THE SOLAR SPECTRUM**, Marcus A. Davis, Austin B. Kerlin, Ajith DeSilva and J.E. Hasbun
- 3:30 **SPEED OF SOUND IN WATER AND IN SALT SOLUTIONS AT VARIOUS CONCENTRATIONS**, Daniel Hartman, Ben Jenkins and Bob Powell
- 3:45 **INFLUENCE OF MICROSTRUCTURE ON HYDROGEN DIFFUSION AND CORROSION DAMAGE IN STEEL**, J. Brant, KkochNim Oh, A. Saatchi and B. Hojjatie
- 4:00 **MECHANICAL STRENGTH OF DENTAL PORCELAIN**, C. G. Ponce, L. Hale, M. N. Tran and B. Hojjatie
- 4:15 **INVESTIGATION OF LOW-COST Cu_2O -CUI BASED PHOTOVOLTAIC DEVICES WITH NEAR INFRARED RESPONSE**, Ryan Landry, P. K. D. D. P. Pitigala, Ajith DeSilva and A. G. U. Perera
- 4:30 **A COMPARISON BETWEEN SEISMIC WAVE GRADIOMETRY AND FK ANALYSIS IN THE ESTIMATION OF THE SLOWNESS VECTOR**, A.Hughes and C. Poppeliers

- 4:45 **TEMPERATURE DEPENDENCE OF THE ELECTRICAL RESISTANCE OF DIAMOND AND SILVER NANOMATERIALS**, Natalee Hite, Evan Reed, Matthew Ansley and Ben de Mayo
- 5:00 **MEASURING THE RESISTIVITY OF PRODUCE**, Adam Pullen and J. L. Talbot
- 5:15 **DESIGNING A NOBLE MILITARY VEHICLE**, Richard (Seong Hyun) An and B. Hojjatie
- 5:30 **FLEXIBLE GROUPING IN A MIDDLE SCHOOL MATH CLASSROOM**, Carla M. Poole and R.A. Cooper

Posters will be displayed through 7:00

SATURDAY PAPER PRESENTATIONS

*Denotes student presenter

**Denotes student research in progress

**Section I: Biological Sciences
Science Hall W1002
Paul T. Arnold, Presiding**

- 8:15 **MOLECULAR SYSTEMATICS OF *CHARACODON* (GOODEIDAE): PHYLOGENY BASED ON A NUCLEAR LOCUS**, Joshua W. McCausland* and S.A. Webb
- 8:30 **EVALUATION OF SAMPLING METHODS FOR MONITORING THE SICKLEFIN REDHORSE *MOXOSTOMA* SP. IN GEORGIA**, David J. Atwood* and J.G. Davis
- 8:45 **THE IMPACT OF LOCAL WATERSHED DEVELOPMENT TO A BIODIVERSE MOUNTAIN HEADWATER STREAM FISH COMMUNITY**, Alex Spiegel* and J.G. Davis
- 9:00 **HABITAT PREFERENCES AND POPULATION CHARACTERISTICS OF A STATE-ENDANGERED CRAYFISH IN THE UPPER HIWASSEE RIVER**, Brittany Henry*, S. Weaver and J.G. Davis
- 9:15 **A MORPHOLOGICAL DESCRIPTION OF THE SKIN OF HAGFISH *MYXINE GLUTINOSA* (AGNATHA: MYXINI)**, Rasheeda S. Rickman*, A.J. Clark and T.A. Uyeno
- 9:30 **A DYADIC ANALYSIS OF ACOUSTIC COMMUNICATION IN *PROCAMBARUS SPICULIFER* (CAMBARIDAE)****, Cambrielle N. Sanders*, D.L. Bechler, J.S. Reece and T.A. Uyeno

9:45 **DEVELOPMENT OF RADTAG LIBRARIES AND SEQUENCING FOR THE ION TORRENT PERSONAL GENOME MACHINE****, F.A. Dadzie*, J.F. Elder and B. Ring

10:00 **Section Business Meeting**

Posters will be displayed through 11:59 AM

POSTERS

AN INVESTIGATION OF MARINE BIOFILMS FOUND ON THREE FISH SPECIES ALONG THE SOUTHEASTERN US**, Chris Bates, C.F. Best* and J.M. Reichmuth

A FIELD EVALUATION OF CAMERA AND LURE TYPES ON CAMERA-TRAPPING SUCCESS IN CENTRAL GEORGIA, Mark R. Beatty* and M.J. Bender

A COMPARISON OF SURFACE AND DEEP POPULATIONS OF PHYTOPLANKTON IN THE NORTHEASTERN GULF OF MEXICO**, Courtney M Brylker*, A.V.F. Nienow*, M. Waters and J.A. Nienow

DIGITAL MINIONS: OUTSOURCING RESEARCH TASKS TO SMARTPHONES AND OTHER HARDWARE, S.C. Burnett

POPULATION DENSITIES OF VARIOUS WILDLIFE SPECIES ON COWDEN PLANTATION, JACKSON, SOUTH CAROLINA, Austin Coleman*, S. Mannix*, J. Miller*, G. Jansen*, R. Lancaster*, L. Justice*, K. Kelley* and B. Saul

NEW COUNTY RECORDS OF AMPHIBIANS AND REPTILES IN GEORGIA, Ashley W. Dean*, A.L.J. Duffus, T.M. Ward*, L.A. West*, J.M. Strickland*, M.J. Bender, G.D. Hartman, N.B. Hays*, Z. Burke* and S. Croft*

ECOLOGY OF THE LARGE MOUTH BASS (*MICROPTERUS SALMONOIDES*) AND BLUEGILL (*LEPOMIS MACROCHIRUS*) POPULATIONS IN THE GORDON STATE COLLEGE POND USING MARK-RECAPTURE: TWO YEARS OF DATA**, Philip Gregory*, C. Sander-Fletcher*, J.C. George and A.L.J. Duffus

DESIGN AND DEVELOPMENT OF AN INEXPENSIVE MULTIPURPOSE UNDERWATER SENSOR USING ARDUINO™**, Eriq Hearn*, K. Lansing*, J. Lundeen*, J. O'Meara*, T. Mujadzic*, C. Bates and J. Hauger

AN EVALUATION OF THE RELATIVE INFLUENCE OF INSECT ORDERS ON BAT ACTIVITY IN BARNESVILLE, GEORGIA, Leah D. Herring*, J.D. Nestor* and M.J. Bender

PRELIMINARY ANALYSIS OF FISHES SURROUNDING ST. CATHERINES ISLAND**, A.L. Hurst*, C.F. Best*, K.A. Jonske*, J.W. Moak*, G.D. Carroll, C.W. Lambert and B.M. Saul

EVALUATION OF HEAVY METAL ACCUMULATION AND DISEASE IN VIRGINIA OPOSSUMS (*DIDELPHIS VIRGINIANA*) FROM NORTH FLORIDA AND SOUTH GEORGIA**, D.B. James* and J.M. Lockhart

MORPHOLOGICAL COMPARISON OF TWO POPULATIONS OF *HYALELLA AZTECA* FROM FRESHWATER SPRINGS IN FLORIDA, U.S.A.**, Taylor A. MacMackin*, K. Oh* and T.R. Sawicki

FECAL PELLET MORPHOMETRY AS AN INDICATOR OF BODY SIZE IN NINE-BANDED ARMADILLOS (*DASYPUS NOVEMLINCTUS*) FROM THE SOUTHEASTERN UNITED STATES**, B.A. Mixon* and C.M. McDonough

ICHTHYOFAUNA OF PHINIZY SWAMP NATURE PARK, AUGUSTA, GA, Jason W. Moak and B.M. Saul

LONG-TERM OBSERVATIONS OF FISH COMMUNITIES AND WATER QUALITY ALONG THE GEORGIA-CAROLINA COAST**, Erik Neff*, A. Outhwaite* and J.M. Reichmuth

PLANT DNA BARCODING: AN ONGOING RESEARCH PROJECT AT GORDON STATE COLLEGE**, Lucas Newman*, P.A. Scott*, S. Rosario, A.L.J. Duffus and C. Lee

MORPHOLOGICAL ANALYSIS AND COMPARISON OF A POPULATION OF *HYLALLA AZTECA* COLLECTED FROM A SPRING BASIN IN DE LEON SPRINGS STATE PARK, DELAND, FLORIDA, U.S.A. TO SPECIMENS DESCRIBED FROM THE TYPE LOCALITY IN VERA CRUZ, MEXICO**, Jane Probadora* and T.R. Sawicki

USING R AS A GENERAL PLATFORM FOR COMPUTATIONAL EDUCATION IN BIOLOGY, Hong Qin

INSECTICIDAL EFFECT ON THE ARGENTINE ANT (HYMENOPTERA: FORMICIDAE) BY METABOLITES IN PLANT SALICYLIC ACID BIOSYNTHESIS**, Paul Aaron Scott*, M. Babb*, L. Herring*, C.H. Kang, M. Brinkman and C. Lee

MULTI-YEAR INVESTIGATION OF A TURTLE COMMUNITY IN A NORTHWEST GEORGIA LAKE AND WETLAND PRIOR TO RESTORATION, Crispian F. Shelton*, C.B. Manis and G.J. Lugthart

INFLUENCE OF INSECT SIZE ON BAT ACTIVITY IN LAMAR COUNTY, GEORGIA, Victoria L. Swenson*, H.D. Bryan* and M.J. Bender

USING ANGLER CATCH DATA TO ASSESS AN INTRODUCED SPOTTED BASS FISHERY IN A GEORGIA HIGHLAND RESERVOIR**, Joe Thompson* and J.G. Davis

DETERMINATION OF A GENE EXPRESSED ONLY IN THE INFECTIVE LARVAL STAGE OF *DIROFILARIA IMMITIS***, S.J. Thompson* and E.W. Chambers

HOST-PLANT PREFERENCE OF MEGACOPTA CRIBRARIA, Taylor L. Upole* and C. Zehnder

GROWTH INHIBITION AND HYDROGEN PEROXIDE PRODUCTION OF LACTOBACILLUS JOHNSONII IN PRESENCE OF PHENOLIC ACIDS**, Sheena Vasquez*, M. Maduro*, C.F. Gonzalez and G. Lorca

ACTUAL VS. PREDICTED CHELONIAN DIVERSITY IN GEORGIA**, Tiffany M. Ward*, J.G. McGuire, A.L.J. Duffus and J. Jensen

ANURAN AMPHIBIAN DISTRIBUTIONS IN GEORGIA: PREDICTED VS ACTUAL PATTERNS**, L.A. West*, A.L.J. Duffus, J.G. McGuire and J. Jensen

PHENOLOGY OF PHOTOSYNTHESIS, LEAF AND LITTER TRAITS IN CHINESE PRIVET, AN INVASIVE SHRUB, Tyler Williams* and M.P. Weand

**Section II: Chemistry
Science Hall E1051**

Ghislain Mandouma, Presiding

- 8:15 **AN EXPLORATION OF THE SYNTHESIS AND CHARACTERIZATION OF MICROEMULSION POLYMERIZATION OF CROSSLINKED POLYMETHYL METHACRYLATE-NET-POLYETHYLENE GLYCOL DIMETHACRYLATE ENCAPSULATED POLYSTYRENE****, Christopher J. Scanlon* and Daniel Holley
- 8:30 **CATALYST- AND SOLVENT-FREE HIGH YIELDING ULLMANN COUPLING REACTION**, Solita Lam, Yvonne Pupilampudove, Ayunna Epps and Ghislain Mandouma*
- 8:45 **A PRELIMINARY ELEMENTAL ANALYSIS OF THE ORGAN SYSTEMS OF THE FETAL PIG VIA FLAME ATOMIC ABSORPTION SPECTROSCOPY AND INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY****, M.M. Quick*, A. Ahmed*, S. Hudson*, J. Solomon* and D.P. Pursel
- 9:00 **DESIGN AND SYNTHESIS OF NEW FLUORINATED SULFANILAMIDES****, Hannah E. Cole*, Gabrielle N. Costello*, J. C. Helms, J. C. Sloop, D. P. Pursell and R. Haining
- 9:15 **Break**
- 9:30 **STUDY OF STEM-LOOP DNA AS STARTING MATERIAL FOR SELEX****, S. L. Boone* and A. C. Spencer
- 9:45 **OPTIMIZATION OF THE INTRAMOLECULAR BUCHWALD-HARTWIG N-ARYLATION OF A 2-AMINOPYRROLE FOR THE ORGANIC TEACHING LABORATORY****, P. X. Moon* and C. E. Stephens

10:00 **Section Business Meeting****Posters will be displayed through 11:59 AM****POSTERS**

A NOVEL GREEN SYNTHESIS OF SUBSTITUTED BENZO[c]CINNOLINES AND DIBENZO[c,h] CINNOLINES, POTENTIAL INHIBITORS OF TOPOISOMERASES I AND II**, Tahera Nembhard*, Brittney Bender* and Ghislain Mandouma

DETERMINATION OF CADMIUM AND CHROMIUM IN COMMERCIAL WINE SAMPLES, K. Smith and S. M. Abegaz

GEMINAL DIFLUORINATION OF THE PYRAZOLE RING OF 3,5-DIPHENYL-PYRAZOLE USING AN N-F REAGENT**, Allyson L. Knapp*, C. K. Eidell, H. R. Duplain*, L. Walton*, T. B. Tinkle* and C. E. Stephens

THE SURFACE OF SILICA AS A MEDIUM FOR THE SYNTHESIS OF CHIRAL IMINES AND CHIRAL AMINES, M. Brock*, J. Rivera, C. Winford and J. T. Barbas

Section III: Earth and Atmospheric Sciences
Science Hall W1047
Alfred J. Mead, Presiding

8:00 **ASSESSING THE LEVELS OF LEAD CONTAMINATION IN KABWE AND THE POTENTIAL FOR PHYTOREMEDIATION IN REMOVING LEAD FROM HEAVILY CONTAMINATED SOILS****, Megan Corley*, Samuel Mutiti, Alice Mweetwa, Mutande Tembo, Mikalin DeFoor* and Sarah Hazzard*

8:15 **SOLAR WATER DISINFECTION (SODIS): THE PERFORMANCE OF GLASS, CLEAR PLASTIC, TRANSLUCENT PLASTIC, AND OPAQUE PLASTIC BOTTLES****, Kristina S. Hensey* and S. Mutiti

8:30 **USING GEOPHYSICS AND HYDROGEOLOGY IN STUDYING FACTORS THAT CONTROL CRAYFISH DISTRIBUTION**, Sarah Hazzard*, S. Mutiti and C. Skelton

8:45 **GEOCHEMICAL AND SUBSURFACE CHARACTERISTICS THAT DETERMINE THE LOCATIONS OF CRAYFISH ON SAPELO ISLAND****, Taylor Upole*, Samuel Mutiti, Sarah Hazzard* and Chris Skelton

9:00 **CORING AND SAMPLING OF SOILS FROM PLEISTOCENE LANDFORMS ON OSSABAW ISLAND****, Megan D. Hunnicutt* and Donald M. Thieme

- 9:15 **DID THE ALTAMAHA RIVER ORIGINALLY ENTER THE ATLANTIC AT ST. ANDREWS SOUND?**, Timothy M. Chowns and S. Hannah Hill*
- 9:30 **URBAN HEAT ISLAND PLANNING STRATEGIES IN GEORGIA CITIES****, S.J. Bowens* and S.C. Ojiagbaje*
- 9:45 **TEMPERATURE STRUCTURE TO 28 KM ABOVE THE MOJAVE DESERT**, Randal L. N. Mandock
- 10:00 **Section Business Meeting**
- 10:30 **MICRO-MINERALS FROM TOPAZ MOUNTAIN, THOMAS RANGE, JUAB COUNTY, UTAH**, David J. Babulski
- 10:45 **EOCENE-OLIGOCENE TRANSITION IN NEBRASKA DOMINATED BY CHANGING FLUVIAL ARCHITECTURE, NOT CLIMATE**, Grant S. Boardman and William E. Lukens

Section IV: Physics, Mathematics, Computer Science and Technology
Science Hall W1008
Hasson M. Tavossi, Presiding

- 8:00 **AN ITERATION DERIVED, FIRST-ORDER SOLUTION FOR A HARMONIC OSCILLATOR HAVING CUBIC-ROOT DAMPING**, 'Kale Oyedeji
- 8:15 **MEASUREMENT OF THE INTERACTIONS OF LOW ENERGY GAMMA RAYS WITH DENSE METALS FOR APPLICATIONS IN NUCLEAR CARDIOLOGY IMAGING**, G.G. Passmore, T.F. Lynam and J.L. Spradlin
- 8:30 **THE STATISTICS BEHIND COMPARING THE RATES OF PEDOGENESIS IN RECLAIMED LANDS AND THE RATES OF NATURAL PEDOGENESIS**, Eric C. Brevik and Andreas Lazari
- 8:45 **DESIGN OF A GAS-FLOW INVERTER, EXPERIMENT AND MATHEMATICAL MODELING ON THE BIFURCATION OF STEADY-FLOW INTO PULSED-FLOW**, Hasson M. Tavossi
- 9:00 **MODELING THE TEMPERATURE BEHAVIOR OF AN INCANDESCENT LAMP**, Javier E. Hasbun
- 9:15 **MARS' NORTH POLAR REGION IN LATE 2013**, Richard W. Schmude, Jr.
- 9:30 **MARS' SOUTH POLAR CAP: 1907-2005**, Richard W. Schmude, Jr.
- 10:00 **Section Business Meeting**

- 10:45 **TIME AND SPACE ARE EACH COMPOSED OF QUBITS**, Dennis W. Marks
- 11:00 **THE EFFECT OF METAL OXIDE ON RESISTIVITY OF BUCKYSHEET**, K.C. Chan, Liqiu Zheng and Jerry Li
- 11:15 **BUILDING THE NSF S-STEM PROGRAM AT GEORGIA REGENTS UNIVERSITY**, A. Hauger, S. J. Reinke and S. L. Robinson

Posters will be displayed through 11:59 AM

POSTERS

MATHEMATICAL MODELLING OF RANAVIRUS ECOLOGY IN THE UNITED KINGDOM: A CALCULUS BASED APPROACH, John C. George, Ryan D. Haire* and Amanda L.J. Duffus

COMPARING STAR FORMATION IN SEYFERT 1 AND SEYFERT 2 ACTIVE GALACTIC NUCLEI OBSERVATIONS VIA SIGNIFICANT SPECTRAL FEATURES, Murray E. Macnamara and Grant D. Thompson

MEASUREMENT OF THE INTERACTIONS OF LOW ENERGY GAMMA RAYS WITH DENSE METALS FOR APPLICATIONS IN NUCLEAR CARDIOLOGY IMAGING, T.F. Lynam, J.L. Spradlin and G.G. Passmore

EFFECT OF GEL MEDIUM IN EXTRACTION OF CANCER CELL'S COMPLEX PERMITTIVITY, Arun Saha and Le'Aaricka Hodge

ORGANIC INORGANIC HYBRID HIGH REFLECTIVITY BRAGG MIRRORS, Anthony Donato and Ajith DeSilva

MULTI-OBJECTIVE OPTIMIZATION OF COMPLEX THERMO-FLUID PHENOMENA IN WELDING, Agegnehu Atena

Section V: Biomedical Sciences

Science Hall W1047

Seyed H. Hosseini, Presiding

- 8:00 **TWO NOVEL COMPOUNDS INDUCE APOPTOSIS IN A BREAST CANCER CELL LINE****, Keri L. Jones*, Rachel K. Clay*, Ivie L. Conlon*, Thomas D. Crute and Richard D. Griner
- 8:15 **EFFECTS OF RESVERATROL AND QUERCETIN ON B[a]P- AND 3MC-INDUCED CYP1A1 REPORTER ASSAY****, Caitlin N. Meads* and Jennifer C. Schroeder

- 8:30 **EXTRACTS FROM *GANODERMA LUCIDUM*, *TRAMETES VERSICOLOR*, *GRIFOLA FRONDOSA*, AND *LENTINULA EDODES* DECREASE XRE-MEDIATED TRANSCRIPTION INDUCED BY B[A]P****, Matthew D. Sudderth* and Jennifer C. Schroeder
- 8:45 **DOES FLUOXETINE-HCL PROMOTE NEUROGENESIS IN ADULT ZEBRAFISH SUBJECTED TO STRESS?***, Nina B. Couch*, Ryan D. Shepard* and Linda G. Jones
- 9:00 **Break**
- 9:15 **EFFECT OF XYLITOL ON *FUSOBACTERIUM NUCLEATUM* AND *STREPTOCOCCUS SP.* GROWTH AND BIOFILM FORMATION****, L.N. Johnson* and A.L. Kwiatkowski
- 9:30 **THE INFLUENCE OF SECRETIONS FROM MACROPHAGE-LIKE CELLS PULSED WITH BACTERIAL GHOST ON PROSTATE CANCER CELLS****, O.Martinez*, D. N. McKeithen*, A. Stevens* and G. A. Ananaba
- 9:45 **BIOFLAVANOIDS AS FULL OR PARTIAL AGONISTS OF THE AHR AND THEIR EFFECTS ON LEVELS OF LACTIC ACID AS A MODEL OF DIABETES****, Whitney R. Marcus*, Alejandra Escamilla*, Madison L. Perdue* and Jennifer C. Schroeder
- 10:00 **Section Business Meeting**
- 10:30 **NLRP3 INFLAMMASOME'S ROLE IN IL-10KO MICE FOLLOWING *CHLAMYDIA* INFECTION, DN McKeithen***, Y Omosun, EC Kibakaya*, F Eko, CM Black, JU Igietseme, GA Ananaba and Q He
- 10:45 **PHYTOCHEMICAL CAPABLE OF INHIBITING Phip INDUCED CYTOTOXICITY**, Ashok Jain* and Abhilash Samykutty
- 11:00 **VIBRIO CHOLERAЕ GHOSTS AS AN ADJUVANT TO ENHANCE IMMUNE RESPONSE DURING TREATMENT OF *CHLAMYDIA* INFECTION****, A Stevens, GA Ananaba, JU Igietseme and FO Eko
- 11:15 **MEASUREMENT OF THE INTERACTIONS OF LOW ENERGY GAMMA RAYS WITH DENSE METALS FOR APPLICATIONS IN NUCLEAR CARDIOLOGY IMAGING****, G.G. Passmore, T.F. Lynam* and J.L. Spradlin*
- 11:30 **PHAGE THERAPY: A POSSIBLE PARADIGM SHIFT FROM ANTIBIOTICS?**, V. L. Chivukula* and D. O'Bryant

Posters will be displayed through 11:59 AM

POSTERS

SCREENING OF SOME NATURAL PRODUCTS AND NANOPARTICLES FOR THEIR ANTI-BREAST CANCER ACTIVITIES, C. T. Ahweyevu*, L. Wrensford and M. A. Taha

EXAMINATION OF SODIUM FLUORIDE'S EFFECT ON YEAST CELL GROWTH AND GENOMIC STABILITY**, A.R. Arvidsson* and A. L. Abdulovic-Cui

EFFECT OF A RNR1 MUTATION ON DNA MICROSATELITE STABILITY IN YEAST**, A.I. Alam*, N.A. Hashmi* and A.L. Abdulovic-Cui

THE EFFECTS OF NICOTINE ON CRANIOFACIAL DEVELOPMENT IN EMBRYONIC ZEBRAFISH**, Philip R. Uys* and Linda G. Jones

MEASUREMENT OF THE INTERACTIONS OF LOW ENERGY GAMMA RAYS WITH DENSE METALS FOR APPLICATIONS IN NUCLEAR CARDIOLOGY IMAGING**, J.L. Spradlin*, T.F. Lynam* and G.G. Passmore

IS LUTEINIZING HORMONE RECEPTOR (LHR) REDUCED IN MOUSE LEYDIG TUMOR CELLS TREATED WITH PFOA?, S.Y. Tadros* and J.D. Cannon**

REGENERATION OF RETINAL GANGLION CELLS IN EMBRYONIC ZEBRAFISH FOLLOWING GLUTAMATE EXCITOTOXICITY**, Tiffany C. Goebel* and Linda G. Jones

ALPHA ENOLASE(ENO1) EXPRESSION MIGHT BE A VITAL COMPONENT OF THE IMMUNE RESPONSE TO *CHLAMYDIA TRACHOMATIS* INFECTION**, Khamia Ryans, Camilla C. illsYusuf Omosun and Qing He

**Section VI: Philosophy and History of Science
Science Hall W1004
E.T. McMullen, Presiding**

- 8:30 **COMMON TACTICS USED BY THE PSEUDOSCIENCES INCLUDING CREATIONISM**, John V. Aliff
- 9:00 **A UNIVERSAL DEFINITION OF EVOLUTIONARY PRINCIPLES**, Eugene R. Mesco
- 9:30 **A (HEURISTIC) PHILOSOPHICAL ANALYSIS OF DIMINISHING INTEREST IN STEM FIELDS**, Charmayne E. Patterson and Ronald E. Mickens
- 10:00 **Section Business Meeting**

- 10:30 **AN ACCOUNT OF JOHN AND WILLIAM BARTRAM'S VISIT TO THE ORPHAN HOUSE AND WORMSLOE, SAVANNAH, GEORGIA IN 1765**, Elliott O. Edwards, Jr.
- 11:00 **PIMPING "GOD": AN ANALYSIS OF POPULAR WRITINGS ON MODERN SCIENCE AND MATHEMATICS**, Ronald E. Mickens and Charmayne E. Patterson
- 11:30 **THE PATTERN OF HAECKEL'S PICTURES**, Tom McMullen

Section VII: Science Education
Science Hall W1001
Mike Sakuta, Presiding

- 9:00 **PARALLAX: A LAB FOR INTRODUCTORY ASTRONOMY STUDENTS**, Amanda L. Mashburn*, Bob Powell and Ben Jenkins
- 9:15 **MAKING WRITING A PRIORITY IN EIGHTH GRADE PHYSICAL SCIENCE CLASSES****, Allyson L. Martin* and R. A. Cooper
- 9:30 **LEARNING MATHEMATICAL MODELING WITH A PROGRAMMABLE MODELING ENVIRONMENT**, Brian C. Brodsky
- 9:45 **KINEMATICS, DYNAMICS, AND MATH: YEAR I OF SMITE**, Bob Powell, David Leach, Ann Robinson, Sharon Kirby and David Todd
- 10:00 **Section Business Meeting**
- 10:30 **EMPIRICAL EVIDENCE OF THE EFFECTIVENESS OF CONCEPT MAPPING AS A LEARNING INTERVENTION FOR BOTH RESIDENT AND DISTANCE LEARNING NMT STUDENTS**, Gregory Passmore
- 10:45 **A PRELIMINARY ASSESSMENT OF GAME-BASED LEARNING IN ORGANIC CHEMISTRY I LECTURE**, Pamela M. Leggett-Robinson
- 11:00 **DIAGNOSTIC EVALUATION OF UNDERPREPARED STUDENTS IN FIRST SEMESTER GENERAL CHEMISTRY (A PRELIMINARY STUDY)**, Peter A. Roessle, S. Payne, M. Atteya, M. Trani, M. Nelson, M.F. Burkart and A. Dutta
- 11:15 **ESTABLISHMENT OF AN ONGOING PHENOLOGY PROJECT AS A RESEARCH PROJECT AND EDUCATIONAL MODEL****, Eugene R. Mescio

Posters will be displayed through 11:59 AM

POSTERS

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

PEER LED TUTORING FOR PRINCIPLES OF CHEMISTRY I AND II, Amy Cook

LESSONS FROM A PLACE OF LIGHT: LESEDI CULTURAL VILLAGE**, Ashley M. Plummer*

USING KNOWLEDGE SPACE THEORY TO EXTRACT CRITICAL LEARNING PATHS FOR STUDENTS LEARNING OF CALCULUS, Iman C. Chahine and Mark Grinshpon

BRIDGING OF CULTURES THROUGH ETHNOMATHEMATICS: AN INVESTIGATION OF ZULU BONE DIVINATION PRACTICES, M. I. McGlone*

**Section VIII: Anthropology
Science Hall W1053
Teresa P. Raczek, Presiding**

- 8:30 **SKELETAL ANALYSIS OF TWO INDIVIDUALS FROM A ROMAN CEMETERY IN IERAPETRA, CRETE, GREECE****, April M. Tolley*
- 8:45 **OSTEOLOGY OF A BURIAL VESSEL FROM THE LATE PRE-HISTORIC/EARLY CONTACT PERIOD PINE HARBOR SITE (9MC64)****, Amanda C. Shively*
- 9:00 **LATE WOODLAND AND EARLY MISSISSIPPIAN BURIAL PATTERNS IN NORTH GEORGIA****, Anthony Chieffo* and Ashley Estep*
- 9:15 **THE ACTUAL COST OF THE "DISPOSAL OF THE DEAD": A COMPARATIVE STUDY OF FUNERARY EXPENDITURE IN DALLAS, TX, 1902-1909**, Z.W. Dirnberger*
- 9:30 **SIX FEET OVER: A COMPARATIVE STUDY OF GRAVE MARKERS IN ATLANTA GEORGIA AND DALLAS TEXAS**, Megan R. Hoogstad*
- 9:45 **ANALYSIS OF THE LAWTON SITE CLEAR-CUT COLLECTION****, Kimberly M. Shattuck*
- 10:00 **Section Business Meeting**

- 10:30 **REDISCOVERING THE ARCHAEOLOGY OF WEST GEORGIA: A REANALYSIS OF DR. LEWIS LARSON'S 1974 ARCHAEOLOGICAL SURVEY OF CARROLL, HARALSON, AND PAULDING COUNTIES, GEORGIA****, J.R. Unterwagner* and B.A. Coomes*
- 10:45 **AN EXAMINATION OF CHERT WITHIN THE RIDGE AND VALLEY: CONDUCTING LITHIC ANALYSIS AT THE MIDDLE ARCHAIC SITE OF IN THE VALLEY SITE, BARTOW COUNTY, GEORGIA****, Selene Cannelli* and Ronnie Johnson*
- 11:00 **THE ROLE OF WATER SOURCES IN INFLUENCING SOCIAL INTERACTION BETWEEN THE AHAR BANAS COMPLEX AND PROXIMATE SOCIETIES IN INDIA****, Blake S. Bottomley*
- 11:15 **Posters will be displayed through 11:59 AM**

POSTERS

PRELIMINARY ANALYSIS OF A PROBABLE ARCHAIC HEARTH FEATURE IN PHINIZY SWAMP, AUGUSTA, GEORGIA**, April S. Boatwright*, Brittany A. Coomes*, Spencer J. Hill*, Ashley M. Smallwood and Thomas A. Jennings

A SURVEY OF THE ASSEMBLAGE OF HOMINOIDEA GENOMES INVESTIGATED AND RECURRENTLY ANALYZED GENES IN PRIMATE GENOMICS, Jessica R. Engel*

LOLITA FASHION AND THE DIGITAL IMAGE: SIGNIFICANCE OF PHOTOGRAPHY IN SOCIAL MEDIA**, Chancy J. Gatlin*

THE APPLICATION OF ANTHROPOLOGY TO A STEM-BASED SUMMER PROGRAM IN FORENSIC SCIENCE, Lara E. McCormick*, Jules Angel, Ana Casado and Lori Critcher

GATEKEEPING MELUNGEON HERITAGE: EXPERIENCES WITH GENETIC GENEALOGISTS, AND HOW THEY SHAPE AND DETERMINE IDENTITY, J.M. Starnes*

REGIONAL TAPHONOMY IN COLD, WET CLIMATES: EFFECTS OF THE FREEZE/THAW CYCLE ON TAPHONOMIC CONDITION OF IMMERSSED SKELETAL REMAINS**, Stephanie West*

FRIDAY PAPER PRESENTATIONS

*Denotes student presenter

**Denotes student "in progress" research

Section I: Biological Sciences Science Hall W1002 Paul Arnold, Presiding

1:00 **CREATING A DRUG-SENSITIVE *PICHIA PASTORIS* YEAST STRAIN THROUGH GENE DELETION OF PUTATIVE DRUG TRANSPORTER TRANSCRIPTION FACTORS****, Shawna McCafferty*¹, E. Holcomb*¹, D. Sloan*¹, S. Aller² and B. Dunn¹, ¹Georgia Regents University, Augusta, GA 30904 and ²University of Alabama at Birmingham, Birmingham, AL 35205. In the budding yeast *Saccharomyces cerevisiae*, expression of multi-drug resistance proteins is regulated by the transcription factors PDR1 and PDR3. A PDR1 and PDR3 double knockout strain has increased drug sensitivity. A similar drug-sensitive *Pichia pastoris* yeast strain would be a useful model for testing the effects of drugs on recombinant proteins expressed in *P. pastoris*. We are engineering such a strain by knocking out three genes (identified as 0203, 0322, and 0233) from the GS115 *P. pastoris* strain. These three *P. pastoris* genes have high homology to the *S. cerevisiae* PDR1 and PDR3 genes. Gene deletion will be accomplished by homologous recombination, replacing the target genes with one of two selectable genes, G418 resistance and histidine synthesis. Transformed colonies that grow under selective conditions will be screened by PCR to confirm gene replacement of the target genes. Colonies that are positive by PCR will be used in functional assays for increased drug sensitivity and the genomic DNA will be sequenced. PCR screening indicates that we have successfully replaced the 0322 gene with His4 allowing histidine synthesis. Functional assays are now underway. Work is ongoing for the 0203 and 0233 genes. Funding provided through a GRU CURS grant and Dr. Aller at UAB.

1:15 **INFLUENCE OF GENE NETWORK TOPOLOGY ON CELLULAR AGING****, Brittany Jackson* and H. Qin, Spelman College, Atlanta, GA 30314. Cellular aging can be viewed as an emergent property of gene networks, because aging can occur in gene networks with only non-aging components. We have shown that cellular aging can be studied by failures of gene networks. In this study, we ask whether network topological features influence the dynamics of cellular aging. We address this question by studying the failure of the protein interaction network in the budding yeast *Saccharomyces cerevisiae*. Gene networks contain essential and non-essential genes. If an essential gene loses all of its interactions, the cell will cease to function and die. To evaluate the network reliability of the yeast protein interaction network, we randomly permuted the yeast protein interaction network by reshuffling its interactions. By comparing the aging dynamics between the original network and the random networks, we seek to answer whether there are some inherently robust features built into the yeast gene networks.

1:30 **SIMULATED PREDATION AND RELEASE OF ALARM CUES BY PLANARIANS**, Jessica L. Winkler*, C.B. Winkler* and F.S. Corotto, University of North Georgia, Dahlonega, GA 30597. Planarians are reported to release alarm cues for conspecifics when they are pulverized in a small volume of water. We sought to determine if cues were released when flatworms are subjected to a treatment that more closely resembles predation or when they are suffer stress with no tissue damage. Single planar-

ians were placed in 1 ml of water and stabbed 10 times with a shirt pin or immersed in 0.5 ml of water and subjected to 200 pulses of 20 mA current with durations of 2 ms. After 10 min for release of alarm cues, treated water was placed on a cotton ball that was positioned at one end of a plastic straw that had been cut in half lengthwise and filled with water. A control solution was applied the same way at the other end. Single planarians were placed in the straws and, for 10 min, animals were scored at 1 min intervals as being on either the treatment or control halves of the straw. Single-sample t tests were used to determine if the mean number of times a worm was found on the treatment side differed significantly from the expected outcome of five out of ten. No preference for a solution was detected. Planarians did, however, avoid solutions prepared by pulverizing animals as reported previously. Our results lead us to question whether flatworms release alarm cues when suffering predation. Complete tissue destruction may be necessary to release such cues.

1:45 SEASONAL VARIATION IN POPULATION DISTRIBUTION OF *SUS SCROFA* ON COWDEN PLANTATION, JACKSON, SOUTH CAROLINA**, Grace C. Jansen* and B. Saul, Georgia Regents University, Augusta, GA 30904. The distribution of feral hogs (*Sus scrofa*) has been estimated on Cowden Plantation, Jackson, SC, since November 2012. Cuddeback trail cameras were stratified on wildlife trails along roadways and planted fields across a 10,000 acre private plantation. Feral hog activity patterns were documented for a year to observe the potential seasonal changes in habitat preference. Variations in activity patterns were used to estimate seasonal population distributions across the plantation related to ecosystem type and soil classification. Activity patterns were analyzed with a Chi-Square Test to determine the presence of changes in distribution between densely wooded and swamp areas during fall and winter months. Habitat preference for thinner forests or agricultural land was also tested for spring and summer months. The distribution effects of interspecific competition and depredation of wild turkeys (*Meleagris gallopavo*) by feral hogs were observed during peak turkey breeding months. The niche overlap in spatial use of hogs and turkeys was also related to habitat and soil classification at each camera site. NatureServe ecosystem units and USDA's Natural Resources Conservation Service Soil Survey Geographic (SSURGO) were utilized through GIS and ESRI technology. Funding: Georgia Regents University Student Technology, Pamplin College of Arts and Sciences, Center for Undergraduate Research & Scholarship, and the Georgia Regents University Department of Biological Sciences.

2:00 THE USE OF TRAIL CAMERAS TO ESTIMATE EFFECTS OF PREDATOR ACTIVITY ON PREY DISTRIBUTION IN A FLOODPLAIN RIPARIAN WOODLAND, Jessica Miller* and B. Saul, Georgia Regents University, Augusta, GA 30904. Cowden Plantation is 10,000 acres of private hunting, logging, and agricultural land in Jackson, South Carolina. Varied land use and habitat types present a unique opportunity to assess distribution of both native and invasive predator and prey species in the Southeastern United States. An understanding of such community dynamics can assist landowners in efforts to decrease feral pig (*Sus scrofa*) and coyote (*Canis latrans*) populations and increase the health and fitness of white-tailed deer (*Odocoileus virginianus*). It was hypothesized that predator and prey activity would correlate to indicate foraging behavior or inversely correlate to indicate avoidance behavior. Since May 2012 trail cameras have captured animal activity at wooded locations with semi-permanent deer feeders and at relatively open locations on roads or planted fields. Locations were stratified by habitat type and compared by activity of prey and predator species. Activity and distribution of each species were determined by the number of pictures taken within each habitat and compared using χ^2 test. Selected locations were occasionally supplemented

with corn to attract deer and scent tabs to attract predators. Results indicate predators are more active along roads than at feeder locations and predator activity correlates with small prey species activity ($p < 0.0001$). Funding Sources: Center for Undergraduate Research & Scholarship, Pamplin College of Arts and Sciences, Augusta State University Department of Biology.

2:15 FIELD EVALUATION OF WILDLIFE POPULATION RESPONSES TO FATTY ACID SCENTED CHEMICAL ATTRACTANTS, Kathleen E. Kelley*, R. Lancaster*, L. Justice* and B. Saul, Georgia Regents University Augusta, GA 30904. Responses of the resident wildlife population to fatty acid scent tablets were measured remotely by trail cameras at Cowden Plantation in Jackson, South Carolina. The research focused specifically on the effects that fatty acid scent tablets have on whitetail deer (*Odocoileus virginianus*), feral hogs (*Sus scrofa*), wild turkeys (*Meleagris gallopavo*), coyotes (*Canis latrans*), bobcats (*Lynx rufus*), opossums (*Didelphis virginiana*), and raccoons (*Procyon lotor*). It is hypothesized that the fatty acid scent tablets will produce the highest visitation rates with wildlife that rely on olfactory stimuli, as opposed to visual and auditory stimuli. The study was conducted over a ten month period between June 2012 and March 2013. Thirty-six Cuddleback digital cameras were evenly spaced along high traffic wildlife trails on this 10,000 acre farm. Corn supplements were distributed at each site as a wildlife attractant. Scent tablets were placed at each site after wildlife patterns were established, during supplement applications and after supplement applications were terminated. Visitation and individual activity rates varied throughout the study period from site to site and appeared to be associated with weather, high human traffic, population density, and food abundance. Funding Sources: Augusta State University Student Technology, Pamplin College, CURS Undergraduate and the Department of Biology.

2:30 ECTOPARASITES OF THE WHITE-TAILED DEER (*ODOCOILEUS VIRGINIANUS*) IN SOUTHEAST GEORGIA**, Willie Lee Adams, Jr.* and J. Wedincamp, Jr., East Georgia State College, Swainsboro, GA 30401. Surveys of the ectoparasites of the white-tailed deer were conducted in the 2000-2002 and the 2013-2014 hunting seasons in a fifteen-county region located in Southeast Georgia. Deer carcasses were surveyed at local deer processing plants. The ectoparasites were removed by combing the dorsal and ventral surfaces of the deer for approximately 30 strokes with a standard flea comb and attached ticks were removed with forceps. Ectoparasites were placed into labeled vials containing 70% ethyl alcohol. Additionally, the interior surface of the ears were swabbed using cotton swabs and placed into vials containing 70% ethyl alcohol for transport to the lab. Patterns of tick and deer ked infestations were statistically analyzed with respect to county, host sex, and host reproductive status. Preliminary results from our study indicate a high percentage of the deer harvest was infested with Hippoboscidae and to a lesser extent *Ixodes scapularis*.

2:45 TORTOISE POPULATION PERSISTENCE: 10 YEARS POST CONSTRUCTION**, Cody Osting*¹, R. Phillips*¹, B. Simmons¹, J. Wedincamp, Jr.¹ and J. McGuire², ¹Department of Biology, East Georgia College, Swainsboro, GA 30401 and ²USDA/NRCS, Swainsboro, GA 30401. The burrow of the Gopher Tortoise (*Gopherus polyphemus*) is utilized by a variety of native wildlife, making the tortoise a keystone species in sandhill habitats. This tortoise is state-listed in Georgia, where it is negatively impacted by widespread habitat loss due to human encroachment. In 2003, 42 tortoise burrows were measured and recorded with a GPS at the site of a proposed technology park (120 acres), adjacent to the East Georgia College Campus in Emanuel County, Georgia. Entrance measurements of active burrows indicated a population consisting of

both sub-adults and adults, suggesting that reproduction was occurring in this colony. Voluntary mitigation procedures by site managers included the installation of tortoise-friendly concrete curbs and relocation of several tortoises to an adjacent property. In 2013, a survey was undertaken to determine current habitat suitability and the efficacy of these mitigation procedures in preserving the tortoise colony. At present, only 5 burrows with 2 tortoises have been recorded in the remaining sand hill habitat (approximately 250 acres). The remaining habitat is currently considered to be fair to poor quality due to the lack of fire and overgrowth of undesirable tree species. Initial mitigation efforts by site managers may have been successful; however, the subsequent lack of management on the site itself may have been detrimental to the tortoise population.

3:15 THE ENERGETIC BENEFITS OF HUDDLING IN OCHROMTOMYS NUTTALLI**, Alexa N. Gusmerotti*, W.H. Miller*, G.W. Barrett and T.L. Barrett, Odum School of Ecology, University of Georgia, Athens, GA 30602. This study focused on the energetic benefits of huddling in golden mice (*Ochrotomys nuttalli*). Water oak (*Quercus nigra*) acorns and flowering dogwood (*Cornus florida*) fruits comprised the diet in this study. It is thought that by huddling, golden mice conserve energy and thus require less energy from their diet. To test this hypothesis, mice were placed in five cylindrical tanks (80 x 88 cm) functioning as mesocosms, each containing a nest box holding non-absorbent cotton with an outside water bottle. Four food bowls were spaced 90° apart along the circumference of the tank with like food types 180° apart. The temperature of the laboratory was set at 60°F (16°C) to induce huddling. The first week, four males were placed in a mesocosm, while four females were placed individually in the remaining four mesocosms. The design was repeated with the four females in a single mesocosm, and the four males in their own mesocosms. To determine if benefits were present in huddling groups, we measured the amount of food consumed (Kcal • g live wt⁻¹ • day⁻¹) and used the known caloric value of *Q. nigra* (5.2 ± 0.17) and *C. florida* (5.2 ± 0.12). When comparing consumption for lone mice with huddling mice, we obtained a value for *Q. nigra* ($P = 0.000365$, $P \leq 0.05$) resulting in a significantly lower amount of caloric intake through diet in huddling mice for *Q. nigra* (mean 2.65 g consumed compared to 2.10 g). This study was funded in part by the Eugene P. Odum Endowed Chair.

3:30 METAL TOLERANCE AND ACCUMULATION IN A RARE PLANT SPECIES, PEDIOMELUM PIEDMONTANUM (FABACEAE)**, Jessica Padgett*, Elgin N. Hobbs*, J. Ramos and S.T. Bennetts, Georgia Regents University, Augusta, GA 30904. *Pediomelum piedmontanum*, "Dixie Mt. Breadroot," is an endangered species with only three known populations, one on serpentine in Georgia and two on phyllite in South Carolina. Derived from ultramafic rocks, serpentine Mg₃Si₂O₅ refers to a mineral and a soil, typically containing high concentrations of heavy metal. Previously, our lab has discovered that the serpentine population is tolerant up to 100µM Zn. Since this species tolerates high Zn levels, we decided to determine the level of Zn accumulation in the leaves of field collected and lab-raised individuals of the serpentine population. The level of Zn accumulation from field and experimental leaf samples was determined using the zincon colorimetric test. The level of Zn accumulation in leaves from the field was significantly lower than other legume species ($p < 0.05$). Zn accumulation was greater in the roots than in the shoots in plants propagated with Zn enrichment ($p < 0.05$). These results are consistent with the fact that this species has a large taproot. In addition to these findings, lab-raised plants demonstrated symptoms of Mg deficiency. Thus, Mg tolerance is presently being investigated by comparing growth rates in hydroponic control solutions and Mg enriched solutions [50-100µM Zn]. This population may require an unusual concentration of Mg.

3:45 INOCULATION WITH RHIZOBIUM AND HERBIVORY BY MEGACOPTA CRIBRARIA AFFECT SOYEAN PHYTOCHEMISTRY AND SUCCESSIVE HERBIVORES**, Anne O. Zimmerman* and C.B. Zehnder, Georgia College & State University, Milledgeville, GA 31061.

Plant-mediated interactions are when one herbivore induces changes in plant chemistry that then affect subsequent herbivores. We are interested in examining plant-mediated interactions in the soybean-kudzu bug system. *Megacopta cribraria*, commonly known as the kudzu bug, is an invasive pest to many economically important legumes in the southeastern United States including *Glycine max* (soybeans). In our experiment, soybeans were grown in a greenhouse with half of the seedlings receiving the rhizobium inoculation treatment and half receiving no inoculation. Four weeks later, half of the plants from each rhizobium treatment group were exposed to *Megacopta cribraria* herbivory for 72 hours. Then, leaves from each treatment group were fed to *Spodoptera exigua* larvae for 72 hours and the proportional change in biomass was measured for each caterpillar. Additionally, leaves were collected for phytochemical analysis including trypsin inhibitor, chitinase, and nitrogen concentrations. Root nodules were counted before the roots were dried and weighed for below ground biomass data. Root nodule results showed that the inoculation treatment was successful and preliminary results have found an interaction between inoculation with rhizobium and induced responses to herbivory. Official results are forthcoming.

4:00 DOCUMENTING CHANGES IN MOTH LIFECYCLE AND ABUNDANCE CAUSED BY URBAN WARMING**, Trung Quach*¹, Yen Duong*¹, I.Y. Rickets¹, J. Pickering² and J.M. Lochamy¹, ¹Georgia Perimeter College, Clarkston, GA 30021 and ²University 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. 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 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.

4:15 THE DEVELOPMENT OF A NEW BIOLOGICAL CONTROL, THE GIANT WATERBUG (*BELOSTOMA LUTARIUM*), TO CONTROL SNAIL POPULATIONS**, Peter M. Schlueter*, R.A. Fiorillo and M.A. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043.

Snails are an intermediate host for numerous parasites, many of which are dangerous to humans. Reductions in snail populations may lead to decreases in parasite populations. The purpose of this study is to develop a new biological control to reduce snail populations in lakes and ponds. Waterbugs (*Belostoma* species) are known to be aggressive and highly effective predators that pierce their prey with sharp beaks and remove their body fluids. It is hypothesized that *B. lutarium* can reduce snail populations and reduce parasite abundance. The first step of our project was to test predation effectiveness of *Belostoma lutarium* on both types of freshwater snails, lunged snails (Sub-class PULMONATA) without an operculum, and gilled snails (Sub-class PROSOBRANCHIA) with a hard protective operculum cover. Each of our 24 waterbugs

exhibited 100% predation on both lunged and gilled snails. Next, prey preference was tested. *B. lutarium* consumed dragonfly larvae, damselfly larvae, tadpoles, snails; however, it did not consume crane fly larvae or small fish. In testing chambers, *B. lutarium* consumed 66% of dragonfly larvae versus 53% of the snails. However, snail predation may be higher in nature, since many of the lunged snails left the water and crawled up the side of the testing chamber. Waterbugs introduced to an aquarium that contains trematode infected snails 24 hours prior to the fish, may reduce trematode infections in fish to 0%? The next step will be to compare the parasite load of fathead minnows (*Pimephales promelas*) in aquaria that contain snails with trematode infections and various combinations of waterbugs. *B. lutarium* may be used to reduce snails and parasites in ponds and lakes, which will benefit human public health.

4:30 AN EVALUATION OF GEORGIA'S MASON BEES (*OSMIA SPECIES*) AND THEIR NESTING PREFERENCES**, Nicholas G. Stewart* and M.A. Schlueter, Georgia Gwinnett College, Lawrenceville, GA 30043. Bees are responsible for pollinating almost every fruit, nut, and vegetable crop. Recent concerns over the declines in honeybee populations have generated a strong interest in identifying alternative pollinators, which can replace or supplement the honeybee. Mason bees (*Osmia* species) are an ideal candidate for pollination of commercial fruit orchard. In Japan, the blue orchard bee (*Osmia lignaria*) has been used to pollinate fruit orchards since the 1960s. They estimated that 250-500 *Osmia cornifrons* are required per acre for pollination compared to 60,000-120,000 honeybees. In the current study, we have surveyed mason bee species diversity and abundance in North Georgia apple orchards for the past four years. We have identified 13 species, including several species not previously recorded in Georgia. Since mason bees are stem/cavity nesters, we hypothesized that providing additional nesting habitats inside the orchard would increase *Osmia* nesting inside the orchard and increase their abundance in the orchard in the following year. In order to maximize *Osmia* abundances, wooden bee houses were constructed that contained 24 tubes of various sizes (6mm, 7mm, and 8mm) or wooden blocks with predrilled holes were used to attract the mason bees. Preliminary results indicated that *Osmia* nested in 40% of the 6mm tubes, 3.5% of the 7mm tubes, 7% in the 8 mm tubes, and 4% in the wooden pre-drilled blocks. Early estimates indicate roughly 200 *Osmia* pupae have been laid in the tubes. It is believed that the bees laid in the large tubes are *Osmia lignaria*, *O. cornifrons*, and *O. taurus*. These larger species are the most ideal mason bees for apple crop pollination. In conclusion, habitat enrichments, the nest boxes, did successfully encourage *Osmia* nesting in the apple orchards.

4:45 OBSERVING AND MEASURING THE POLLINATION EFFECTIVENESS OF *ANDRENA CRATAEGI* AND OTHER BEES IN COMMERCIAL APPLE ORCHARDS, Catherine G. Schlueter*¹, N.G. Stewart² and M.A. Schlueter², ¹University of North Georgia, Gainesville, GA 30566 and ²Georgia Gwinnett College, Lawrenceville, GA 30043. European honeybees (*Apis mellifera*) are the major pollinators of fruits, nuts, and vegetables. However, worldwide agriculture may be in jeopardy due to unprecedented declines in honeybees due to colony collapse disorder and other factors. The purpose of this study was to find a native bee replacement for the honeybee. First, a survey of the native bees was conducted in Georgia apple orchards. Second, the pollination characteristics of target bees (mining bees (*Andrena* species), bumblebees (*Bombus* species) and carpenter bees (*Xylocopa virginica*)) identified from the survey data were measured. Honeybees (0.68 grams) and bumblebees (0.1-0.8 grams) carried significantly larger pollen loads than mining bees (0.01 grams). However, all pollen on the mining bees was available for pollination compared to less than 4% of the honeybee's pollen,

since that pollen was packed away in the bee's corbicula (pollen basket). Mining bees spent the longest time at the apple flower (16.1 seconds) compared to honey bees (6.8 seconds), bumblebees (<2 seconds), or carpenter bees (<2 seconds). It was hypothesized that mining bees could successfully replace the honeybee in apple pollination. Apple trees in four different orchards were selected for this experiment. Netting enclosures (cages), which kept out honeybee-size and larger bees, were placed over selected branches (experimental group), while other branches (control group) were left uncovered. In August, mature apples were collected. Each apple was measured for size (weight, circumference, and diameter), and each apple's seeds were counted. Statistical analyses indicated that there were no differences between the control and experimental groups. *Andrena crataegi* accounted for 72.5% of the native bees collected in the experiment. *A. crataegi* and the mining bees can provide a natural and sustainable agricultural alternative to the declining honeybee.

Posters will be displayed at the Jaguar Student Activities Center Ballroom until 7:00 PM.

**Section II: Chemistry
Science Hall E1051
Ghislain Mandouma, Presiding**

3:15 THE MORPHOLOGY OF MOLYBDENUM TRIOXIDE NANOPARTICLE DEPOSITION ON CARBON NANOTUBE NETWORKS**, Liqiu Zheng¹, Jerry Li² and K.C. Chan¹, ¹Albany State University, Albany, GA 31705 and ²Florida State University, Tallahassee FL 32313. The morphology of molybdenum trioxide MoO₃ nanoparticles attached to a network of nanotubes has been imaged using electron microscope. Purified multi-wall carbon nanotubes were suspended in sodium cholate solution (~0.1mg/ml) with assistance of bath sonication, and then filtrated and washed with plenty of water through a membrane filter to make free-standing buckypaper. The resulting buckypaper was calcined at 400°C in air in an oven for 4 hours to remove the surfactant which adsorbed on the tube surface and further cleaned and functionalized with hydrochloride (18%HCl). Different amount of Ammonium heptamolybdate ((NH₄)₆Mo₇O₂₄ • 4H₂O) were dissolved in water in order to make various concentration of heptamolybdate aqueous solution (0.05M, 0.1M, 0.5M). The buckypaper was impregnated into these molybdate solution over night, and dry naturally. These molybdate coated buckypaper was calcined in argon atmosphere at different temperature (450°C, 600°C, 750°C) into to decompose the molybdate into molybdenum trioxide (MoO₃) nanoparticles which decorate on the surface of carbon nanotubes, sometimes as twins. The particle size, single to twin ratio, and the density of MoO₃ on the carbon nanotube network will be reported and the ideal conditions controlling the density and size of nanoparticles discussed.

3:30 SYNTHESIS AND CHARACTERIZATION OF OLIGO-BENZO[c]CINNOLINE ETHYNYLENES AS MOLECULAR JUNCTIONS**, Bridgette Sands*, Danielle Mitchell and Ghislain Mandouma, Albany State University, Albany, GA 31705. Oligo-benzo[c]cinnoline ethynylenes (OBEs) are being prepared with the goal of obtaining their self-assembled monolayers (SAMs) structures on different solid media. The ultimate objective is to study the potential of novel oligo-benzo[c]cinnoline ethynylenes as molecular junctions. Self-assembly of molecules on gold or other solid surfaces has emerged as a cornerstone in modern electronics. Using a scanning tunneling microscope (STM), the molecular structures of SAMs can be imaged at the nano scale to reveal polymorphism

and other details of organization in two dimensions. Benzo[c]cinnoline (BC) and its derivatives are interesting because of their biological activities, their potential as ligands for metals, and also for their highly stable molecular conformations with different symmetries. Starting from available 2-nitroaniline, we accessed 3,8-dibromobenzo[c]cinnoline through a coupling reaction and a ring-forming diazotization. Subsequent cross-coupling of protected-acetylene to the core BC, afforded a monomer of benzo[c]cinnoline ethynylene. Planned oligomerization under moderate heat will afford the title compound.

Posters will be displayed at the Jaguar Student Activities Center Ballroom until 7:00 PM.

**Section IV: Physics, Mathematics, Computer Science,
Engineering and Technology
Science Hall W1008
Hasson M. Tavossi, Presiding**

1:30 SITE PERCOLATION IN TRIANGULAR AND KAGOME LATTICE, John Calhoun Stephens^{*1} and Trinanjan Datta², ¹Davidson Fine Arts, Augusta, GA 30901 and ²Georgia Regents University, Augusta, GA 30912. Percolation provides a mathematical basis and theoretical explanation for the behavior of connected clusters in a lattice. In percolation theory, a spanning cluster is a connected path which bridges between opposite sides of a lattice. For site percolation, a site is either “occupied” with probability p or “empty” with probability $1-p$. In such a situation there is a critical probability p_c for which a spanning cluster will exist. Using source code from the Open Source Physics library written in Java as a basis, I have developed a series of simulations to computationally calculate the critical probability in both a conventional triangular lattice ($p_c = 0.5$), as well as in a non-trivial lattice such as the kagome lattice ($p_c = 0.65$). Our results confirm the relevant theoretical p_c for these lattice types evaluated theoretically previously.

1:45 DYNAMIC PHASE TRANSITION IN THE CLASSICAL ANISOTROPIC XY MODEL ON A SQUARE LATTICE, Jones E. Jenkins^{*1}, William D. Baez² and Trinanjan Datta¹, ¹Georgia Regents University, Augusta, GA 30912 and ²The Ohio State University, Columbus, OH 43210. Ginzburg-Landau analysis of the anisotropic XY model in a spatially homogeneous oscillating magnetic field on a square lattice suggests the existence of several dynamical phases - Ising symmetry restoring order (Ising SRO), Ising symmetry breaking order (SBO), XY symmetry restoring order (XY SRO), and XY symmetry breaking order (XY SBO). We investigate the presence of these phases and the dynamic phase transition (DPT) between these phases using classical Monte Carlo simulation techniques. We explore the system for a range of values for the external field amplitude, field frequency, and anisotropy parameter. Utilizing the period-averaged magnetization (in both the x - and y - component) as the dynamic order parameter we confirm the presence of multiple DPT transitions in the model. Funding from Cottrell Research Corporation is gratefully acknowledged.

2:00 DISTORTIONS IN 2p4d PARTIAL FLUORESCENCE YIELD FOR 4d ELEMENTS, Alexander Price^{*1}, Frank de Groot² and Trinanjan Datta¹, ¹Georgia Regents University, Augusta, GA 30912 and ²Utrecht University, Netherlands. X-ray absorption spectroscopy (XAS) is a standard tool to determine the electronic structure of molecules and materials. CTM4XAS and CTM4RIXS are semi-empirical programs

to analyze transition metal L- and M- edge transitions by evaluating the effects of crystal field and charge transfer parameters on the atomic multiplets. We compute and compare the XAS and the fluorescence yield (FY)- XAS, of the 3d and 4d transition metal ions. In the case of 2p edges of 3d elements Auger decay dominates and sets the time scale. The 2p3d X-ray emission spectra (XES) accounts for approximately 80% of the radiative decay. The 2p3d partial FY is distorted and because it dominates the FY, the total FY is also distorted. For the 4d elements the 2p4d XES decay is approximately 10% of 2p3d XES decay, implying that (the energy-constant) core-core XES and Auger channels dominate the decay. The computed 2p4d partial FY-XAS spectra are different from the 2p XAS. Although 2p4d partial FY is distorted, the total FY is not because it is dominated by 2p3d XES. We also find that the 2p3s and 2p4s XES channels contribute less than 1% and can be neglected. Funding from Cottrell Research Corporation is gratefully acknowledged.

2:15 OBSERVATIONS OF CHANGES IN FLUORESCENCE DECAY TIMES IN RUBIDIUM VAPOR EXPOSED TO MAGNETIC FIELDS, Chris Cutler* and Dr. Tom Colbert, Georgia Regents University, Augusta, GA 30912. A 0.50ns resonant laser excitation is applied to excite the $5P_{3/2}$ energy level in Rubidium vapor enclosed inside a transparent heated quartz cell. Following the excitation, the fluorescence may be reabsorbed many times prior to emission from the cell. This process is called radiation trapping. The natural lifetime of the excited state in rubidium is 26ns. For situations of high optical density, the fluorescence lifetime in the cell is expected to be much longer than the natural lifetime. In our proof of principle experiment we observed a fluorescence decay time of 2.416 μ s with no magnetic field. This corresponds to about 929 re-absorptions, and indicates that we do have conditions of high optical depth. When an electromagnet is turned on the fluorescence decay is observed to change. The measured decay time of 2.157 μ s corresponds to about 830 re-absorptions. We are continuing to investigate the system and develop theoretical models for conditions in the cell, but are able to qualitatively explain the reasons for faster escape of light from the cell under conditions of an applied magnetic field.

2:30 MODELING INCANDESCENT BULB SPECTRA**, Austin B. Kerlin*, J.E. Hasbun and Ajith DeSilva, Department of Physics, University of West Georgia, Carrollton, GA 30118. The purpose of this research is to provide physical science students and teachers with a complete method for measuring incandescent bulb spectra using simple spectroscopic techniques and a process for analyzing those spectra through MATLAB software. Captured spectra are fit with Planck's radiation law, so that a temperature can be extracted. Voltage across and current through the bulb are recorded at the time of spectra capture, and the power and temperature data are fit with the Stefan-Boltzmann law. Temperature is also shown to be proportional to the square root of the current to conclude that the intensity is proportional to the square of the current. Specific equipment discussed includes a QE65Pro spectrometer from Ocean Optics, SpectraSuite software, MATLAB software, and Ocean Optics' HL-2000 and HL-2000-Cal halogen lamps. This research was funded by the UWISE program at UWG.

2:45 BROADENING THE REACH OF SCIENTIFIC EDUCATION: THE MILLIKAN OIL DROP EXPERIMENT - A SIMULATION, Benjamin E. Hogan* and Javier E. Hasbun, Department of Physics, University of West Georgia, Carrollton, GA 30118. Due to advancements in computing techniques it has become possible to extend the accessibility of physics demonstrations across the curriculum. The widespread availability of computers in modern classrooms provides access to hands-on physics, chemistry, and biology experiments, among others, that may not be readily accessible

at certain institutions. One such example is the famous Millikan oil-drop experiment. This experiment requires the combination of several components that can be dangerous and expensive. A complimentary practical approach is achieved via a computer simulation, which is a useful and universally available alternative. The goal of this research endeavor is to encourage scientific thinking, literacy, and innovation while promoting a free network of academic tools. The result of the research is a simulation that allows a user to carry out the Millikan oil-drop experiment which leads to a measurement of the elementary electronic charge. In the simulation, the user measures the speed of a falling and rising droplet moving through an electric field, depending on the amount of charge. This is repeated until the user has enough data to calculate the charge of the electron. The simulation provides the user with a clean and simple user interface, allowing for realistic interactions within a real-time environment. For best results, one should have a basic understanding of the experimental procedure.

3:00 **Break**

3:15 **MODELING THE SOLAR SPECTRUM****, Marcus A. Davis*, Austin B. Kerlin*, Ajith DeSilva and J.E. Hasbun, Department of Physics, University of West Georgia, Carrollton, GA 30118. The purpose of this research is to provide students and teachers with a simple technique for measuring the solar spectrum, and a method for analyzing that spectrum through MATLAB software. Specific equipment discussed includes a QE65Pro spectrometer from Ocean Optics, SpectraSuite software, MATLAB software, and Ocean Optics' HL-2000 and HL-2000-Cal halogen lamps. Teachers and students will be able to accurately measure the solar spectrum with the method provided, as well as analyze and model their data with MATLAB software. This will serve as an experimental procedure and modeling tutorial with the aforementioned equipment. This research was funded by the UWise program at UWG.

3:30 **SPEED OF SOUND IN WATER AND IN SALT SOLUTIONS AT VARIOUS CONCENTRATIONS**, Daniel Hartman*, Ben Jenkins and Bob Powell, University of West Georgia, Carrollton, Georgia 30118. Iowa Doppler Products' (IDP) instrumentation has been used to measure the speed of sound in a variety of media. In this study, the speed of sound in distilled water and in solutions of sodium chloride at 20 degrees Celsius up to the saturation limit of salt have been measured. The results differ by less than one percent from values published in the CRC handbook. Student work was supported by a UWG UWise Grant.

3:45 **INFLUENCE OF MICROSTRUCTURE ON HYDROGEN DIFFUSION AND CORROSION DAMAGE IN STEEL****, J. Brant*¹, KkochNim Oh², A. Saatchi², and B. Hojjatie¹, ¹Valdosta State University, Valdosta, GA 31698 and ²Georgia Institute of Technology, Atlanta, GA 30332. Corrosion is a phenomenon that has adversely affected many industries for many years. One of the important corrosion environments is acid solutions or aqueous solutions with pH levels less than 7 where the hydrogen is produced during the corrosion process and then hydrogen concentration dissolved into the metal. Hydrogen diffusion and permeation through the metal is an important issue in material science and engineering because hydrogen presence induces serious effects in the properties of a metal. Besides, the storage of hydrogen for many applications is a challenging task. The aim of this study is to determine this influence by carrying out some experiments to simulate hydrogen permeation on several X65 pipeline steel samples. We created a corrosion cell using a potentiostat, three electrodes, and a solution to mimic the metals environment at the corrosion laboratory at Georgia Tech.

Then we conducted a hydrogen permeation test to determine the hydrogen concentration dissolved into the metal, flux and diffusion of hydrogen through a metal sample. In continuation of this study, some treatments that change the microstructure will be carried out on these samples before permeation experiments. This study was supported by a grant from VSU Quality Enhancement Program (QEP) awarded to the VSU Engineering Studies Program.

4:00 MECHANICAL STRENGTH OF DENTAL PORCELAIN**, C. G. Ponce*, L. Hale*, M. N. Tran* and B. Hojjatie, Valdosta State University, Valdosta, GA 31698. Dental ceramic materials are used for construction of various dental prostheses such as crowns, bridges, and veneers. These prosthetics must operate in an environment subjected to various mechanical and thermal loads. The magnitude of these multidirectional biting forces can exceed 500 N. Therefore, all ceramic prostheses must be designed to safely operate in that environment for many years with minimum chances of premature failure or discomfort to the user. The objective of this study was to determine the mechanical strength of an opaque dental porcelain subjected to biaxial (piston-on-three-balls) testing and three-point bending experiments. Using specific circular and rectangular shaped molds, we prepared many porcelain discs and bars samples in our engineering laboratory. The samples were made with varying firing and drying conditions to determine the conditions at which the ceramic samples have optimal strength. We designed and contracted a biaxial test fixture to be attached to our mechanical testing system for the flexure experiments. In order to evaluate the performance of the system, initial experiments were conducted using disc samples of some medical tablets. Subsequent experiments were performed using the dental porcelains specimens. Analysis of experimental data showed a good repeatability for strength values. The mean value of the biaxial strength of the tablets was 1127 kPa and the corresponding values of standard deviation and coefficient of variability were 154.6 kPa and 13.7, respectively. This study was supported by a grant from VSU Quality Enhancement Program (QEP) awarded to the Engineering Studies Program.

4:15 INVESTIGATION OF LOW-COST Cu_2O -CUI BASED PHOTOVOLTAIC DEVICES WITH NEAR INFRARED RESPONSE**, Ryan Landry*¹, P.K.D.D.P. Pitigala², Ajith DeSilva¹ and A.G.U. Perera², ¹University of West Georgia, Carrollton, GA 30118 and ²Georgia State University, Atlanta, GA 30303. Recently there has been a growing interest in thin films formed from low-cost, non-toxic semiconducting materials due to the promise shown for use in a wide variety of applications ranging from solar cells to environmental purification. In this study, we form n-type copper (I) oxide ($\text{n-Cu}_2\text{O}$) thin films by boiling copper electrodes in copper (II) sulfate (CuSO_4) solutions of varying molarity. Thin films of p-type copper (I) iodide (p-CuI) are then formed over the $\text{n-Cu}_2\text{O}$ films - thus completing p-n heterojunctions that are studied as photon-detecting devices with near infrared response. The devices have a final configuration of glass/FTO/ $\text{Cu/n-Cu}_2\text{O/p-CuI/graphite-FTO/glass}$. We characterize these devices via responsivity, capacitance-voltage (CV), and ultraviolet-visible-near infrared (UV-VIS-NIR) spectroscopy measurements. A peak photoresponsivity of 75mA/W at 575nm and 1mA/W at 943nm is observed at room temperature. The response data also indicates a variation in device response with film thickness - we are making efforts to optimize these films to increase performance. Acknowledgement: This material is based upon work supported by, or in part by, the U.S. Army Research Laboratory and the U. S. Army Research Office under contract/grant number W911NF-12-2-0035 and the Undergraduate Research Apprenticeship Program under U.S. Army Research Office.

4:30 A COMPARISON BETWEEN SEISMIC WAVE GRADIOMETRY AND FK ANALYSIS IN THE ESTIMATION OF THE SLOWNESS VECTOR, Alexander Hughes* and C. Poppeliers, Georgia Regents University, Augusta, GA 30904. Seismic wave gradiometry is a relatively new array processing methodology that can yield information about a wave's slowness and spatial amplitude changes. The principle is to relate the spatial gradients of the wavefield to two coefficients. The first coefficient relates to the vector slowness, and the second coefficient relates to the seismic radiation pattern. It's a new paradigm in seismic array processing in that it's essentially a "point measurement" of the wavefield. In practice, however, to estimate spatial derivatives we use an array with an aperture of less than ten percent of the seismic wavelength. As with any new methodology the efficacy must be tested against established methods. In this work we compare gradiometry's estimation of the slowness vector to the results obtained from the well-known fK analysis method. Additionally we explore the internal consistency of gradiometry under the plane wave assumption by systematically changing the master station, for the purpose of calculating spatial derivatives. We incorporate the station location uncertainties using a Monte Carlo simulation to resolve a statistically robust estimation of the slowness vector, which in turn we compare to the result obtained from fK analysis.

4:45 TEMPERATURE DEPENDENCE OF THE ELECTRICAL RESISTANCE OF DIAMOND AND SILVER NANOMATERIALS**, Natalee Hite*, Evan Reed*, Matthew Ansley* and Ben de Mayo, University of West Georgia, Carrollton, GA 30118. Diamond and silver nano-materials are currently of great interest for such practical uses as biomarkers, for drug delivery at the cellular level and in quantum computing. In this study, the electrical resistivities of diamond and silver nanoparticles were compared with the resistivities of powdered graphite and carbon nanotubes at temperatures between liquid nitrogen and 100 C. The samples, obtained from commercial sources were in the form of powders and were formed into cylindrical shapes with heat-shrink tubing. A LabView virtual instrument system was devised to measure the temperature of the sample, the voltage drop across the sample, the current through the sample, and the time development of each experiment. The data were analyzed using Excel software.*Undergraduate student. Work supported by the Georgia Space Grant Consortium-NASA and the Advanced Academy of the University of West Georgia.

5:00 MEASURING THE RESISTIVITY OF PRODUCE**, Adam Pullen and J. L. Talbot, University of West Georgia, Carrollton, GA 30118. The purpose of this inquiry is to measure, experimentally, the resistivity of a sample of fruits and vegetables. The samples used in this inquiry are a tomato, banana, carrot, apple, and lemon. The method used to measure resistivity was to find the current across the sample given an amount of voltage across the sample. Then the resistance can be found, and treating the sample as an ohmic material, the resistivity can be found from the resistance. I came to a conclusion that of my samples, the apple has the highest resistivity and the carrot has the least, with the assumption that the material will be tested for each case.

5:15 DESIGNING A NOBLE MILITARY VEHICLE**, Richard (Seong Hyun) An* and B. Hojjatie, Valdosta State University, Valdosta, GA 31698. In this study, a military vehicle was designed that it can be placed at the front line at a combat zone with the most advanced system for reducing the accidental death, and also as a huge threat to an enemy. Through the GPS system which is connected with the Sea-Based X-band Radar, it will detect the movement of the deployed ground, sea and air forces and also the pinpoint strike of the laser or the ground-to-air missile armament. All of the installed armaments in this military vehicle can be controlled by the electric engine system which

has the electro-catalysis of the carbon-nanotube of PEFC (Polymer Electrolyte Fuel Cell). Also, it is equipped with a 3- Channel Coupling Boost Converter System that can supply 10 times more electricity than the existing gas turbine engine system. A large amount of delivered electricity will be supplied by the equipped graphene wires. The material of the military vehicle is composed of the EFG (Edge Functionalized Graphene), Super-Strength Aluminum, Cork, Nickel Silicide, HHS (High Hardness Steel). The surfaces of the films and boards are polished, and then the end parts of them weld and bond to each other by the hot rolling. Then, the bonded films and boards reheat and refrigerate by the rolling work. The thickness of the material used for military vehicle is 100mm, which results in a significant weight reduction.

5:30 FLEXIBLE GROUPING IN A MIDDLE SCHOOL MATH CLASSROOM**, Carla M. Poole* and R.A. Cooper, Brenau University, Norcross, GA 30071. The purpose of this study was to determine the effects of using flexible grouping within a sixth grade math classroom. Three forms of grouping including whole group instruction, gender based partners, and heterogeneous groups was implemented within three different sixth grade math classrooms. The classes were chosen due to their similarities in size and student math achievement. Students were administered a pretest to determine their current level of math understanding before the beginning of each of three units. Throughout each unit, students were taught using the class assigned form of flexible grouping. The class that was instructed through the use of whole group instruction was given direct instruction and time to practice concepts independently with the individual support of the teacher. The gender based partners class was given a brief overview of the lesson, time to discuss the concepts with their partner, time to ask the teacher questions, and time to practice problems with their partner. The class using heterogeneous groups for instruction was given math problems and told to discuss their ideas with their group members while the high achieving student served as the teacher and leader of the group. Each student in the group was required to ask questions. Groups were then given time to ask the teacher questions and complete a practice assignment as a group. All classes were taught the same concepts and given the same practice problems, quizzes, tickets out the door, and tests. At the conclusion of each unit, students completed a posttest to determine their understanding of the concepts. The posttests for each unit were compared to determine which form of flexible grouping showed the greatest increase in sixth grade math achievement.

Posters will be displayed at the Jaguar Student Activities Center Ballroom until 7:00 PM.

SATURDAY PAPER PRESENTATIONS

*Denotes student presenter

**Denotes student "in progress" research

Section I: Biological Sciences Science Hall W1002 Paul Arnold, Presiding

8:15 **MOLECULAR SYSTEMATICS OF CHARACODON (GOODEIDAE): PHYLOGENY BASED ON A NUCLEAR LOCUS**, Joshua W. McCausland* and S.A. Webb, University of North Georgia, Dahlonega, GA 30597. *Characodon* is a genus of livebearing fishes whose two extant species, *C. lateralis* and *C. audax*, occur along the Río Mezquital of Durango, Mexico. Study of this lineage of Goodeidae (Cyprinodontiformes) is critical because of its biogeography and phylogenetic position, and both species are of conservation concern. A recent mitochondrial DNA analysis contradicts the published taxonomy, and suggests that *Characodon* has diverged into northern and southern populations. This, coupled with the observation that the morphological characters used in the original species descriptions might be flawed, led us to study the phylogenetic relationships among populations using a third kind of evidence, nuclear DNA. The flanking regions of a microsatellite locus, amplified and sequenced using standard protocols, were compared for 20 specimens representing the one population of *C. audax* and seven populations of *C. lateralis*. Four non-*Characodon* outgroups rooted the phylogeny. The sequences of *C. audax* were found to be identical to those of northern *C. lateralis*, and southern *C. lateralis* were recovered as a clade that excluded the northern populations, consistent with the mitochondrial analysis. A relative dearth of sequence variation means this finding should be evaluated cautiously, but it appears that morphological, mitochondrial, and nuclear evidence are in agreement that *Characodon* diversity needs redescription. This project was supported by the Department of Biology and the Honors Program of UNG.

8:30 **EVALUATION OF SAMPLING METHODS FOR MONITORING THE SICKLEFIN REDHORSE MOXOSTOMA SP. IN GEORGIA**, David J. Atwood* and J.G. Davis, Young Harris College, Young Harris, GA 30582. The sicklefin redhorse (SFR) *Moxostoma sp.* is a rare, potadromous, candidate species of catostomid fish that migrates upstream to Brasstown Creek in Towns County, Georgia, in late spring to spawn. To establish consistent monitoring of this fish in Georgia, we evaluated various sampling strategies (streamside visual surveys, underwater observation, and seining) at six 100-m representative sites from April to June 2013. Streamside surveys were conducted using binoculars; underwater observation occurred with two snorkelers moving systematically upstream and then floating downstream; seining was implemented by pulling a seine net quickly downstream. Additionally, an approximately 8-km section of Brasstown Creek was canoed to observe SFR abundance and occupancy. Throughout the study, 37 SFR were captured with the majority (59%) observed through visual surveys. SFR captured in seines ranged in total length from 43 to 55 cm and consisted of only males. The first and last SFR capture occurred on 24 April and 23 May 2013, respectively. Predicted capture probabilities are low (< 20%), but streamside visual surveys were most likely (~15%) to detect SFR. We also report a potential upstream record for this fish and presence in a small, headwater tributary. Thus, future research on SFR should be expanded

to tributaries and stream headwaters and should focus on specific protocol development for visual survey methods.

8:45 THE IMPACT OF LOCAL WATERSHED DEVELOPMENT TO A BIODIVERSE MOUNTAIN HEADWATER STREAM FISH COMMUNITY, Alex Spiegel* and J.G. Davis, Young Harris College, Young Harris, GA 30582. Southeastern native freshwater fishes are highly imperiled, mostly due to habitat loss associated with watershed development. Fish extinctions result from cumulative effects of local extinctions and barriers to recolonization. The objective was to determine if a fish community was impacted by watershed activities by measuring fish biodiversity at multiple sites along Corn Creek, a small stream in north Georgia that flows through an expanding college campus. Fishes were collected at 6 sites located upstream and throughout Young Harris College's campus using seines from September to November 2013. Environmental variables such as stream habitat type, riparian zone width, and substrate type were recorded for each site and paired with fish abundance data for analysis in the BiodiversityR package in R. Diversity was assessed by several metrics such as Shannon's diversity index, Renyi diversity profiles, and rank-abundance curves. Ecological distance between sites was compared by hierarchical clustering methods and tested against significant ($P < 0.05$) environmental variables. A downstream decrease in diversity was observed on campus with available riffle habitats and substrate types likely contributing to fish community change. Ecological distance increased proceeding downstream, demonstrating that local watershed development can alter fish communities by homogenizing stream habitats.

9:00 HABITAT PREFERENCES AND POPULATION CHARACTERISTICS OF A STATE-ENDANGERED CRAYFISH IN THE UPPER HIWASSEE RIVER, Brittany Henry*, S. Weaver and J.G. Davis, Young Harris College, Young Harris, GA 30582. Crayfishes are keystone species in headwater aquatic ecosystems that process organic material, increase nutrient availability, and engineer benthic stream habitat. This study defined habitat preferences of a state-endangered, data-deficient crayfish, *Cambarus parrishi*, in the upper Hiwassee River watershed in northeast Georgia. Crayfish were collected at 12 sites over a two year period, and habitat parameters including substrate size, depth, water velocity, and stream roughness were measured at a microhabitat scale. Correlation analysis identified habitat variables associated with presence that were incorporated into logistic regression models. *C. parrishi* ($n = 108$) were less abundant at lower elevation sites and prefer a wide range of water velocities, cobble and boulder substrates, and shallow depths. In particular, young-of-year *C. parrishi* were found mostly in shallow side pools near undercut banks. Population characteristics such as age-structure, growth rate, and mortality were also defined by measuring captured crayfish. At least four definable age classes are present that show a moderate growth rate with males being larger than females. As listing status for *C. parrishi* is considered, habitat, population, and distributional data from this study will be useful in the evaluation process. Future surveys will expand to higher elevation streams where increased occupancy and abundance was observed.

9:15 A MORPHOLOGICAL DESCRIPTION OF THE SKIN OF HAGFISH MYXINE GLUTINOSA (AGNATHA: MYXINI), Rasheeda S. Rickman*¹, A.J. Clark² and T.A. Uyeno¹, ¹Valdosta State University, Valdosta, GA 31698 and ²College of Charleston, Charleston, SC 29401. This study describes the structure of hagfish (*Myxine glutinosa*, L. 1758) skin. Hagfish have loose skin that is unique among most fish, however, its morphology remains poorly understood. We sampled three hagfish skins from three positions along the body. The tissue was processed for paraffin histology. We cut

10 μm sections that were transverse with respect to the long axis of the fish, and stained them using Milligan's trichrome protocol. The morphology was investigated using light microscopy. The skin was found to be composed of four layers. Proceeding from the outside in: the first, most dense layer had muscle and collagen-like staining properties with longitudinal and circumferential muscle fiber orientations; the second layer was about ten cells thick, also stained like muscle tissue, and included radial, oblique and circumferential fibers; the third layer stained like collagen and included cells with large vacuoles; the fourth layer had collagen and muscle-like staining properties and included varying fiber orientations. Three out of four of these layers are heavily invested with muscle, which is uncommon in fish. This unique morphology has a number of functional implications for swimming and body knotting, that will be investigated in future studies. This study was funded by a Valdosta State University Faculty Research Seed Grant to T.A.U.

9:30 **A DYADIC ANALYSIS OF ACOUSTIC COMMUNICATION IN *PROCAMBARUS SPICULIFER* (CAMBARIDAE)****, Cambrielle N. Sanders*, D.L. Bechler, J.S. Reece and T.A. Uyeno, Valdosta State University, Valdosta, GA 31698. Acoustic communication in crayfish is not well-described and are unknown in the Georgia species *Procambarus spiculifer* (LeConte, 1856). We hypothesized that this crayfish is capable of acoustic communication in response to conspecific visual cues. Sound signals may be generated by knocking parts of their carapaces against objects in the environment. Acoustic communication between and within the sexes may be important for mate selection and territory defense. Three females and two males were caught in Lowndes County streams. Crayfish were housed separately and visually presented to each other, using separate tanks, in all pairwise combinations. Each crayfish was recorded for 0.5 hours before exposure to the other specimen, and then 1.0 hour after initiation of exposure. Recordings were performed during their nocturnal active period using a custom hydrophone, pre-amplification circuit and an Olympus digital recorder. Potential percussive signals were identified using visualizations of the recorded sounds. We compared the number of knocks produced by crayfish before and after the conspecific was presented. Pairwise T-test showed no significant differences in any of the combinations. Therefore unlike some other crayfish species, *P. spiculifer* does not seem to employ acoustic communication in response to visual presentations of other crayfish. This study was funded by a Valdosta State University Faculty Research Seed Grant to T.A.U.

9:45 **DEVELOPMENT OF RADTAG LIBRARIES AND SEQUENCING FOR THE ION TORRENT PERSONAL GENOME MACHINE****, F. A. Dadzie*, J.F. Elder and B. Ring, Valdosta State University, Valdosta, GA 31698. The identification and classification of *Kryptolebias marmoratus* and *Kryptolebias ocellatus* as separate or similar species has been a dilemma. *K. marmoratus* and *K. ocellatus* belong to the Aplocheilidae family and order CYPRINODONTIFORMES. They are both self-fertilizing vertebrates resulting in clonal reproduction suitable for genetic studies. Based on morphological studies, both fishes were thought to be synonymous but recent mitochondrial studies of these fishes suggest otherwise. Though they are known to be self-fertilizing, out crossing has been observed which results in a form of heterozygous offspring. Recently, a viable hybrid (Gitmo) between *K. marmoratus* and *K. ocellatus* was isolated in the VSU aquatic lab. This hybrid questions the species status of these congener fishes. By developing RAD tag libraries for sequencing on the ION Torrent PGM, sequenced fragments can be easily identified and compared. Also the opportunity exists to perform SNP analysis on novel sequences. The Stacks software will be used for phylogenetic analysis of these fragment sequences. RAD tags will aid in resolving the questionable relationship among these killifishes.

10:00 **Section Business Meeting****POSTERS**

AN INVESTIGATION OF MARINE BIOFILMS FOUND ON THREE FISH SPECIES ALONG THE SOUTHEASTERN US**, Chris Bates, C.F. Best* and J.M. Reichmuth, Department of Biological Sciences, Georgia Regents University, Augusta, GA 30904. Most marine biofilm research has been limited to fish farming and waste effluent into coastal zones. Only recently has literature suggested that biofilms growing on substrates may act as cues to settling marine organisms. However, very little research exists regarding biofilms growing on larger marine organisms such as fish. As coastal zone development increases, in addition to increases in temperature of coastal waters associated with climate change, the potential for pathogenic and antibiotic resistant gram-negative bacteria persisting in the marine environment increases. The current investigation seeks to determine the presence of gram-negative bacteria living on three species of fish commonly found in southeastern US coastal waters: Atlantic silverside (*Menidia menidia*), bay anchovy (*Anchoa mitchilli*), and Florida pompano (*Trachinotus carolinus*). All three species are important in the transfer of energy within coastal food webs and serve as food for economically important species such as bluefish, striped bass, and Atlantic mackerel. Fish were caught using seines at three sites: Hunting Island State Park (SC), Cockspar Island (GA) and Tybee Island (GA). Fish were swabbed and bacteria were plated while in the field on MacConkey agar. Samples were transported back to the lab for incubation. Bacteria were purified, characterized biochemically, and tested for antibiotic resistance. Results of these analyses will be presented.

A FIELD EVALUATION OF CAMERA AND LURE TYPES ON CAMERA-TRAPPING SUCCESS IN CENTRAL GEORGIA, Mark R. Beatty* and M.J. Bender, Gordon State College, Barnesville, GA 30204. Georgia is home to a high diversity of wildlife, but presence/absence data in any particular landscape are often lacking. Camera trapping is a time-efficient sampling method, but captures are dependent on the camera and lure employed. The primary objective of this experiment was to compare two cameras that varied substantially in features and cost. Secondarily, we were interested in the influence of two lures on capture success. We sampled points (n=22) in Monroe County, Georgia between May and July 2013 using paired cameras ("Hyperfire" infrared and "Capture" flash). We used a general predator scent lure at half of the camera locations and canned sardines at the remaining. Seventy-seven photographs were taken during 308 trap days. The Reconyx camera captured more animal photographs than the Cuddeback camera (2.45 vs. 1.05/week; Wilcoxon-Signed Rank, $p = 0.0103$). There was no significant difference in the number of photos/week at the points with the sardine lure (3.64) and those with the general predator lure (3.36; Kruskal-Wallis, $p = 0.8154$). Contrary to our expectations, few animals were captured which hampers our ability to make any strong inferences about the influence of camera and/or lure types on capture success. However, our data suggest that, when low capture success is likely, the "Hyperfire" infrared camera is superior to the "Capture" flash camera likely because the faster trigger associated with the Reconyx improves trap success.

A COMPARISON OF SURFACE AND DEEP POPULATIONS OF PHYTOPLANKTON IN THE NORTHEASTERN GULF OF MEXICO**, Courtney M Brylller*, A.V.F. Nienow*, M. Waters and J.A. Nienow, Valdosta State University, Valdosta, GA 31698. We are conducting a multi-year study of phytoplankton in the vicinity of DeSoto Canyon in the northeastern Gulf of Mexico. This is part of a larger project aimed at assessing

the potential transport of water (and oil) up the canyon and the possible impacts of this transport on the ecosystem. Here we report on changes in phytoplankton community structure with depth, with an emphasis on comparisons between surface phytoplankton and those found in the deep chlorophyll maximum (DCM). In June, September, and December 2013, samples were collected from 15 stations along three transects extending 80 km from the coast. At each station, 1-liter samples were collected at set intervals from the surface to the bottom, filtered onto 0.45- μm nitrocellulose filters, and air-dried. A portion of each filter sample will be mounted, sputter-coated, and viewed with scanning electron microscopy (SEM) to determine species composition. An additional 4- to 8-liter sample was collected from the surface and the DCM at each station. These were filtered onto glass fiber filters and frozen; the filters were later extracted and separated using high-performance liquid chromatography (HPLC). Thirteen pigment classes have been identified. The relative concentrations of these will be used to assess changes in community structure with depth using a combination of cluster analysis, principal component analysis, and the program CHEMTAX. The results of the pigment analysis will be compared with those obtained by direct observation using SEM.

DIGITAL MINIONS: OUTSOURCING RESEARCH TASKS TO SMARTPHONES AND OTHER HARDWARE, S.C. Burnett, Clayton State University, Morrow, GA, 30260.

Improvements in digital devices (especially smartphones) provide researchers with a set of powerful tools. Many projects can use such tools in ways that can replace the efforts of several researchers. This can be a significant benefit to those at undergraduate institutions where availability of funding and research assistants can be limited. Such devices can provide functions that were previously much more expensive (e.g., GPS) but they can also function as digital assistants that can take over some of the work that would have been performed by students. This allows us to examine research questions that we might have been unable to address in the past. There is a great deal of software that is available for limited cost (or free), but there are often limitations in what these programs can accomplish. This can render them unable to match the exact need of a particular project. I argue that researchers need to develop familiarity with programming tools to give them greater control of their hardware. This allows one to use these devices to meet the exact needs of a particular project. I will discuss several examples of such projects using tools like MIT's App Inventor (for smartphone apps) and Processing (for computers and microprocessors) to produce software for field research. While there is a need to spend time in learning to use these tools, they have allowed me to produce results quickly and with minimal investment of time. Partial funding for these projects was provided by the College of Arts & Sciences at Clayton State University.

POPULATION DENSITIES OF VARIOUS WILDLIFE SPECIES ON COWDEN PLANTATION, JACKSON, SOUTH CAROLINA, Austin Coleman*, S. Mannix*, J.

Miller*, G. Jansen*, R. Lancaster*, L. Justice*, K. Kelley* and B. Saul, Georgia Regents University, Augusta, GA 30912. An ongoing study to determine the population densities of feral hogs (*Sus scrofa*), white-tailed deer (*Odocoileus virginianus*), wild turkeys (*Meleagris gallopavo*), coyotes (*Canis latrans*) and bobcats (*Lynx rufus*) has been conducted on Cowden Plantation, Jackson, SC, since May 2012. The 10,000 acres of private property are managed for multiple uses, including trophy deer management. Cuddeback trail cameras were initially stationed at feeder locations dispersed across approximately 50% of the property. The cameras were moved away from the feeders after four months to secondary sites on wildlife trails along roadways and planted fields. These new locations were stratified across the entire property. Wildlife activity patterns were initially established at secondary sites with the use of corn supplements as an attractant. Once

baseline rates were documented, scent tablets were placed at each site during and after supplement applications as carnivore specific attractants. Activity rates varied throughout the study period between primary and secondary sites and were associated with several abiotic factors. Population density numbers for each species were calculated based upon methodologies created by researchers at Mississippi State University.

NEW COUNTY RECORDS OF AMPHIBIANS AND REPTILES IN GEORGIA,

Ashley W. Dean*, A.L.J. Duffus, T.M. Ward*, L.A. West*, J.M. Strickland*, M.J. Bender, G.D. Hartman, N.B. Hays*, Z. Burke* and S. Croft*, Department of Biology, Gordon State College, Barnesville, GA 30204. For some portions of Georgia, the distribution of amphibians and reptiles is poorly known, and within the predicted range of many species, there are counties for which no records exist. As part of an effort to establish a herpetology teaching collection at Gordon State College, we have been collecting amphibians and reptiles from Bibb, Butts, Coweta, Fayette, Henry, Lamar, and Spalding counties. We report new records for at least 5 species of reptiles (including *Hemidactylus turcicus*, *Diadophis punctatus*, *Storeria dekayi*, *Scincella lateralis*, *Eumeces (Plestiodon) farciatus*), 3 species of amphibians (including *Lithobates sphenoccephalus*, *Lithobates catesbeianus* and *Notophthalmus viridescens*), and 4 species of turtles (including *Graptemys geographica*, *Chrysemys picta*, *Pseudemys floridana* and *Apalone spinifera*). All specimens were collected with the permission of the Georgia Department of Natural Resources (Scientific Collection Permit: 29-WJH-126) and deposited in the Gordon State College Collection of Vertebrates.

ECOLOGY OF THE LARGE MOUTH BASS (*MICROPTERUS SALMOIDES*) AND BLUEGILL (*LEPOMIS MACROCHIRUS*) POPULATIONS IN THE GORDON STATE COLLEGE POND USING MARK-RECAPTURE: TWO YEARS OF DATA**

Philip Gregory*¹, C. Sander-Fletcher*¹, J.C. George² and A.L.J. Duffus¹, ¹Department of Biology, Gordon State College, Barnesville, GA 30204 and ²Department of Mathematics and Physical Sciences, Gordon State College, Barnesville, GA 30204. Using mark-recapture methods, we examined the population ecology of the largemouth bass (*Micropterus salmoides*) and the bluegill (*Lepomis macrochirus*) in the Gordon State College pond. We angled for several hours on a regular basis from June 2012 to December 2013 to capture the fish. The fish were checked to see if they already had a transmitter and if not they were tagged with a 9mm internal transmitter to permit individual identification. For each fish caught or recaptured the following measurements were taken: length, width, girth and weight. We plan to perform the following analyses on the data collected: determining the average length, weight and depth for each species collected and making comparisons between the animals caught in different years; calculating the predicted population size for each species and the recapture rates for each species. We plan to use the predicted population sizes and capture rates to determine the status of the population (growing, stable or in decline) for each species.

DESIGN AND DEVELOPMENT OF AN INEXPENSIVE MULTIPURPOSE UNDERWATER SENSOR USING ARDUINO™**

Eriq Hearn*, K. Lansing*, J. Lundeen*, J. O'Meara*, T. Mujadzic*, C. Bates and J. Hauger, Georgia Regents University, Augusta, GA 30904. Industry-standard underwater environmental sensors are quite useful, but often expensive. This project aims to develop a device with multiple sensors that are of comparable quality to the commercial equipment using the very affordable, and easily programmed, Arduino™ Microcontroller. The project demonstrates the Arduino's usefulness in measuring multiple environmentally significant parameters such as turbidity,

pH, flow rate, and temperature. Design, construction, testing details and comparisons to commercially available devices will be presented.

AN EVALUATION OF THE RELATIVE INFLUENCE OF INSECT ORDERS ON BAT ACTIVITY IN BARNESVILLE, GEORGIA, Leah D. Herring*, J.D. Nestor* and M.J. Bender, Gordon State College, Barnesville, GA 30204. Several diet studies suggest that bats exhibit insect prey preferences at the ordinal level. Therefore, fluctuating insect abundances should correspond with fluctuating bat activity at a sample point. Our objective was to determine which insect order was most plausibly related to nightly bat activity in Barnesville, GA. We used a black-light insect trap and an ANABAT SD2 bat detector to concurrently sample insect abundance and bat activity for 20 nights between 26 September and 20 November 2013. Insects were partitioned into nightly samples and identified to order (n=1535). Nine insect orders were represented but only four orders (Coleoptera, Lepidoptera, Diptera, Hemiptera) were present in sufficient quantity to be considered as plausibly related to bat activity. Bat call data were processed to remove non-bat ultrasonic noises and determine the nightly number of call sequences recorded. On average, 150 bat sequences were recorded nightly (range = 2 – 801). Our modeling efforts indicate that bat activity was most plausibly related to the nightly abundance of Lepidopterans, which was also the most frequently captured insect order (average/night = 29). Our results agree with a plethora of research suggesting the importance of Lepidopterans to insectivorous bats.

PRELIMINARY ANALYSIS OF FISHES SURROUNDING ST. CATHERINES ISLAND**, A. L. Hurst*¹, C.F. Best*¹, K. A. Jonske*¹, J.W. Moak², G. D. Carroll², C.W. Lambert¹ and B.M. Saul¹, ¹Georgia Regents University, Augusta, Georgia 30904 and ²Georgia Southern University, Statesboro, Georgia 30458. The effects of global climate are influencing ecosystems around the world. Our oceans and fish stocks may be facing threats from changing water temperatures. It seems likely that as temperatures change, conditions will change and fish assemblages will move. Vulnerable marine species will be subjected to increased pressure. The full impacts of these changes are not yet known. Monthly ichthyofaunal research utilizing beach seining and trawling has been conducted on St. Catherines Island since 1998 to the present. The purpose of this research is to collect data on the current fish assemblages surrounding the Georgia barrier island of St. Catherines for comparison with similar data collected from archaic fish populations and previous studies of the 1960s. This continuous data set of species richness, species diversity, habitat utilization, and temperature can be very useful for determining trends or fluctuations within these fish populations. In this study we highlight similarities in species richness and diversity between the three time periods and overall changes in population composition. For example, early analysis suggests ubiquity is more strongly influenced by seasonal patterns within each time period than temperature differences between time periods. We also point out some of the key implications of using these studies for management of fish populations in environments where conservation has shifted from focusing on single species to ecosystem conservation. Funding for this study was provided by American Museum of Natural History.

EVALUATION OF HEAVY METAL ACCUMULATION AND DISEASE IN VIRGINIA OPOSSUMS (*DIDELPHIS VIRGINIANA*) FROM NORTH FLORIDA AND SOUTH GEORGIA**, D.B. James* and J.M. Lockhart, Valdosta State University, Valdosta, GA 31698. Using tissue and blood samples from over 1,700 Virginia opossums from four sites in South Georgia and North Florida, we plan on evaluating the

prevalence of both parasitic diseases and heavy metal accumulation. The samples were collected from 2003 to 2006 as part of a USDA-WS project. For each sample, we will run toxicology tests to determine heavy metal accumulation, a PCR test to assess the presence of *Trypanosoma cruzi*, and fluorescent antibody tests to determine whether any of the following are present: *Toxoplasma gondii*, *Sarcocystis neurona*, *Sarcocystis falcatula*, *Besnoitia darlingii*, *Neospora caninum*, *Leptospira*, and *Encephalitozoon cuniculi*. The results from this study will be compared to a similar survey of armadillos of the same region. Taken together, the results from both studies may indicate patterns of disease cycles in nature.

MORPHOLOGICAL COMPARISON OF TWO POPULATIONS OF *HYALELLA AZTECA* FROM FRESHWATER SPRINGS IN FLORIDA, U.S.A.**, Taylor A. Mac-

Mackin*, K. Oh* and T. R. Sawicki, Middle Georgia State College, Macon, GA 31220. Since the original description of *Hyalella azteca* by Saussure (1858) from Vera Cruz Mexico, populations of *H. azteca* from all across North America, Central America and even into South America have been discussed in the literature. Collections of two populations of *H. azteca* were made from springs in Florida as part of a larger research project attempting to understand the species diversity of amphipods in the Floridan aquifer. One population was collected from sand and algae of an epigeal benthic habitat in the spring basin at De Leon Springs State Park. The second species was collected from a hypogean environment in Weeki Wachee Springs State Park. This may represent the first record of *H. azteca* from a cave environment. This study is a morphological comparison of these two populations of *H. azteca*. Field collections were conducted on July 21, 2012 and November 2, 2013 using SCUBA equipment. Specimens were collected with a 250 ml Nalgene bottle modified for use as a suction device. After each dive the Nalgene bottles were placed on ice for 60 minutes. Specimens were then fixed in 95% ethyl alcohol and subsequently stored at -70°C. Specimens were dissected using a Leica M125 stereomicroscope and appendages mounted on temporary glycerin slides. Appendages were analyzed and drawn using a Leica DM 750 compound microscope with camera lucida. Funding sources: APUS Faculty Research Grant, Macon State College Faculty Grant, The Cave Conservancy Foundation, Dogwood City Grotto.

FECAL PELLET MORPHOMETRY AS AN INDICATOR OF BODY SIZE IN NINE-BANDED ARMADILLOS (*DASYPUS NOVMCINCTUS*) FROM THE SOUTHEASTERN UNITED STATES**, B.A. Mixon* and C.M. McDonough, Valdosta State University, Valdosta, GA 31698. Although nine-banded armadillos (*Dasyopus novemcinctus*) are a common sight throughout the southeastern United States, they are difficult to study because of their nocturnal habits. Fecal remains are a common artifact in some habitats and may provide a means of defining population demographics without the time-consuming efforts of a mark-recapture study. If pellet size can give some indication of age and thus, population structure, then this information could facilitate future wild-life management decisions for endangered armadillo species. Fecal remains deposited naturally or during capture were collected for 102 armadillos from Florida, Georgia and Texas. Upon capture, age, sex and body weight were recorded. Each fecal sample was dried. Width and length were measured for each pellet and volume was calculated in 65 samples that maintained pellet formation. Pellet volume correlated positively with body weight when all age classes were combined. When age classes were considered separately, only pellet volume of juveniles, but not adults or yearlings, correlated with body weight. Juveniles on average deposited significantly smaller pellets by volume when compared to yearlings and adults. No significant differences in pellet volume were found between

males and females for all age classes. Our results suggest that a differentiation between juvenile and adult pellets is possible, potentially indicating recruitment in a population.

ICHTHYOFAUNA OF PHINIZY SWAMP NATURE PARK, AUGUSTA, GA, Jason W. Moak¹ and B.M. Saul², ¹Southeastern Natural Sciences Academy, Augusta, GA 30906 and ²Georgia Regents University, Augusta, GA 30904. The ichthyofauna of aquatic ecosystems is determined by the type of habitat available. Floodplain wetlands, bottomland hardwood forests, and tributaries that flow through them have all been impacted by human activities over the past two centuries. Phinizy Swamp Nature Park is an 1,100 acre area situated on the floodplain within the Middle Savannah River Basin (HUC 03060106), and includes a 360 acre constructed wetland used for tertiary wastewater treatment. Additionally, natural wetlands, bottomland hardwood forest, and a portion of Butler Creek occur within the Park's boundaries. We have periodically sampled aquatic habitats within Phinizy Swamp Nature Park (PSNP) since 2005 to determine what fish species were present. In Fall 2010 and 2013, we again conducted a systematic sampling of fish species within the park. To date, a total of 44 species of fish representing 11 families have been documented within PSNP. Only 4 species of fish have been collected from within the constructed wetland habitats, ostensibly due to frequent hypoxic conditions.

LONG-TERM OBSERVATIONS OF FISH COMMUNITIES AND WATER QUALITY ALONG THE GEORGIA-CAROLINA COAST**, Erik Neff*, A. Outhwaite* and J.M. Reichmuth, Department of Biological Sciences, Georgia Regents University, Augusta, GA 30904. Most of the literature on long-term fish communities exists for the mid- and northern US Atlantic coasts. However, very little has been published on the southeastern Atlantic coast, specifically the South Atlantic Bight. The purpose of this study is to fill this current void in the literature regarding fish communities and their correlations with water quality (*i.e.*, temperature, salinity, and dissolved oxygen) along our immediate coast. Our study sites included Tybee Island (GA) and Hunting Island (SC). To collect fishes, we used two beach seines using the quarter haul technique; fish were identified to species, counted, and total length was measured. A Hach HydroLab water quality multi-probe was used in obtaining water quality data. To date, we have found the following trends: dissolved oxygen was highest for both sites in colder months. Mostly bait fish, bay anchovies (*Anchoa mitchilli*) and Atlantic silversides (*Menidia menidia*), were caught in these colder months in high numbers, but community diversity was low, overall. As water temperatures warmed in late spring through early fall the highest diversity of species was observed, but the number of individuals caught was lower. This project wouldn't have been possible without funding from GRU's Center of Undergraduate Research and Scholarship and the Pamplin Student Research and Travel Fund.

PLANT DNA BARCODING: AN ONGOING RESEARCH PROJECT AT GORDON STATE COLLEGE**, Lucas Newman*, P.A. Scott*, S. Rosario, A.L.J. Duffus and C. Lee, Gordon State College, Barnesville, GA 30204. In 2012, a project involving plant DNA barcoding was started at Gordon State College to improve student engagement in upper-division and senior-level biology research courses. DNA barcoding involves the collection of specimens of interest for identification and laboratory analysis of DNA barcode sequences. The data are then placed in a database for subsequent analyses. One of the most important components of the Barcode Initiative is the construction of a public reference library of species identifiers that could be used to assign unknown specimens to known species. This provides an excellent molecular tool for students to be trained to collect, manage, and analyze DNA barcode data. In Fall 2012 and Spring 2013, three

groups of six students from the Biotechnology and special research topics classes isolated genomic DNA from 60 plant species from the produce sections of local grocery stores and nine plant species from the Gordon State College Walking Trail. Genomic DNA preparation was done using PureLink™ Plant DNA Total DNA Purification Kits (Invitrogen, Carlsbad, CA). The students amplified chloroplast *rbcL* sequences with polymerase chain reaction (PCR). Genomic DNA templates and DNA sequencing were done by GeneWiz. The students currently enrolled in the special research topics course in Fall 2013 are analyzing DNA sequences using MEGA software to understand the evolutionary relationships between these species and further analyze DNA barcoding data. This provides an excellent educational research project within the undergraduate upper-division and special research topics biology courses.

MORPHOLOGICAL ANALYSIS AND COMPARISON OF A POPULATION OF *HYLALLA AZTECA* COLLECTED FROM A SPRING BASIN IN DE LEON SPRINGS STATE PARK, DELAND, FLORIDA, U.S.A. TO SPECIMENS DESCRIBED FROM THE TYPE LOCALITY IN VERA CRUZ, MEXICO**, Jane Probadora* and T.R. Sawicki, Middle Georgia State College, Macon, GA 31220. *Hyaella azteca* is a common freshwater amphipod species that forms a species complex distributed throughout South, Central and North America. *H. azteca* was originally described by Saussure (1858) from Vera Cruz Mexico and was recently redescribed by Gonzalez and Watling (2002). Morphological, ecological, and genetic variation observed between various populations of *H. azteca* from across their range potentially represents species level differences. This study is a morphological comparison of a population of *H. azteca* collected from De Leon Springs State Park to that of the specimens described from the type locality in Vera Cruz, Mexico. Field collections were conducted on July 21, 2012 and November 2, 2013 using SCUBA equipment. Specimens were collected with a 250 ml Nalgene bottle modified for use as a suction device. After each dive the Nalgene bottles were placed on ice for 60 minutes. Specimens were then fixed in 95% ethyl alcohol and subsequently stored at -70°C. Specimens were dissected using a Leica M125 stereomicroscope and appendages mounted on temporary glycerin slides. Appendages were analyzed and drawn using a Leica DM 750 compound microscope with camera lucida. Funding sources: American Public University System Faculty Research Grant, Macon State College Faculty Grant, The Cave Conservancy Foundation, Dogwood City Grotto.

USING R AS A GENERAL PLATFORM FOR COMPUTATIONAL EDUCATION IN BIOLOGY, Hong Qin, Spelman College, Atlanta, GA 30314. The program language R is a state-of-the-art tool for bioinformatics and computational biology. To better prepare biology students for their careers, we developed an R-based computational biology course. In this course, students learned to program in R through in-class exercises, YouTube tutorial videos (youtube.com/qinostat), and group research projects. Basic skills of computational thinking such as abstraction, automation, iterations, conditionals, search space, and permutation were emphasized. In addition, portions of the developed materials are offered as modules in other courses. Our experiences of teaching computing to biology students at undergraduate level can be helpful for other faculty interested in integrating computational biology into the undergraduate biology curriculum.

INSECTICIDAL EFFECT ON THE ARGENTINE ANT (HYMENOPTERA: FORMICIDAE) BY METABOLITES IN PLANT SALICYLIC ACID BIOSYNTHESIS**, Paul Aaron Scott*¹, M. Babb*¹, L. Herring*¹, C. Kang², M. Brinkman¹ and C. Lee¹, ¹Dept. of Biology, Gordon State College, Barnesville, GA 30204 and ²Dept of Chemistry, Washington State University, Pullman, WA 99164-4660. The Argentine ant, *Linepi-*

thema humile (Mayr), is a serious pest in the southern United States. As for developing safe methods of controlling the Argentine ant, we tested plant salicylic acid metabolites as possible natural insecticides. One of the main plant secondary metabolites is a salicylic acid, β -hydroxybenzoic acid that is synthesized from phenylalanine via cinnamic acid and *o*-coumaric acid or via benzoic acid. In this report, the lethal effect of salicylic acid and their precursor molecules, namely phenylalanine, *o*-coumaric acid, cinnamic acid and benzoic acid to worker ants was tested. In addition, acetaminophen, a synthetic hydroxyphenyl derivative, was tested to investigate any plausible lethal effect of salicylic acid through a catabolic quinone or phenoxyl radical formation. Cumulative mortality of Argentine ants was estimated after 3-day exposure to a salicylic acid and other target powder compounds. Worker ants in both control and compound trials were fed a 10% sucrose food solution. Three containers with twenty ants were tested for each compound for three days and each experiment was repeated three times. Our preliminary results strongly indicated a severe lethal effect of salicylic acid, cinnamic acid and benzoic acid and slight lethal effect of *o*-coumaric acid and acetaminophen. However, the upstream precursors, such as phenylalanine and *p*-coumaric acid were not effective.

MULTI-YEAR INVESTIGATION OF A TURTLE COMMUNITY IN A NORTHWEST GEORGIA LAKE AND WETLAND PRIOR TO RESTORATION, Crispian F. Shelton*, C.B. Manis and G.J. Lughart, Dalton State College, Dalton, GA 30720.

A study of a Northwest Georgia lake and wetland was undertaken during two week sampling periods in June 2012 and July 2013 in order to characterize the turtle community prior to a pending restoration of the area. The study site is within Lakeshore Park in the city of Dalton. A total of 453 turtles were captured representing four families and six species. *Trachemys scripta* was the most abundant Emydid and species observed (30%). Other Emydids, including *Pseudemys concinna* (17%) and *Chrysemys picta* (7%) were less common. Representatives of families Kinosternidae, Chelydridae, and Trionychidae were represented by one species each, with *Sternotherus odoratus* (35%), *Chelydra serpentina* (10%), and *Apalone spinifera* (1%) being collected, respectively. All but three of the species had sex ratios of approximately 1:1. Female *S. odoratus* outnumbered males (1.42♀:1♂) whereas male *C. serpentina* and *P. concinna* significantly outnumbered females (2.5♂:1♀ and 1.4♂:1♀, respectively). The turtle community of the Lakeshore site is similar to other regional assemblages. Sexual size dimorphisms were noted in two of the Emydid species, with females reaching significantly larger sizes in all body measurements relative to males. Mature male *C. serpentina* were significantly larger than females in regards to carapace length.

INFLUENCE OF INSECT SIZE ON BAT ACTIVITY IN LAMAR COUNTY, GEORGIA, Victoria L. Swenson*, H.D. Bryan* and M.J. Bender, Gordon State College, Barnesville, GA 30204.

Aerial insects are the primary prey of insectivorous bats in the southeastern U.S. and likely play a key role in the distribution and abundance of bat populations in the region. However, assessing habitat quality based on insect abundance is difficult because the appropriate measure of insect abundance remains an unanswered research question. Although some research suggests bats are capable of making fine taxonomic-level discriminations, other research suggests that bats choose or reject prey based on size alone. The objective of this project was to determine the insect size most plausibly related to bat activity. We concurrently sampled insects using a black-light trap and bat activity using an ANABAT SD2 detector at a single location for 30 nights between 30 August and 11 November 2013. We captured an average of 304 insects nightly (range 1-1283). Negative binomial regression and Akaike's Information Criterion were used to evaluate the relative plausibility of models relating bat activity to insect abundance. Mod-

eling results indicate that bat activity was most plausibly related to the largest insect size class we investigated (> 12mm body length). However, insect size classes were correlated with each other and also with temperature. Researchers interested in the influence of insect abundance on bat activity in central Georgia during autumn likely could use a simple count without sorting size-classes or use temperature as a surrogate for insect abundance.

USING ANGLER CATCH DATA TO ASSESS AN INTRODUCED SPOTTED BASS FISHERY IN A GEORGIA HIGHLAND RESERVOIR**, Joe Thompson* and J.G. Davis, Young Harris College, Young Harris, GA 30582. Chatuge Reservoir in northern Georgia is a popular angling destination for black basses (*Micropterus* spp). An introduction of spotted bass in the early 1990s resulted in the development of a popular spotted bass fishery. Using black basses (n=503) collected from weekly tournaments, we assessed the spotted bass fishery by measuring growth, condition, and stock indices. Although largemouth bass were heavier and longer than spotted bass (weight=1329 g and 1014 g, respectively; total length=442.5 mm and 420.9 mm, respectively), only 8.3% of the catch consisted of largemouth bass. Relative weight, a measure of condition, of spotted bass (mean=87.4 g, SD=10.6) was highest during spawning season although condition quickly recovered probably due to a blueback herring spawn before declining until late September. Stock indices were estimated using a back-calculated regression model constructed from length-frequency data. Proportional stock density was 53.4 and relative stock densities of preferred, memorable, and trophy-sized fish were 29.4, 10.7, and 1.2, respectively. Condition of trophy-sized spotted bass was significantly (P=0.009; ANOVA) less than other size ranges. Catch-curve analysis estimated annual mortality rate of the population at 61%. Further research will examine seasonal catch rates by anglers. Although biases exist, tournament data is collected cheaply, supplements data collected by resource agencies, engages anglers in resource management, and provides surrogate population measures. Furthermore, information gained is useful because resource managers are considering a reintroduction of the native smallmouth bass that was displaced by the spotted bass introduction.

DETERMINATION OF A GENE EXPRESSED ONLY IN THE INFECTIVE LARVAL STAGE OF *DIROFILARIA IMMITIS***, S. J. Thompson* and E.W. Chambers, Valdosta State University, Valdosta, GA 31698. *Dirofilaria immitis* is a mosquito-transmitted nematode parasite of canines. These worms usually pose a significant risk to the heart by compromising its function. Many species of mosquitoes are thought to be potential vectors, most in the genera *Aedes*, *Anopheles*, and *Culex*. Although a significant number of mosquito species may permit complete development of the parasite to the infective L3 larval stage, the risk of transmission that each individual poses is still widely unknown. A standard PCR assay has been developed and applied in the field to identify infected mosquitos. Unfortunately, this assay cannot provide transmission potential as it detects the presence of DNA from all parasite stages in the mosquito. This research will identify candidate genes that are preferentially expressed by mosquitoes carrying *D. immitis* at the L3 stage using bioinformatic analysis. Only those genes with defined intron-exon targets will be used to construct a reverse- transcriptase PCR (RT-PCR) assay. This assay will allow both veterinarians and other animal care professionals to correctly identify mosquito vectors that play a critical role in heartworm transmission.

HOST-PLANT PREFERENCE OF *MEGACOPTA CRIBRARIA*, Taylor L. Upole* and C. Zehnder, Georgia College & State University, Milledgeville, GA 31061. *Megacopta cribraria*, the kudzu bug, is a rapidly spreading invasive species that was first reported in Georgia in 2009. *M. cribraria* can have negative impacts on their native host plant,

kudzu, as well as economically important crops such as soybeans. To better understand their feeding habits, studies were conducted to determine their host plant preference. In one set of laboratory trials, *M. cribraria* were presented with both kudzu and soybeans. When given this choice, the insects showed preference towards kudzu. In a second set of laboratory trials, the insects were presented with an inoculated soybean plant and a non-inoculated soybean plant. *M. cribraria* did not show any preference between the two choices of soybeans, suggesting them ill equipped for distinguishing between the two. Overall, these results show that in areas where soybeans are grown near kudzu, kudzu will suffer more damage than soybean crops.

GROWTH INHIBITION AND HYDROGEN PEROXIDE PRODUCTION OF *LACTOBACILLUS JOHNSONII* IN PRESENCE OF PHENOLIC ACIDS**, Sheena

Vasquez*¹, M. Maduro*³, C. F. Gonzalez² and G. Lorca², ¹Georgia Perimeter College, Decatur, GA 30034, ²University of Florida, Gainesville, FL 32611 and ³Miami Dade College, Miami, FL 33132. The *Lactobacillus johnsonii* N6.2 strain delayed the onset of type 1 diabetes in previous experiments. It also displayed strong ferulic acid esterase activity; its probiotic activity may be a result of the slow release of ferulic acid. The correlation between *L. johnsonii* and ferulic acid prompted our investigation of the bacterial interaction with other phenolic acids. The growth of the cells was observed *in vitro* under different conditions: static and shaking. Cultures treated with ferulic acid and *p*-coumaric acid had μ_{\max} values of 0.13 and 0.16 respectively under shaking conditions, displaying slower growth than other treatments. Cultures treated with curcumin acid grew the fastest with a μ_{\max} of 0.26. The average optical density within the first 8 hours under shaking conditions was 0.564, in contrast to 0.942 under the static conditions. For hydrogen peroxide testing, supernatants from samples were treated with 4-aminoantipyrine. Cultures exposed to oxygen stress under shaking conditions produced an average of 155 μM of hydrogen peroxide as opposed to an average of 104 μM produced under static conditions. Surprisingly, *L. johnsonii* grown in the presence of caffeic acid produced significantly lower amounts of hydrogen peroxide, 69 μM , than those grown with rosmarinic acid, 215 μM . For further investigation, these cultures were separated through High Performance Liquid Chromatography. Rosmarinic acid did not fully degrade until 24 hours. Research was funded by the National Science Foundation. NSF Due: 1067896 and NSF Due: 1161177.

ACTUAL VS. PREDICTED CHELONIAN DIVERSITY IN GEORGIA**, Tiffany M.

Ward*¹, J.G. McGuire², A.L.J. Duffus¹ and J. Jensen², ¹Gordon State College, Barnesville, GA 30204 and ²Georgia Department of Natural Resources, Forsyth, GA 31029. There are 28 species of chelonians present in Georgia, many of which have not been recorded in counties where they are predicted to occur. We are currently creating a database of county-level occurrence records derived from Jensen *et al.* (2008) 'Amphibians and Reptiles of Georgia' along with more recent collections and references. Using this database we hope to identify the species with the poorest geographical representation (*i.e.* species that do not have records in counties where they are predicted to occur) and to identify the counties that are the most deficient in data. This will allow for the identification of species and counties that require more intensive research so we can fully understand and map distributions. Understanding the distribution of chelonian species in Georgia is critical for conservation efforts as many are of conservation interest (listed for protection at the state and/or federal level) and/or have limited distributions.

ANURAN AMPHIBIAN DISTRIBUTIONS IN GEORGIA: PREDICTED VS ACTUAL PATTERNS**, L.A. West*¹, A.L.J. Duffus¹, J.G. McGuire² and J. Jensen², ¹Department of Biology, Gordon State College, Barnesville, GA 30204 and ²Georgia Department of Natural Resources, Forsyth, GA 31029. Much of the predicted range of many anuran species in Georgia is not supported by voucher specimens. In this study, we are creating a database based on predicted distribution patterns and actual species records obtained from Jensen *et al.* 2008 Amphibians and Reptiles of Georgia, along with more recent records. We will examine the actual distribution of species compared to their predicted distributions in Georgia. As a result, we can identify both species and counties that require more intensive surveys to fully understand and map distributions. Understanding the distribution of anuran species in Georgia is critical for conservation efforts as many of these species have limited distributions and/or are of conservation interest, having been listed for protection at the state and/or federal level.

PHENOLOGY OF PHOTOSYNTHESIS, LEAF AND LITTER TRAITS IN CHINESE PRIVET, AN INVASIVE SHRUB, Tyler Williams* and M.P. Weand, Southern Polytechnic State University, Marietta, GA 30060. Chinese privet (*Ligustrum sinense*) is a non-native semi-evergreen shrub commonly forming dense understories in disturbed lowland forest fragments throughout the southeastern US. One mechanism by which privet may invade forests is through extended leaf duration that allows greater access to carbon (C) compared to native shrubs. We hypothesized that privet captures increased C during autumn months when the over-story canopy senesces and light levels in the understory increase. We measured photosynthetic leaf and litter traits in privet from August to November 2012 in urban forest fragments in Marietta, GA. Over this time period mean rates of stomate conductance and photosynthesis increased 125% and 51% respectively. Mean leaf mass per area, an index of photosynthetic ability, increased from 3.9 mg/cm² to 5.3 mg/cm². While foliar N concentrations increased from 2.81% to 3.00%, litter N concentrations decreased from 1.88% to 1.64%. These results support our hypothesis and suggest that during fall, as light increases occur in the forest understory, privet resorbs more N from its senescing leaves, and constructs more N-demanding photosynthetic machinery (e.g. chlorophyll) required to capture C. This phenological pattern of nutrient investment is in contrast to many native shrubs that lose photosynthetic ability over the fall months.

Section II: Chemistry
Science Hall W1051
Ghislain Mandouma, Presiding

8:15 **AN EXPLORATION OF THE SYNTHESIS AND CHARACTERIZATION OF MICROEMULSION POLYMERIZATION OF CROSSLINKED POLYMETHYL METHACRYLATE-NET-POLYETHYLENE GLYCOL DIMETHACRYLATE ENCAPSULATED POLYSTYRENE****, Christopher J. Scanlon* and Daniel Holley, Columbus State University, Columbus, GA 31907. The synthesis and characterization of microemulsion polymerization of crosslinked PMMA-net-PEGDMA encapsulated linear Polystyrene (PS) is explored. Microemulsion polymerization synthesis using a sodium dodecyl sulfate (SDS) surfactant was used to prepare the polystyrene within the micelles. An attempt to encapsulate linear polystyrene within micelles by crosslinking PMMA-net-PEGDMA around the polystyrene. Polymer characterization techniques, such as, gel-permeation chromatography and IR were used to analysis the polymer material. The purpose of encapsulating the polystyrene is to lower the free volume of the linear

polystyrene. Lowering the free volume of the polystyrene in the encapsulation is theorized to lower the glass transition temperature of the polymer material. The encapsulated polymeric material may have novel, rubber-like properties at room temperature. I am appreciative for the help and support given by Dr. Wade Holley. CSU Chemistry Department, CSU SRACE Grant, CSU SGA and ACS Auburn Local Section provided funding for this research.

8:30 CATALYST- AND SOLVENT-FREE HIGH YIELDING ULLMANN COUPLING REACTION, Solita Lam, Yvonne Pupilampu-Dove, Ayunna Epps and Ghislain Mandouma*, Department of Natural Sciences, Albany State University, Albany, GA 31705. Solvent-free reaction using a high-speed ball milling technique has been applied to the classical Ullmann coupling reaction for the first time. Biarylation of several nitrated aryl halides was achieved in good to quantitative yields when performed in custom-made copper vials through continuous shaking without additional copper or solvent. All products were obtained pure or required little purification. These reactions were cleaner, and faster than solution phase coupling which require longer reaction time in high boiling solvents, and added copper catalyst as well as lengthy extraction and purification steps. Gram quantities of biaryl compounds have been synthesized by gradual scale up of vials' sizes, a proof that this method can be used to reduce industrial waste *en route* to sustainability.

8:45 A PRELIMINARY ELEMENTAL ANALYSIS OF THE ORGAN SYSTEMS OF THE FETAL PIG VIA FLAME ATOMIC ABSORPTION SPECTROSCOPY AND INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY**, M.M. Quick*¹, A. Ahmed*², S. Hudson*², J. Solomon*² and D.P. Pursell¹, ¹Georgia Gwinnett College, Lawrenceville, GA 30043 and ²Gwinnett School of Math, Science, and Technology, Lawrenceville, GA 30044. We conducted elemental analysis of fetal pig (*Sus scrofa domesticus*) organ systems. Pigs were dissected and organ systems separately washed, dried, weighed, and digested using nitric acid, hydrogen peroxide, and heat following standard protocols. Digested samples were then diluted to known concentration solutions and analyzed using standard techniques with flame AA and ICP-MS to determine elemental metal composition. Results obtained thus far and direction of future work will be presented.

9:00 DESIGN AND SYNTHESIS OF NEW FLUORINATED SULFANILAMIDES**, Hannah E. Cole*, Gabrielle N. Costello*, J. C. Helms, J. C. Sloop, D. P. Pursell and R. Haining, School of Science and Technology, Georgia Gwinnett College, Lawrenceville, GA 30043. The design of novel sulfanilamide species which combine the structural features of traditional sulfa drugs, branched architecture and the unique electronic properties of fluorine enables investigation of multiple structure-property relationships and biological activity studies. Along these lines, we report the synthesis of several new sulfanilamide molecules containing fluorine and other electron-donating groups. Electrophilic fluorination using the Selectfluor[®] reagent was accomplished at two different points in the synthetic scheme, affording ring-selective fluorine incorporation into the sulfanilamide targets in yields ranging from 40-82%. A comparative study of aromatic selectivity-reactivity toward Selectfluor[®] in these molecules revealed some unusual product distributions for the fluoro-sulfanilamides, which will be discussed. Preliminary bioactivity test results will be presented.

9:15 Break

9:30 **STUDY OF STEM-LOOP DNA AS STARTING MATERIAL FOR SELEX****, S. L. Boone* and A. C. Spencer, Georgia Regents University, Augusta, GA 30904. An aptamer is a single-strand oligonucleotide that is capable of binding a target with high selectivity and specificity. There are well developed methods for obtaining an aptamer, the most common being a method called SELEX. Though SELEX is a well-developed and efficient process, it still has its problems when obtaining a DNA aptamer. The SELEX method includes an extra purification step in order to convert the double-strand DNA into single-strand DNA. This extra step can be very expensive, time consuming, and results in a low yield. Aptamers have many industrial uses such as drugs or diagnostic tools. So it is important to improve the method. In order to avoid the purification step of SELEX, stem-loop DNA is used as the starting material. In order for this method to be tested, a stable stem-loop DNA structure needed to be designed, characterized, amplified, and produce the correct product after amplification. A SELEX procedure has been designed.

9:45 **OPTIMIZATION OF THE INTRAMOLECULAR BUCHWALD-HARTWIG N-ARYLATION OF A 2-AMINOPYRROLE FOR THE ORGANIC TEACHING LABORATORY****, P. X. Moon* and C. E. Stephens, Georgia Regents University, Augusta, GA 30912. The transition metal-catalyzed Buchwald-Hartwig N-arylation reaction has revolutionized the synthesis of N-arylated compounds. But to our knowledge, there has been no report of a teaching experiment which illustrates this reaction. Recently, we described the Pd-catalyzed intramolecular N-arylation of some 2-aminopyrroles containing a (2-chlorophenyl) sulfonyl group at the 3-position to give a novel tricyclic ring system. With the goal of optimizing this reaction for use in the organic teaching laboratory, we explored conducting the reaction at a 30 minute reaction time, which would allow the reaction, purification, and analysis to be completed in a typical 3 hour lab period. We also explored the use of K_2CO_3 and Na_2CO_3 as alternatives to the more expensive Cs_2CO_3 , and performing the reaction in an open atmosphere, instead of under inert gas. In all cases, the air stable $Pd(OAc)_2$ was used as precatalyst, X-Phos was used as ligand, and t-BuOH was used as solvent. Our results show that the N-benzyl 2-aminopyrrole substrate can be cyclized using such optimized conditions without any noticeable decrease in yield or purity of the tricyclic product. Plans are now underway to have students in either the Organic II or Advanced Organic laboratory perform a two-step synthesis project involving preparation of the 2-aminopyrrole followed by intramolecular Buchwald-Hartwig N-arylation to give the tricyclic product.

POSTERS

A NOVEL GREEN SYNTHESIS OF SUBSTITUTED BENZO[c]CINNOLINES AND DIBENZO[c,h]CINNOLINES, POTENTIAL INHIBITORS OF TOPOISOMERASES I AND II**, Tahera Nembhard*, Brittney Bender* and Ghislain Mandouma, Albany State University, Albany, GA 31705. Biaryl compounds play an important role in medicinal chemistry and drug discovery and synthetic methods of biarylation have been dependent on expensive transition metal catalysts. Benzo[c]cinnoline and its derivatives are important heterocyclic compounds with antirheumatoid, as well as antimetabolic properties. A novel two-step synthetic method to prepare benzo[c]cinnoline and its chlorinated derivatives is proposed. The first step of the procedure is entirely "green" involving no use of solvent or added catalysts for this novel Ullmann-type biarylation of chlorinated nitroarenes at room temperature. The following step is a classical diazo moiety forming cyclization at low temperature to generate the benzo[c]cinnolines. The new procedure is suitable for self- and cross-coupling condensations. Cross-coupling of different chlorinat-

ed nitroarenes is moderate to high yielding in comparison to self-dimerization as shown in the preparation of biarylated compounds. Examples of novel tandem cross-coupling triarylation to form the compounds demonstrate the general scope of this novel method.

DETERMINATION OF CADMIUM AND CHROMIUM IN COMMERCIAL WINE SAMPLES, K. Smith and S. M. Abegaz, Columbus State University, Columbus, GA 31907. A method has been developed for direct determination of arsenic, cadmium and chromium in commercial wine samples using graphite furnace atomic absorption spectrometry (GFAAS) which is equipped with Zeeman-effect background correction. The ashing and atomization temperatures were optimized, and the accuracy of the analytical method was confirmed using certified reference material. The results of this study and the certified values were in good agreement. The proposed method was applied for analysis of several commercial wine samples produced from different regions of the world. The concentration range of arsenic, cadmium and chromium in the wine samples were 0.50-9.50, 0.20-2.05, and 10-40 $\mu\text{g/l}$, respectively. We would like to thank the department of chemistry and the office of the provost for their financial support.

GEMINAL DIFLUORINATION OF THE PYRAZOLE RING OF 3,5-DIPHENYL-PYRAZOLE USING AN N-F REAGENT**, Allyson L. Knapp*, C. K. Eidell, H. R. Duplain*, L. Walton*, T. B. Tinkle* and C. E. Stephens, Georgia Regents University, Augusta, GA 30912. The pyrazole ring is present in many interesting biologically active compounds. Fluorination of these heteroaromatic ring systems can produce profound changes in activity and is the reason that many drugs on the market today contain fluorine substituents. The ability to directly fluorinate a heteroaromatic ring system is of great importance in synthesizing possible new drug compounds. Previous work has shown that 1,3,5-triphenylpyrazole can be monofluorinated at the 4-position using N-F reagents. In this study, fluorination of 3,5-diphenylpyrazole using the mild N-F reagent Selectfluor has led to the formation of a novel 4,4-difluoropyrazole derivative, along with a hydrated byproduct formed by the addition of water across one of the pyrazole pi bonds. Optimization of reaction conditions, taking care to minimize contact with water, provided substantial improvement of the yield of the desired non-hydrated 4,4-difluoro product. An X-ray crystal structure has been obtained for the non-hydrated difluorinated pyrazole.

THE SURFACE OF SILICA AS A MEDIUM FOR THE SYNTHESIS OF CHIRAL IMINES AND CHIRAL AMINES, M. Brock*, J. Rivera, C. Winford and J. T. Barbas, Valdosta State University, Valdosta, GA 31698. We have continued our investigation for green economical methods for the synthesis of chiral imines and chiral amines. We have synthesized several of these compounds quantitatively, in reactions between aromatic aldehydes having unique substituents and primary chiral amines. These reactions take place in minutes, at room temperature on activated silica, with or without solvents. The enantiomeric purity of the products is 100%. Typically, 2 g of activated silica are suspended in the minimum amount of dry ether. To this suspension equimolar quantities (2×10^{-3} mol) of an aldehyde and a chiral amine are added successively, while stirring. Formation of the chiral imine is complete in a few minutes as confirmed by GC-MS. At this point the imine can be isolated or converted to the amine as desired. For the reduction step, the suspension is cooled in an ice bath, followed with the addition of 0.15 g of sodium borohydride. To this mixture, a few drops of water are added periodically and stirred briefly. Completion of the reduction to the amine is monitored by GC-MS. The products are extracted from silica with dry ether, dried over anhydrous sodium sulfate, and the solvent removed under vacuum. The products are weighed and analyzed by IR, GC-MS, proton and C-13 NMR, and polarimetry.

Section III: Earth & Atmospheric Sciences
Science Hall W1047
Alfred J. Mead, Presiding

8:00 ASSESSING THE LEVELS OF LEAD CONTAMINATION IN KABWE AND THE POTENTIAL FOR PHYTOREMEDIATION IN REMOVING LEAD FROM HEAVILY CONTAMINATED SOILS**, Megan Corley*¹, Samuel Mutiti¹, Alice Mweetwa², Mutande Tembo², Mikalin DeFoor*¹ and Sarah Hazzard*¹, ¹Georgia College & State University, Milledgeville, GA 31061 and ²University of Zambia, Lusaka, Zambia. Heavy metal contamination is a widespread problem in most mining towns. The problem is even worse in developing countries with lax environmental regulations. Zambia, a developing southern Africa nation has some of the most active mines in the region. Unfortunately, the country also has one of the worst polluted places in the world, Kabwe. Kabwe once boasted a very productive lead, zinc and cadmium mine which operated for over 90 years. The environmental legacy of this mine is widespread soil, air, water and plant contamination. The main contaminant of concern is lead, a heavy metal that can cause severe health problems. Blood lead concentrations of 200 µg/dL or more have been reported especially in children who play in the contaminated soils. Lead concentrations at such levels can cause death and various diseases including hematological, gastrointestinal, and nephropathy. In this study we assessed the level of lead contamination in soils, water and plants in Kabwe. Lead concentrations were quantified using the Aqua Regia method and Atomic Absorption spectrometry. The role of plants in lead exposure to humans and removal from soils and water is also investigated. The plants studied *Brassica rapa* and *Tithonia diversifolia* Indian mustard (*Brassica juncea*), and sunflower. Preliminary results showed lead concentrations in soils ranging from 27 to 328 ppm while plant concentrations, were between 0.985 and 8 ppm.

8:15 SOLAR WATER DISINFECTION (SODIS): THE PERFORMANCE OF GLASS, CLEAR PLASTIC, TRANSLUCENT PLASTIC, AND OPAQUE PLASTIC BOTTLES**, Kristina S. Hensey* and S. Mutiti, Georgia College & State University, Milledgeville, GA 31061. In most developing countries drinking water from local sources is often contaminated with pathogens such as protozoa, bacteria, and viruses. A variety of methods for disinfecting drinking water are widely available today. One of these methods is solar water disinfection (SODIS). This is a simple, low-cost method that can be used throughout the world to supply people with clean drinking water. By exposing transparent water-filled containers to direct sunlight, bacteria and viruses can be killed by solar radiation making the water safe for consumption. In this study, SODIS and the effect of container type on bacterial deactivation were investigated. The project also investigated the effects of exposure time on the ability of artificial ultraviolet (UV) light to disinfect drinking water. Preliminary results indicated that even though total coliform bacteria persisted in some treatments, most of the fecal coliform bacteria were disinfected within a day of exposure to direct sunlight. Since the samples exposed to direct sunlight had the same temperature, heat was ruled out as a factor in the disinfection process. In one of the exposure trials, there was no difference in the performance of the different water containers with regards to fecal coliform but there appeared to be a difference when it came to total coliform. The research is being continued to obtain sufficient data for statistical analysis and UV exposure analysis. A water treatment apparatus that combines both sand filtration and UV sunlight treatment is also being designed to clean contaminated drinking water.

8:30 USING GEOPHYSICS AND HYDROGEOLOGY IN STUDYING FACTORS THAT CONTROL CRAYFISH DISTRIBUTION, Sarah Hazzard*, S. Mutiti and C. Skelton, Georgia College & State University, Milledgeville, GA 31061. The importance and significance of organisms that are commonly found in the subsurface, such as burrowing crayfishes, are often unrecognized by many people, including scientists. Crayfishes are important components of wetland and flood plain ecosystems because they help with detritus processing and nutrient cycling. The spatial distribution of crayfish burrows within a given colony often shows very sharp breaks indicating these animals are choosing specific habitat parameters. There have been a few investigations into burrowing crayfishes' soil preferences, but there is still very little known about what determines burrow location choice. The study organisms were *Cambarus striatus* and *C. truncatus*; *C. striatus* is a widespread common species, while *C. truncatus* is known from only about 12 localities. Hydrogeological parameters that control the distribution of burrowing crayfish populations were investigated. Ground Penetrating Radar was utilized to determine the subsurface stratigraphy within populations of each species. Electrical Resistivity was used to explore the sharp delineation boundary within a crayfish population of *Cambarus striatus*. Slug tests were performed to determine the differences in soil hydraulic conductivity between areas where *C. striatus* burrows were present and nearby areas where they were not found. Soil cores were analyzed for grain size distribution, texture, porosity, and permeability. Crayfish inhabited zones were found to have different soil characteristics compared to areas outside of their habitat. Subsurface stratigraphy also varied between the two zones, with disrupted boundaries observed within the population of *C. truncatus* using geophysics.

8:45 GEOCHEMICAL AND SUBSURFACE CHARACTERISTICS THAT DETERMINE THE LOCATIONS OF CRAYFISH ON SAPELO ISLAND**, Taylor Upole*, Samuel Mutiti, Sarah Hazzard* and Chris Skelton, Georgia College & State University, Milledgeville, GA 31061. Crayfish are commonly found in freshwater systems, and very few species have been reported in saline environments. The present study investigates the occurrence and distribution of crayfish on Sapelo Island. This study investigates geochemical and hydrogeological parameters that control the distribution of crayfish on Sapelo Island. Geochemical (temperature, dissolved oxygen, conductivity, pH and ORP) data were collected from around 15 sites using a YSI 556 and Solinst water probes, while groundwater and other hydrogeological parameters were measured using handmade temporary PVC piezometers. Soil samples were collected using an open-faced auger. Water chemistry samples were also analyzed for nitrates, chlorine, iron and phosphates using the HACH DR290 colorimeter. Most of the sites at Sapelo Island consisted of brackish water. Burrowing Crayfish were found at two sites and burrow evidence was observed at a third site. Surface water crayfish were found in at least three roadside creeks/ditches. While some of the crayfish were found in freshwater, all the burrowing crayfish were found in brackish water. Multiple species, including one that had not been seen before (on the island) were identified. Preliminary results also indicated very little difference in hydrogeologic, geochemical and soil characteristics of sites inhabited by burrowing crayfish and those without the crayfish. Further research, that includes geophysics and in situ slug testing, is being carried out to gain more understanding in the spatial distribution of these burrowing crayfish.

9:00 CORING AND SAMPLING OF SOILS FROM PLEISTOCENE LANDFORMS ON OSSABAW ISLAND**, Megan D. Hunnicutt* and Donald M. Thieme, Valdosta State University, Valdosta, GA 31602. Several of Georgia's barrier islands include a combination of Pleistocene remnant islands with more rapidly accreted

Holocene shoreface sands. Ossabaw Island is a relatively pristine barrier island currently located just south of the mouth of the Ogeechee River. Two soil cores were collected from a ridge thought to represent a remnant of a Pleistocene barrier island. Evidence was sought to test the hypothesis of a Pleistocene age for the landform, in particular the presence of a strongly developed paleosol. Methods used during field work consisted of hand auger coring at two locations along the ridge and collecting labeled sediment samples in plastic bags as well as limited characterization. Core samples are currently being described in the laboratory using soil science and sedimentological procedures. The texture, structure, color and boundaries for each soil horizon and the predominant minerals found in the sand fractions are being described. Laboratory analyses are being performed on approximately 15 samples from each core. Soil pH will be measured in a slurry using accumet model 10 pH meter. Particle size will be measured using the hydrometer method and organic matter will be measured by loss-on-ignition (LOI) using a Thermolyne 62700 furnace at a temperature of 550°C.

9:15 DID THE ALTAMAHA RIVER ORIGINALLY ENTER THE ATLANTIC AT ST. ANDREWS SOUND?, Timothy M. Chowns and S. Hannah Hill*, Geosciences, University of West Georgia, Carrollton, GA 30118. A comparison between the modern strandline and the Holocene trim-line on the Silver Bluff barrier (~4500 BP) suggests that the present tide-dominated features replaced an earlier wave-dominated morphology. The modern coast, with ten main barrier islands between the Savannah and St. Johns rivers, evolved through the breaching of the ~4500 BP barrier with just two islands, separated at St. Andrews Sound. Breaching is a consequence of the Holocene transgression, which has flooded the low-country behind the Silver Bluff barrier and favors tidal, over wave processes. An abundance of mica in vibracores collected at the south end of Jekyll Island indicates that the ancestral Altamaha originally drained into the Atlantic in the vicinity of Little Cumberland Island, which is interpreted as the remains of an old delta (analogous to Little St. Simons at the mouth of the modern Altamaha). With other inlets closed or greatly reduced in size the Ogeechee, Satilla and St. Marys rivers most likely flowed through the low-country as tributaries of the ancestral Altamaha. The breach at Altamaha Sound probably dates to around 4000 BP, but the abundance of 'fossil' trees (dated between 4400-2100 BP) beneath saltmarsh in the low-country indicates that woodland persisted in some places. The youngest dates are from trees close to St. Simons Sound and suggest that St. Simons and Jekyll islands remained connected until about 2000 years ago.

9:30 URBAN HEAT ISLAND PLANNING STRATEGIES IN GEORGIA CITIES**, S.J. Bowens* and S.C. Ojiagbaje*, University of West Georgia, Carrollton, GA 30118. Urban climates are affected by heat island effects. Through planning strategies, applied climate science can lead to healthier cities. Heat island effects create changes that cause urban areas to become warmer than surrounding natural landscape by utilizing man-made materials such as buildings, roads, and other infrastructure while reducing vegetation. Urbanization contributes to urban heat island effects in cities across Georgia. Intense urbanization along with land-use changes negatively impacts the environment, especially in the summer, by increasing temperatures. This increases energy demand for air conditioning and impacts human health. The U.S. EPA has identified four methods to decrease heat island effects. The first method is to plant more trees and vegetation covers. Secondly, they are creating "green roofs" or rooftop gardens. Thirdly, reflective materials or white roofs can be installed. The last method is to build cool pavements. Preliminary research reveals a lack of climate-related planning initiatives in the Southeast. In this research, city planning efforts that address urban heat island effects through the four

methods identified by the EPA will be examined in Georgia cities. Funding is provided by the University of West Georgia's Student Research Assistant Program.

9:45 TEMPERATURE STRUCTURE TO 28 KM ABOVE THE MOJAVE DESERT, Randal L. N. Mandock, Clark Atlanta University, Atlanta, GA 30314. On 18 July 2013 a balloon was launched to observe the temperature and pressure profiles above the Mojave Desert. A maximum altitude of 28 km was reached at 8:18 a.m. when the balloon burst. GPS altitude, temperature, and pressure were measured during the ascent, but altitude was not measured during descent. Temperature and altitude were sampled at 1 Hz, and pressure at 0.5 Hz. The temperature profile observed during the flight shows an atmospheric boundary layer (ABL) height of 2 km above sea level and 1.2 km above ground level. The tropopause is marked in the profile by the beginning of the stratospheric temperature inversion at 12 km above sea level. The region of positive stratospheric temperature gradient began at 15.5 km and extended to the burst height. Temperature gradients in regions of major slope change were as follows: $-20^{\circ}\text{C}/\text{km}$ in the ABL, $-6^{\circ}\text{C}/\text{km}$ in the free troposphere, $+4.5^{\circ}\text{C}/\text{km}$ between 15.5-28 km, and $+3.2^{\circ}\text{C}/\text{km}$ between 12-28 km (stratospheric mean). These values indicate strong temperature instability in the ABL and strong stability in the stratosphere. The balloon ascended most slowly in the ABL at an average rate of 2.1 m/s, but most rapidly just above the tropopause (11.8-15.4 km) at an average rate of 28 m/s. The average rate of ascent was 7.6 m/s in the free troposphere and 8.0 m/s in the stratosphere between 20-28 km above sea level. The minimum temperatures observed in the stratosphere were -64°C on ascent and -53°C on descent. Preliminary analysis shows an inverse relationship between temperature gradient and rate of ascent.

10:00 Section Business Meeting

10:30 MICRO-MINERALS FROM TOPAZ MOUNTAIN, THOMAS RANGE, JUAB COUNTY, UTAH, David J. Babulski, Georgia Mineral Society, Atlanta, GA. *Topaz, Fluorite, Pseudobrookite, Hematite and Hyalite Opal* are all present as mineral species in lithophysal rhyolite of Topaz Mountain. The lithophysal rhyolite provides a unique example of post eruptive mineral deposition as a result of gas and vapor exhalations from the cooling parent rhyolitic magma chamber. The presence of a specific crystal habit for Topaz and Hematite poses interesting questions about mineral chemistry, pressure and temperature at the time of mineral deposition.

10:45 EOCENE-OLIGOCENE TRANSITION IN NEBRASKA DOMINATED BY CHANGING FLUVIAL ARCHITECTURE NOT CLIMATE, Grant S. Boardman¹ and William E. Lukens², ¹Berry College, Mount Berry, GA 30149 and ²Baylor University, Waco, TX 76798. Stable oxygen and carbon isotopic composition in mammalian teeth from assemblages that closely bracket the Eocene-Oligocene transition (EOT) in Nebraska show resolved compositional changes inconsistent with the widely accepted expectations for drastic cooling at mid- to high-latitudes associated with the Oi-1 glaciation. Though many studies indicate spatial heterogeneity related to cooling in North America, we contend that local isotopic changes observed through this interval were largely uncoupled from climate. Rather, changes in paleoecology were driven by local paleogeomorphic dynamics. Significant increases in both faunal mean $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ ($+0.4\text{‰}$ and $+1.0\text{‰}$, respectively) indicate increasing water-stress across the EOT. Most notably the significant increase in $\delta^{13}\text{C}$ is entirely counter to expectations for cooling. Changes in fossil soil (paleosol) properties across the EOT reflect greater geomorphic partitioning of landscapes due to increases in aeolian sedimentation and local variations in accommodation space.

These factors enhanced riparian partitioning but did not fundamentally alter the mosaic scrubland vegetation that was established in the late Eocene. Changes in local paleogeomorphology and paleoecology may be reflective of larger regional changes that fit into a proposed Prograding Megafan model.

**Section IV: Physics, Mathematics, Computer Science,
Engineering and Technology
Science Hall W1008
Hasson M. Tavossi, Presiding**

8:00 AN ITERATION DERIVED, FIRST-ORDER SOLUTION FOR A HARMONIC OSCILLATOR HAVING CUBIC-ROOT DAMPING, ¹Kale Oyedeji¹ and Ronald E. Mickens², ¹Morehouse College, Atlanta, GA 30314-3773 and ²Clark Atlanta University, Atlanta, GA 30314. We derive an approximation to the damped oscillatory solution for harmonic oscillator having a damping force proportional to the cube-root of the velocity. Our result is obtained by first converting from Cartesian coordinates, $x(t)$ and $y(t) = dx(t)/dt$, to polar coordinates $x(t) = r(t) \cos\theta(t)$, $y(t) = r(t) \sin\theta(t)$; Calculating the equations of motion for $r(t)$ and $\theta(t)$; and then formulating an iteration scheme to solve these coupled, first-order differential equations. In the course of these calculations, two rather complex integrals appear, involving integrands which are trigonometric functions raised to fractional powers; however, we were able to evaluate them, and this allowed the determination of a valid first-order approximation to the solution, *i.e.*, first-order with respect to the small damping parameter ϵ and first-order with respect to the iteration procedure. Our major finding is that the oscillations exist only for a finite time interval, after which the amplitude is zero.

8:15 MEASUREMENT OF THE INTERACTIONS OF LOW ENERGY GAMMA RAYS WITH DENSE METALS FOR APPLICATIONS IN NUCLEAR CARDIOLOGY IMAGING**, G.G. Passmore, T.F. Lynam* and J.L. Spradlin*, Georgia Regents University, Augusta, GA 30912. Gamma camera imaging of myocardium perfusion with either Tl-201 or Tc-99m is widely used for the detection of coronary artery disease (CAD). Myocardium perfusion imaging studies allow the clinician to differentiate between healthy and damaged myocardium based on the amount of accumulated radioisotope represented in the images. Both radioisotopes, Tc-99m and Tl-201, can indicate the perfusion characteristics of the myocardium. However, Tl-201 has the additional capability to indicate cardiac tissue viability. Simultaneous imaging of Tl-201 stress and Tc-99m rest images would have the benefits of optimal diagnostic perfusion imaging and tissue viability signaling. However, there is a difficulty in trying to image the lower Tl-201 energy photons in the presence of the higher energy Tc-99m photons when using a standard lead collimator because interactions between the Tc-99m photons and lead create down-scatter in the Tl signal region. The objective of this project is to measure the transmission and interactions of Tc-99m photons and Tl-201 photons separately and simultaneously using high density metal discs (different from lead) as attenuators for application in gamma camera collimators. Correction of the down-scatter problem would allow the clinician to take advantage of a simultaneous dual-isotope approach, increasing the detectability of reversible myocardium defects. Methods include using NIST attenuation data to identify multiple high density metals that meet the criteria for reduced Tc-99m down-scatter with K-shell x-rays signals that are different from the Tl-201 energy signal. Spectra for lead (Pb) have been collected. Continued analysis will be based on comparisons of spectra using multiple metallic attenuators.

8:30 THE STATISTICS BEHIND COMPARING THE RATES OF PEDOGENESIS IN RECLAIMED LANDS AND THE RATES OF NATURAL PEDOGENESIS, Eric C. Brevik¹ and Andreas Lazari², ¹Dickinson State University, Dickinson, ND 58601 and ²Valdosta State University, Valdosta, GA 31698. Reclamation is carried out on disturbed lands to return the land to productivity as rapidly as possible. From the perspective of the pedologist, the ultimate in reclamation would be to return the soil resource to its previous condition as rapidly as possible, but do reclamation methods increase rates of pedogenesis? To investigate this question, studies that report rates of soil formation in both reclaimed and natural sites were gathered from the literature, and depth of soil formation was plotted against years of pedogenesis. The slopes and elevations of logarithmic regression trend lines were statistically compared to determine if rates of pedogenesis were the same in reclaimed and naturally-forming soils. Results of the analysis indicate that rates of pedogenesis in reclaimed soils are not higher than in natural soils; however, soil amendments used during the reclamation process likely create parent material conditions that are ideal to support vegetative growth and start reclamation pedogenesis at an advanced stage.

8:45 DESIGN OF A GAS-FLOW INVERTER, EXPERIMENT AND MATHEMATICAL MODELING ON THE BIFURCATION OF STEADY-FLOW INTO PULSED-FLOW. Hasson M. Tavossi, Department of Physics Astronomy, and Geosciences, Valdosta State University, Valdosta, GA 31698. Direct air flow is converted into alternating flow in a specially designed experimental reactor column, having a layer of uniform porous medium. Experiment show that the air-flow becomes pulsed due to non-linearity, and relaxation oscillations with amplitude dependent on system size. A threshold for flow-rate is observed, below which no relaxation oscillations occur. This change in the flow regime from direct to alternating has similarity with the phenomenon of bifurcation in chaotic systems, when amplitude changes abruptly from one level to another. It can also be related to non-equilibrium thermodynamics and Joule-Thomson effect in the porous layer. A preliminary mathematical model is derived to express the resonance frequency of flow in terms of; pressure-drop, flow rate, pore-ratio, dynamic viscosity, and dimensionless aerodynamics characteristic numbers.

9:00 MODELING THE TEMPERATURE BEHAVIOR OF AN INCANDESCENT LAMP, Javier E. Hasbun, Department of Physics, University of West Georgia, Carrollton, GA 30118. A model of an incandescent lamp is presented for the behavior of its temperature as a function of time. As soon as the electric power to the lamp is switch on, the filament's temperature begins to change. In this model, the change in temperature is due to the interplay between the input power and the temperature lost due to conduction through its armature as well as blackbody radiation. By expressing the resulting equations in dimensionless terms, it is possible to perform a numerical calculation of the transient temperature behavior assuming a constant filament resistance. The calculation is repeated for the case of when the resistance is a linear function of temperature. In both cases, the behavior is exponential with a plateau that follows in the steady state regime. From the steady state we analyze the equations and discuss the expected relationship of the lamp's light intensity versus current. It is possible to make measurements of the lamp's intensity as a function of current; a comparison with predictions, indicate a reasonable agreement.

9:15 MARS' NORTH POLAR REGION IN LATE 2013, Richard W. Schmude, Jr., Gordon State College, Barnesville, GA 30204. This study has two objectives: (1) Compare the North Polar Cap (NPC) size in 2013 to what it was four years earlier.

er and (2) Report preliminary results of a large circular cloud imaged in September 2013. Over fifty images of Mars made in visible and near-infrared light between September 6 and November 21, 2013 were analyzed. Measurements of the NPC were made with the software package, WinJupos. Essentially, the latitude of the cap edge was measured at all longitudes. Average cap latitudes were computed for each 15-degree longitude interval starting with $0^\circ - 15^\circ$ W. These were compared to those in 2009-2010 according to longitude and seasonal date – Ls. (The areocentric longitude of the Sun as measured from the Vernal Equinox of Mars, Ls, defines the seasonal date on that planet.) It is concluded that for $30^\circ < Ls < 54^\circ$, the NPC was nearly the same size as it was in 2009-2010. One surprise during late 2013 was the development of a large circular, bright area near the NPC. Damian Peach imaged this feature on September 20, 2013. At that time the bright areas was centered at 289° W, 49° N. It had an approximate diameter of 700 km. Images made on September 23 and 24 at this longitude did not show it. Therefore, this feature did not last long. It was bright in blue, green and red light and was probably a cloud composed of water ice crystals.

9:30 **MARS' SOUTH POLAR CAP: 1907-2005**, Richard W. Schmude, Jr., Gordon State College, Barnesville, GA 30204. The goal of this study is to report maps of Mars' South Polar Cap (SPC) for 2003 and 2005. The writer used the software package WinJupos to measure the latitudes of the edge of the SPC for all longitudes. Measurements were made for each four-degree interval of Ls starting with $Ls = 190^\circ$. (The areocentric longitude of the Sun as measured from the Vernal Equinox of Mars, Ls, defines the seasonal date on that planet.) Over 100 visible light images of Mars taken from the Earth were analyzed. It is concluded that the SPC is nearly circular until $Ls = 240^\circ$. At that time there is a large area extending from 180° W to 290° W which goes from white, to faint white to the color of the unfrosted terrain in about two weeks. This is the main reason for the cap asymmetry after $Ls = 240^\circ$. Three other cap irregularities observed in 2003 are the well- documented Mountains of Mitchell at 330° W ($242^\circ < Ls < 274^\circ$), a bright projection near 160° W ($238^\circ < Ls < 258^\circ$) and a bulge near 30° W ($226^\circ < Ls < 278^\circ$). The SPC continued to shrink during Mars' summer season in both 2003 and 2005. The 2005 SPC had an average radius of ~ 200 km by mid-summer. The 2003 SPC was also compared to images and photographs made between 1907 and 1988 for selected longitudes and seasonal dates. (The selected longitudes and seasonal dates depended on when the images and photographs were taken.) The SPC was nearly the same size as the 1907, 1909 and 1988 caps but was a little larger than those in 1924, 1939, 1941 and 1956.

10:00 **Section Business Meeting**

10:45 **TIME AND SPACE ARE EACH COMPOSED OF QUBITS**, Dennis W. Marks, Valdosta State University, Valdosta, GA 31698. Basis vectors for space-times of any number of dimensions and any metric signature can be generated recursively from a time-like unit basis vector T and a space-like unit basis vector S, where T is represented by a real 2×2 anti-symmetric (hence trace-free) matrix, squaring to $-I$, and S is represented by a real 2×2 symmetric trace-free matrix, squaring to $+I$. T is unique up to a sign, so time can run only forward or backward. S has an additional degree of freedom. Products of these basis vectors form a real Clifford algebra $R(2)$, simpler than the complex Pauli algebra $C(2)$. Complex algebras do not distinguish between space and time; real algebras do. The elements of $R(2)$ can be decomposed into qubits. A bit is either 0 or 1; a qubit can be 0 or 1, or any linear combination thereof. Qubits are capable of quantum transitions,

suggesting spontaneous generation of time and space. Recursive generation leads from two dimensions to four, with the grades of the resulting Clifford algebra corresponding to space-time, spin, energy- momentum, and action. These are open dimensions, not compact. A compact time-like dimension has the $U(1)$ symmetry of electromagnetism. Three compact space-like dimensions have the $SU(2)$ symmetry of the weak force. The resulting eight-dimensional space has the $SU(3)$ symmetry of the strong force. After eight dimensions, the pattern of real Clifford algebras repeats itself. This produces a recursive framework of spontaneously expanding space-time with $U(1)\times SU(2)\times SU(3)$ physics at each point of the space-time lattice.

11:00 THE EFFECT OF METAL OXIDE ON RESISTIVITY OF BUCKYSHEET**, K.C. Chan¹, Liqiu Zheng¹ and Jerry Li², ¹Albany State University, Albany, GA 31705 and ²Florida State University, Tallahassee FL 32313. The resistivity of a sheet composed of carbon nanotubes can be controlled by degrees of attachment of metal oxides to the nanotubes in forms as nanoparticles. The impregnation of metal oxide nanoparticles into bulky-paper was achieved using solution method, followed by calcination in temperature 450-700°C in Argon Atmosphere. The resistivity of the bulk-paper is found to be affected by the concentration and the size of the nano-deposition. The result of resistivity of three different concentrations of metal oxides on carbon nanotubes, measured as number of metal-oxide nanoparticles per unit length will be reported and their potential applications/significance discussed.

11:15 BUILDING THE NSF S-STEM PROGRAM AT GEORGIA REGENTS UNIVERSITY, J. A. Hauger, S. J. Reinke and S. L. Robinson, Georgia Regents University, Augusta, GA 30912. The Savannah River Scholars Program (SRSP) at Georgia Regents University is funded through the National Science Foundation's Scholarship for STEM (S- STEM) program. The SRSP currently supports nearly two dozen undergraduates majoring in the target disciplines which include chemistry, computer science, mathematics and physics. Now in its third year of scholarship funding, the program has grown in number of participants as well as complexity of student support activities. The presentation will provide an overview of the essential features of the SRSP and describe how the results of assessment data collected over the past three years have been used to improve student recruitment, retention and academic performance.

POSTERS

MATHEMATICAL MODELLING OF RANAVIRUS ECOLOGY IN THE UNITED KINGDOM: A CALCULUS BASED APPROACH**, John C. George¹, Ryan D. Haire^{*1,2} and Amanda L.J. Duffus², ¹Department of Mathematics and Physical Sciences, Gordon State College, Barnesville, GA 30204 and ²Department of Biology, Gordon State College, Barnesville, GA 30204. Ranaviruses are emerging pathogens of ectothermic vertebrates. In the United Kingdom, the ranavirus began to emerge in populations of the common frog (*Rana temporaria*) in the late 1980s and has been associated with some of the population declines that have occurred. Unlike many ranaviruses, the primary host appears to be adult common frogs. A linear recursive model of transmission was developed in 2010, but because of the life history of amphibians, many of the assumptions do not necessarily hold true. Therefore, a calculus based approach may yield more accurate insights into how the ranavirus is maintained in populations of common frogs over long periods of time, despite population declines.

COMPARING STAR FORMATION IN SEYFERT 1 AND SEYFERT 2 ACTIVE GALACTIC NUCLEI OBSERVATIONS VIA SIGNIFICANT SPECTRAL FEATURES**, Murray E. Macnamara* and Grant D. Thompson, Georgia Regents University, Augusta, GA 30904.

Silicate dust emission dominates the mid-infrared (MIR) spectra of galaxies, and the dust produces two spectral features, at 10 and 18 μm . These features' strengths (in emission or absorption) reveal the geometry of the dust distribution, and they are sensitive to the dust composition. We examine mid-infrared spectra of Seyfert 1 and Seyfert 2 active galactic nuclei (AGNs) along with quasars, all observed with the Infrared Spectrograph aboard the Spitzer Space Telescope, to differentiate each category's dusty environment. The 10 and 18 μm feature strengths together are sensitive to the dust geometry surrounding the central heating engine. Numerical calculations of radiative transfer distinguish between clumpy and smooth distributions, and we find that the surroundings of these AGNs (the obscuring "tori" of unified AGN schemes) are clumpy. We further examine spectral lines, such as the strong low-ionization line [NeII] at 12.8 μm , to determine whether trends exist between AGN luminosity and star formation and to what extent. Specifically, we compare the contribution of star formation occurring within Seyfert 1 and Seyfert 2 AGNs. We acknowledge the support of the NSF funded Savannah River Scholars Program.

MEASUREMENT OF THE INTERACTIONS OF LOW ENERGY GAMMA RAYS WITH DENSE METALS FOR APPLICATIONS IN NUCLEAR CARDIOLOGY IMAGING**, T.F. Lynam*, J.L. Spradlin* and G.G. Passmore, Georgia Regents University, Augusta, GA 30912.

Gamma camera imaging of myocardium perfusion with either Tl-201 or Tc-99m is widely used for the detection of coronary artery disease (CAD). Myocardium perfusion imaging studies allow the clinician to differentiate between healthy and damaged myocardium based on the amount of accumulated radionuclide represented in the images. Both radioisotopes, Tc-99m and Tl-201, can indicate the perfusion characteristics of the myocardium. However, Tl-201 has the additional capability to indicate cardiac tissue viability. Simultaneous imaging of Tl-201 stress and Tc-99m rest images would have the benefits of optimal diagnostic perfusion imaging and tissue viability signaling. However, there is a difficulty in trying to image the lower Tl-201 energy photons in the presence of the higher energy Tc-99m photons when using a standard lead collimator because interactions between the Tc-99m photons and lead create down-scatter in the Tl signal region. The objective of this project is to measure the transmission and interactions of Tc-99m photons and Tl-201 photons separately and simultaneously using high density metal discs (different from lead) as attenuators for application in gamma camera collimators. Correction of the down-scatter problem would allow the clinician to take advantage of a simultaneous dual-isotope approach, increasing the detectability of reversible myocardium defects. Methods include using NIST attenuation data to identify multiple high density metals that meet the criteria for reduced Tc-99m down-scatter with K-shell x-rays signals that are different from the Tl-201 energy signal. Spectra for lead (Pb) have been collected. Continued analysis will be based on comparisons of spectra using multiple metallic attenuators.

EFFECT OF GEL MEDIUM IN EXTRACTION OF CANCER CELL'S COMPLEX PERMITTIVITY, Arun Saha and Le'Aaricka Hodge*, Dept. Of Natural Sciences, Albany State University, Albany, GA 31705.

In order to destroy cancer cells by electromagnetic radiation, it is first necessary to determine the complex permittivity of the cells. In determination of complex permittivity of cancer cells, cells are separated from cell-culture media and mixed with agarose gel to prepare a semi-solid sample which is exposed to elec-

tromagnetic radiation to record reflected (S_{ii}) and transmitted (S_{ij}) signal data. Complex permittivity of cell is calculated using S_{ii} and S_{ij} . In this characterization process, gel is supposed to play no role in determination of cell permittivity. But in reality, gel also plays an undesired role and this role of gel medium on cell permittivity has been ignored by biomedical scientists. In this interdisciplinary research, an investigation is carried out by 3D electromagnetic simulation software HFSS to understand the effect of gel medium while extracting complex permittivity of cancer cells against various gel medium. It is found that cell's complex permittivity is accurately extracted when gel's complex permittivity is very close to that of the cells. This work was supported by MBRS-RISE at Albany State University Grant-NIHGMS Grant #5R25GM071415 and DoD Grant # W81XWH-10-1-1042.

ORGANIC INORGANIC HYBRID HIGH REFLECTIVITY BRAGG MIRRORS**, Anthony Donato* and Ajith DeSilva, Department of Physics, University of West Georgia, Carrollton, GA 30118. A Distributed Bragg Reflector (DBR) consists of alternating layers of two materials with different refractive indexes. Each layer reflects a portion of the incoming light, and the constructive interference from the total reflected portions result in an effective reflector for a particular wavelength region. These structures can be constructed to act as an optical mirror, reflecting nearly all light of a particular wavelength and allowing all other wavelengths to pass through largely uninhibited. We fabricated a one-dimensional hybrid DBR structure using solution processing. The device was constructed by spin coating alternating layers of organic (poly-vinylcarbazole-PVK) and inorganic (Cadmium Sulfide – CdS) layers. A 0.2 M solution of Thiourea and a 0.1 M solution of Cadmium Nitrate, both dissolved in water via sonication, were combined and spin coated at 2,000 RPM upon a glass substrate. Each sample was then heated for five minutes at a temperature of 1200 C to form a 65 nm CdS film. Next a solution consisting of 0.5 g of PVK dissolved in 20.0 g of chlorobenzene was applied to top of the CdS film and spin coated at 1,000 RPM to obtain 90 nm PVK film. The sample was then heated again at 1200°C for five minutes to allow all of the solvent to evaporate resulting one period of CdS/PVK layers. This procedure was repeated for each period of alternating PVK and CdS layers. Due to higher refractive index differentiation between PVK (1.683) and CdS (2.5), a greater reflectivity was obtained using fewer periods of the structure than that of all organic or all inorganic devices. The constructed DBR shows a reflectivity peaked at 620 nm with a reflectance of 60% for three periods, which agrees with the theatrical simulations. For this device, the reflectivity of 95% can be obtained as few as nine periods. This work is supported by UWide program at UWG.

MULTI-OBJECTIVE OPTIMIZATION OF COMPLEX THERMO-FLUID PHENOMENA IN WELDING, Agegnehu Atena, Savannah State University, Savannah, GA 31404. Gas metal arc welding (GMAW) is a process that joins pieces of metal by heating them with an electric arc. The heat of the arc melts the surface of the base metal and the tip of the electrode. The electrode molten metal is transferred through the arc to the molten base metal to form the weld pool. The quality of the weld pool is characterized by the penetration depth, the bead height and width. These characteristics are controlled by a number of welding parameters. The subject of this paper is to establish the welding parameters that yield a weld pool which has a predefined geometry. Our approach to this goal is by casting the problem of optimization of GMAW in the framework of Multi-Objective Optimization.

Section V: Biomedical Sciences
Science Hall E1049
Seyed H. Hosseini, Presiding

8:00 TWO NOVEL COMPOUNDS INDUCE APOPTOSIS IN A BREAST CANCER CELL LINE**, Keri L. Jones*, Rachel K. Clay*, Ivie L. Conlon*, Thomas D. Crute and Richard D. Griner, Georgia Regents University, Augusta, GA 30912. The complex lipid-based compound persin which is produced in avocado leaves is cytotoxic to mammary epithelium and induces apoptosis in several breast cancer cell lines. Because persin also demonstrates cardiotoxicity in mice, the search for analogues with greater specificity has been ongoing. Specifically, our lab has synthesized analogues of persin and is assessing their effects on breast cancer cells. In previous work we showed that the viability of the human breast cancer cell line MCF-7 was decreased below 50% following a 24hr exposure to 30 M of a secondary alcohol synthesized from oleic acid (CG1). In the present work, we have synthesized a secondary ketone from oleic acid (CG3) which decreases MCF-7 cell viability to less than 50% following a 300mM exposure for 24hr. To determine if these compounds induce apoptosis, we have used the M30 apoptosis assay. M30 is an epitope that is revealed following the proteolytic cleavage of cytokeratin 18 which occurs during apoptosis in many epithelial cells. This assay is appropriate for cells like MCF-7 which don't express executioner caspase 3 and thus, don't display typical markers of apoptosis. Significant increases in M30 positivity were observed in MCF-7 cells exposed to 30mM CG1 or 300mM CG3 for six hours. Additional studies are underway to further investigate the mechanisms of action by these compounds on breast cancer cells.

8:15 EFFECTS OF RESVERATROL AND QUERCETIN ON B[a]P- AND 3MC-INDUCED CYP1A1 REPORTER ASSAY**, Caitlin N. Meads* and Jennifer C. Schroeder, Young Harris College, Young Harris, GA 30582. The aryl hydrocarbon receptor (AHR) is a ligand-activated transcription factor involved in the regulation of multiple cellular pathways, including transcription of the *cyp1a1* gene related to drug metabolism. Benzo[a]pyrene (B[a]P) and 3-methylcholanthrene (3MC) are both known agonists of the AHR. Bioflavonoids, such as quercetin, and the stilbenoid resveratrol have also been characterized as ligands for the AHR. Resveratrol and quercetin are naturally found in grapes and red wines; both are also available as nutritional supplements. Many plant-derived compounds, including these two, have been touted as chemo-preventive agents. In this study we explore the competitive inhibition of 3MC- and B[a]P-induced AHR activation with resveratrol and quercetin by utilizing a *cyp1a1* promoter-driven luciferase assay. The degree of inhibition is determined in mouse hepatocytes exposed to varying concentrations of the compounds. Both 3MC- or B[a]P- activated luciferase activity are inhibited in a dose-dependent manner by quercetin. Cotreatment of resveratrol with 3MC or B[a]P also modified expression levels. Funded by the Young Harris College Science Research Initiative.

8:30 EXTRACTS FROM GANODERMA LUCIDUM, TRAMETES VER-SICOLOR, GRIFOLA FRONDOSA, AND LENTINULA EDODES DECREASE XRE-MEDIATED TRANSCRIPTION INDUCED BY B[a]P**, Matthew D. Sudderth* and Jennifer C. Schroeder, Young Harris College, Young Harris, GA 30582. Pharmacological activity of mushrooms is widely unknown due to their numerous chemical constituents. Modern herbalists revere mushrooms for their medicinal activity and even claim they can be effective in treating cancer. *Ganoderma lucidum* (reishi) is one of the most

widely advertised mushrooms for purported anti-carcinogenic effects. *Trametes versicolor* (turkey tail), *Lentinula edodes* (shiitake), and *Grifola frondosa* (maitake) are also regularly claimed as effective treatments of various cancers. Benzo[a]pyrene (B[a]P) is a carcinogen found in cigarette smoke, which is also a strong agonist of the AHR. Binding of the AHR to XRE sequences regulates transcription of many genes, including *cyp1A1*. In these studies mouse liver cells stably transfected with a *cyp1A1*-XRE luciferase reporter construct are exposed to B[a]P, mushroom extracts, or combinations of B[a]P and extracts. While none of the extracts alone activate the reporter, all four were able to inhibit B[a]P-induced activity. These results suggest that components of the mushroom extracts tested here may exhibit their chemoprotective properties via competitive inhibition of the AHR. Funded by the Young Harris College Science Research Initiative.

8:45 DOES FLUOXETINE-HCL PROMOTE NEUROGENESIS IN ADULT ZEBRAFISH SUBJECTED TO STRESS?*, Nina B. Couch*, Ryan D. Shepard* and Linda G. Jones, Young Harris College, Young Harris, GA 30582. Stress is an everyday event. However, chronic or severe stress can be the cause of physical and mental disorders ranging from headaches, insomnia, depression and anxiety to more deleterious effects such as heart disease, hypertension, and even neurologic damage. Excitotoxicity and oxidative stress have been suggested to promote damage along the hypothalamic-pituitary-adrenal axis (HPA axis) resulting in degradation of areas such as the amygdala and the hippocampus. Studies have also suggested that the neurotransmitter serotonin has neurogenic properties. We are interested in determining whether treatment with fluoxetine-HCl (a selective serotonin reuptake inhibitor or SSRI) will increase neurogenesis in adult zebrafish (*Danio rerio*) subjected to stress relative to fish subjected to stress only or to non-stressed control fish. We established four tanks of adult zebrafish (two of which were subjected to stress). One tank from the stressed group and one from the non-stressed group received fluoxetine-HCl treatment. Evidence of neurogenesis will be determined by immunohistochemistry of paraffin-embedded and sectioned tissues using an anti-acetylated tubulin antibody as a marker of newly formed neurons and their axons. Density levels of new neurons will be quantified, and the data analyzed to determine whether differences exist among the experimental groups. Funding for this project was from the Young Harris College Undergraduate Research Initiative.

9:00 **Break**

9:15 EFFECT OF XYLITOL ON FUSOBACTERIUM NUCLEATUM AND STREPTOCOCCUS SP. GROWTH AND BIOFILM FORMATION**, L.N. Johnson* and A.L. Kwiatkowski, Young Harris College, Young Harris, GA 30582. *Fusobacterium nucleatum* is commonly found in human dental plaques that can potentially cause dental caries. It is a middle colonizer that can co-aggregate with early colonizing bacteria to form a biofilm. Xylitol is an artificial sweetener that has been shown in our lab to reduce the growth of *F. nucleatum* monospecies cultures, yet increase the biofilm formation. In this study, experiments were performed to determine the effect of xylitol on mixed species biofilms containing *F. nucleatum* and early colonizing *Streptococcal* species. One mixed culture consisted of *F. nucleatum* and *Streptococcus salivarius* while another one consisted of *F. nucleatum* and *Streptococcus sanguinis*. Cultures were grown for 72-hours anaerobically in 96-well plates at 37°C in Schaedler broth containing xylitol concentrations of 0%, 0.5%, 1%, or 2%. A spectrophotometer was used to measure the optical densities of the growth at 600nm and biofilm stained with safranin at 492nm. The Biology Department of Young Harris College funded this research.

9:30 THE INFLUENCE OF SECRETIONS FROM MACROPHAGE-LIKE CELLS PULSED WITH BACTERIAL GHOST ON PROSTATE CANCER CELLS**, O. Martinez*, D. N. McKeithen*, A. Stevens* and G. A. Ananaba, Department of Biology, Clark Atlanta University, Atlanta, GA 30314. Prostate cancer (PCa) is one of the most common types of cancer in men and is most prevalent among African American men. Some types of PCa grow slowly and may need minimal or no treatment, others are aggressive and can spread quickly. Previously, our lab has shown increased levels of Tumor necrosis factor-alpha when THP-1 cells, a human monocytic Leukemia cell, are pulsed with bacterial ghost. This study focuses on the effects THP-1 cell secretions have on PCa cells and testing the hypothesis; THP-1 cells may secrete factors that can influence proliferation of PC3 prostate cancer cell line. Since bacterial ghosts have adjuvant effects and elicit secretion of THP-1 cytokines, we treated the PCa cells with secretions from bacterial ghost pulsed THP-1 cells. The collected condition media was then cultured with the PCa. The treated THP-1 cells' cytokines can activate T cells having anti cancer properties. Our results suggest factors from innate immune response are essential in stimulating adaptive long-term immunity against endogenous antigens and the importance of robust innate immunity in cancer immunotherapy. This research was funded by RISE Grant #5R25GM060414-11; NSF/CREST/CFNM Award #HRD-1137751; Title III Grant HBG1 #22211K- Enhancing Graduate Students Academic and Professional Development.

9:45 **BIOFLAVANOIDS AS FULL OR PARTIAL AGONISTS OF THE AHR AND THEIR EFFECTS ON LEVELS OF LACTIC ACID AS A MODEL OF DIABETES****, Whitney R. Marcus*, Alejandra Escamilla*, Madison L. Perdue* and Jennifer C. Schroeder, Young Harris College, Young Harris, GA 30582. Diabetes is a condition in which insulin cannot properly regulate glucose transport from the bloodstream into cells. In these studies we aim to validate the findings of Wang, *et al.*, who reported in 2011 that exposure of mouse hepatocytes to β -naphthoflavone (BNF) caused a decrease in glucose metabolism, while those levels could be restored by co-treating the cells with a PPAR- α inhibitor (GW6471). We further seek to determine if bioflavonoids such as apigenin, hesperetin and quercetin modify this metabolism and counteract the effects of BNF by acting as a competitive inhibitor of the AHR, for which BNF is a known ligand. Results shown here are unable to confirm the earlier findings, but did provide unique insight as to the interaction of BNF and the bioflavonoids in this system. All three of the bioflavonoids examined here significantly diminish the levels of glucose metabolism. Current studies are looking to determine if this effect is related more to the regulation of AHR or PPAR- α . Funded by the Young Harris College Science Research Initiative.

10:00 **Section Business Meeting**

10:30 **NLRP3 INFLAMMASOME'S ROLE IN IL-10KO MICE FOLLOWING CHLAMYDIA INFECTION**, DN McKeithen*^{1,2}, Y Omosun¹, EC Kibakaya*¹, F Eko¹, CM Black³, JU Igietseme^{1,3}, GA Ananaba² and, Q He¹, ¹Department Microbiology, Biochemistry, and, Immunology, Morehouse School of Medicine, Atlanta, GA 30310, ²Department of Biology, Clark Atlanta University, Atlanta, GA 30314 and ³Centers for Disease Control & Prevention (CDC), Atlanta, GA 30333. Chlamydia is a public health concern due to its prevalence and devastating reproductive consequences, including inflammation and infertility. In previous studies we have shown that Interleukin 10 knock out (IL-10KO) mice were less likely to develop Chlamydia induced inflammation and infertility. The purpose of this study is to determine the immunoregulatory role of NLRP3 inflammasome within the bone marrow dendritic cells (BMDCs) of IL-10 KO mice fol-

lowing Chlamydia infection. BMDCs were harvested from wild type (WT) and IL-10KO mice and infected with *C. muridarum*. Our results show that Chlamydia infected IL-10 deficient DCs down-regulated NLRP3 inflammasome assembly, inhibited apoptosis, and, increased the lifespan of the DCs. Taken together, our results suggest that IL-10 deficiency yields enhanced immunity against Chlamydia infection. This research is supported by RISE Grant #5R25GM060414-11, Title III Grant #22210J and NIH Grant #1SC1AI03041-01A1.

10:45 PHYTOCHEMICAL CAPABLE OF INHIBITING PHIP INDUCED CYTOTOXICITY, Ashok Jain* and Abhilash Samykutty, Department of Natural Sciences, Albany State University, Albany, GA 31705. Breast cancer is the second leading cause of cancer-related deaths for women. Heterocyclic amines (HCAs) are formed when meat products are cooked at high temperatures and have been shown to be carcinogenic. 2-Amino-1-methyl-6-phenylimidazol [4, 5-b]-pyridine (PhIP) is the most abundant HCA found in well-done and grilled meats. Phytochemicals are wide variety of compounds that occur naturally in plants and known for their antioxidant properties. Phytochemicals are promoted for the prevention and treatment of many health conditions, including cancer. The objective of this study is to understand which antioxidant is more effective in inhibiting the PhIP toxicity. The culture of breast epithelial (MCF 10A) cells was initiated and treated with PhIP in the presence and absence of antioxidants namely ascorbic acid (AsA), Glutathione (GHS), N-acetyl-cysteine (NAC), alpha-tocopherol (Vitamin E), [6]-gingerol, [10]-gingerol, lycopene, Vitamin K3, Piperine and Curcumin for 24 hours. The interaction of PhIP and phytochemicals were evaluated by cell proliferation assay; and for DNA damage by comet assay. The phytochemical showed promising results was further analyzed for Reactive Oxygen Species (ROS), DNA adduct formation and cell cycle. The core signaling pathways evaluated by RT PCR and/or Western blotting which included Nrf2 (GSR, GPX, NQO1), FOXO (Catalase, GADD45, PRDX3) targets; DNA repair genes/proteins BRCA1, H2AFX and PARP-1; and tumor suppressor P16 gene expression. Expression of antioxidants genes was induced by PhIP whereas curcumin significantly suppress the PhIP induced ROS activation, DNA strand breaks and DNA adduct formation. The presence of Curcumin with PhIP inhibits both DNA double strand breaks and DNA adducts formation. Curcumin also induces the tumor suppressor P16 gene. In conclusion, it appears that Curcumin anti-cancer actions are via multiple molecular targets.

11:00 VIBRIO CHOLERAЕ GHOSTS AS AN ADJUVANT TO ENHANCE IMMUNE RESPONSE DURING TREATMENT OF CHLAMYDIA INFECTION**, A Stevens¹, GA Ananaba¹, JU Igietseme^{2,3} and FO Eko², ¹Clark Atlanta University, Atlanta, GA 30314, ²Morehouse School of Medicine, Atlanta, GA 30310 and ³Centers for Disease Control and Prevention, Atlanta, GA 30329. *Chlamydia trachomatis* is one of the leading sexually transmitted infections (STI) worldwide. These are serious infections that lead to infertility in women of childbearing age. Current treatments for the infection are limited to antibiotics and a vaccine, neither of which provide long-term immunity, and thus increasing the rates of infertility in women. Previous studies have shown that clearance of the infection depends on T helper 1 (Th1) response along with complementary antibody response in the primary infection area. This study seeks to continue the investigation in finding a safe potent adjuvant to boost and sustain chlamydial immune responses for long-lasting protective immunity. We hypothesize that stimulation of monocytes and macrophages with *Vibrio cholera* ghosts (VCG) induces the secretion of multiple immune responders. THP-1 monocytes or macrophages were pulsed with VCG (10 ug/ml) for 24 h. After stimulation, cellular supernatant was collected and analyzed for Th1 and Th2 cytokine secretion. THP-1 cells tend to produce increased Th1 cytokine

secretion levels vs. Th2 cytokine secretion during immune response. We conclude that stimulation of THP-1 cells with VCG leads to enhanced secretion of Th1 cytokines. This work is supported by grant RO1 AI41231 from National Institutes of Health (NIH) and Grant #1 C06 RR18386 from National Centers for Research Resources, NIH; Title III Grant HBGI #22211K – Enhancing Graduate Students Academic and Professional Development.

11:15 MEASUREMENT OF THE INTERACTIONS OF LOW ENERGY GAMMA RAYS WITH DENSE METALS FOR APPLICATIONS IN NUCLEAR CARDIOLOGY IMAGING**, G.G. Passmore, T.F. Lynam* and J.L. Spradlin*, Georgia

Regents University, Augusta, GA 30912. Gamma camera imaging of myocardium perfusion with either Tl-201 or Tc-99m is widely used for the detection of coronary artery disease (CAD). Myocardium perfusion imaging studies allow the clinician to differentiate between healthy and damaged myocardium based on the amount of accumulated radio-nuclide represented in the images. Both radioisotopes, Tc-99m and Tl-201, can indicate the perfusion characteristics of the myocardium. However, Tl-201 has the additional capability to indicate cardiac tissue viability. Simultaneous imaging of Tl-201 stress and Tc-99m rest images would have the benefits of optimal diagnostic perfusion imaging and tissue viability signaling. However, there is a difficulty in trying to image the lower Tl-201 energy photons in the presence of the higher energy Tc-99m photons when using a standard lead collimator because interactions between the Tc-99m photons and lead create down-scatter in the Tl signal region. The objective of this project is to measure the transmission and interactions of Tc-99m photons and Tl-201 photons separately and simultaneously using high density metal discs (different from lead) as attenuators for application in gamma camera collimators. Correction of the down-scatter problem would allow the clinician to take advantage of a simultaneous dual-isotope approach, increasing the detectability of reversible myocardium defects. Methods include using NIST attenuation data to identify multiple high density metals that meet the criteria for reduced Tc-99m down-scatter with K-shell x-rays signals that are different from the Tl-201 energy signal. Spectra for lead (Pb) have been collected. Continued analysis will be based on comparisons of spectra using multiple metallic attenuators.

11:30 PHAGE THERAPY: A POSSIBLE PARADIGM SHIFT FROM ANTI-BIOTICS?, V. L. Chivukula* and D. O'Bryant, Atlanta Metropolitan State College, Atlanta, GA 30310.

With the increase in antibiotic resistance among various bacterial species, scientists are investigating alternatives to fight bacterial infections. Using viruses that infect bacteria (bacteriophages) to treat bacterial infections could be more effective than antibiotics. Phage therapy dates back to the 1890s with Ernest Hankin's observations on cholera followed by Twort's studies suggesting viruses as the agents killing the cholera bacteria. D'Herelle discovered the first phage and used it to cure patients of dysentery. Though a number of studies followed that first discovery in the treatment of bacterial infections using phages, phage therapy never gained the importance that was received by antibiotics due to batch inconsistencies and manufacturing issues at that time. Phage therapy has recently regained importance with companies such as Intralytix, Inc. producing and developing products that inhibit pathogens in various food products. Advantages of using phage therapy include exponential growth of phages at the site of application depending on bacterial numbers, natural existence of phages for mutated bacteria, ease of using phage mixtures to inhibit different strains of a specific bacterial disease, and causing no harm to the normal flora. Currently, our lab is developing techniques for isolating bacteriophages from wastewater influent samples against *Klebsiella pneumoniae* and

Streptococcus pyogenes and identifying the best phage titer values for a known bacterial concentration.

POSTERS

SCREENING OF SOME NATURAL PRODUCTS AND NANOPARTICLES FOR THEIR ANTI-BREAST CANCER ACTIVITIES, C. T. Ahweyevu*, L. Wrensford and M. A. Taha, Albany State University, Albany, GA 31705.

Cancer refers to a broad group of diseases that involve unregulated cell growth that form malignant tumors, which ultimately lead to death. Breast cancer is the most common type of cancer in women living in Western nations. It is estimated that approximately 1 in 8 North American females will develop breast cancer throughout their lifetime. The best way to battle cancer or any disease is prevention. One of the most researched aspects of chemoprevention is the use of natural products due to its cost effectiveness and little toxic side effects as opposed to other synthetic methods of chemo-treatment. Herein, we employed both biochemical and microscopic techniques to investigate the anti-breast cancer activities of seven different preparations namely; Milk thistle extract (MTE), Ginkgo biloba extract (GBE), Selenium (Se), Se-MTE, Se-GBE, chitosan, and Se-chitosan nanoparticles. These natural products have previously shown to have various forms of anti-cancer activities. Our results showed that only selenium and chitosan have promising anti-breast cancer activities according to the MTT and microscopy results. Further studies are required to confirm this result. This research is supported by the MBRS-RISE program to Department of Natural Sciences, Albany State University.

EXAMINATION OF SODIUM FLUORIDE'S EFFECT ON YEAST CELL GROWTH AND GENOMIC STABILITY**, A.R. Arvidsson* and A. L. Abdulovic-Cui, Georgia Regents University, Augusta, GA 30912.

Sodium fluoride is a toxic, highly electronegative compound that floods public drinking water, lurks in toothpaste, produce, and pharmaceuticals. The compound sodium fluoride has an electronegativity of three due to the combination of fluorine's electronegativity of four forming an ionic bond with sodium's electronegativity of one. As a result of fluorine's tendency to gain an eighth electron to become stable sodium fluoride acts as a free radical within cells and will take electrons from molecules with only one electron in their valence shell. We believe this tendency may cause sodium fluoride to take electrons from sodium molecules within cells and change the electric charge within cells. It is very important that certain cells, like neurons, maintain a certain internal charge in relation to their surrounding environment to function properly. The charge altering effect in neurons may cause or contribute to dementia and specifically Alzheimer's. To better understand the toxicity of sodium fluoride our aims to explore the effect sodium fluoride has on *Saccharomyces cerevisiae*, the budding yeast. We are exposing the yeast cells to varying concentrations of sodium fluoride solutions and examining results. Specifically, we will be looking for a decrease in cell growth over varying sodium fluoride concentrations and if DNA mutations accumulate in genes within the yeast cells caused by the exposure to sodium fluoride.

EFFECT OF A RNRI1 MUTATION ON DNA MICROSATELLITE STABILITY IN YEAST**, A.I. Alam*, N.A. Hashmi* and A.L. Abdulovic-Cui, Georgia Regents University, Augusta, GA 30912.

Microsatellites are repetitive DNA sequences within eukaryotic genomes. The repeated sequences can consist of two, three, or four base pairs and can be repeated up to a hundred times (e.g. CACACACACACACACACA) Microsatellite sequences are known to be hotspots for DNA mutations, especially frameshift mutations. Importantly, mutations within microsatellite sequences can be very detrimental to human

health and are known causes of colorectal cancer, Huntington's disease, and Fragile X Syndrome. In this study, we will be investigating a genetic pathway in the budding yeast, *Saccharomyces cerevisiae*, which we hypothesize will increase the rate of mutations within microsatellite sequences. We have integrated a mutation into the *RNR1* gene. *RNR1* encodes the large subunit of the enzyme ribonucleotide reductase whose primary function is to create the precursors of DNA, the dNTPs, in a balanced manner. The mutation we used is *rnr1Y285A* which causes an imbalance in the dNTP pools. Previous studies have shown that an imbalance in the dNTP pools causes increased mutations on non-repetitive DNA and we predict that the increase in mutations caused by imbalanced dNTP pools would be amplified on microsatellite DNA. We integrated *rnr1285A*, into the yeast genome in addition to a 10 repeat unit GT microsatellite and a 10 repeat unit CA microsatellite sequences. Using an *in vivo* mutation assay and molecular DNA techniques we will measure the mutation rate of our new mutant strain and investigate the different mutations that were created.

THE EFFECTS OF NICOTINE ON CRANIOFACIAL DEVELOPMENT IN EMBRYONIC ZEBRAFISH**, Philip R. Uys* and Linda G. Jones, Young Harris College, Young Harris, GA 30582. Prenatal exposure to nicotine has been associated with craniofacial malformations, the most common of which is cleft palate. In this study we used embryonic zebrafish (*Danio rerio*) to determine whether exposure to nicotine promoted developmental abnormalities particularly with respect to cartilage formation in the pharyngeal arches. Eggs were collected and exposed to various concentrations of nicotine in order to determine the optimal sublethal dose to use in comparison with control embryos. We also varied the time of treatment, both the total time of exposure and exposure at different phases of development, to determine if these variables affected the outcome. At specified time points, control and treated juvenile zebrafish were anesthetized, fixed overnight in 4% paraformaldehyde before staining with Alcian blue to highlight formed cartilage. Preliminary evidence suggests that exposure to nicotine results in a delay in pharyngeal arch formation. Furthermore, a shortening and hypercontraction of the tail was noted in some instances following nicotine exposure. Further data collection will be required before firm conclusions can be made. Funding for this project was from the Young Harris College Undergraduate Research Initiative.

MEASUREMENT OF THE INTERACTIONS OF LOW ENERGY GAMMA RAYS WITH DENSE METALS FOR APPLICATIONS IN NUCLEAR CARDIOLOGY IMAGING**, J.L. Spradlin*, T.F. Lynam* and G.G. Passmore, Georgia Regents University, Augusta, GA 30912. Gamma camera imaging of myocardium perfusion with either Tl-201 or Tc-99m is widely used for the detection of coronary artery disease (CAD). Myocardium perfusion imaging studies allow the clinician to differentiate between healthy and damaged myocardium based on the amount of accumulated radionuclide represented in the images. Both radioisotopes, Tc-99m and Tl-201, can indicate the perfusion characteristics of the myocardium. However, Tl-201 has the additional capability to indicate cardiac tissue viability. Simultaneous imaging of Tl-201 stress and Tc-99m rest images would have the benefits of optimal diagnostic perfusion imaging and tissue viability signaling. However, there is a difficulty in trying to image the lower Tl-201 energy photons in the presence of the higher energy Tc-99m photons when using a standard lead collimator because interactions between the Tc-99m photons and lead create down-scatter in the Tl signal region. The objective of this project is to measure the transmission and interactions of Tc-99m photons and Tl-201 photons separately and simultaneously using high density metal discs (different from lead) as attenuators for application in gamma camera collimators. Correction of the down-scatter problem would allow the clinician to

take advantage of a simultaneous dual-isotope approach, increasing the detectability of reversible myocardium defects. Methods include using NIST attenuation data to identify multiple high density metals that meet the criteria for reduced Tc-99m down-scatter with K-shell x-rays signals that are different from the Tl-201 energy signal. Spectra for lead (Pb) have been collected. Continued analysis will be based on comparisons of spectra using multiple metallic attenuators.

IS LUTEINIZING HORMONE RECEPTOR (LHR) REDUCED IN MOUSE LEYDIG TUMOR CELLS TREATED WITH PFOA?, S.Y. Tadros* and J.D. Cannon,**

Georgia Regents University, Augusta, GA 30904. Perfluorooctanoic acid (PFOA) is a synthetic long-chain perfluorinated chemical used in numerous industrial and consumer products ranging from non-stick cookware to fire- and weather- resistant clothing. There is growing evidence suggesting that PFOA acts as an endocrine disruptor. Previous studies demonstrated that 24 h treatment of mouse leydig tumor (mLTC-1) cells with 100 μ M PFOA reduced human chorionic gonadotropin (hCG) – stimulated progesterone (P4) synthesis by greater than 16-fold compared to hCG-stimulated control, with no significant decrease in cell viability. It was hypothesized that PFOA-induced reduction in P4 synthesis may be due to a decrease in expression of the luteinizing hormone receptor (LHR). To test this hypothesis, mLTC-1 cells were cultured with or without 100 μ M PFOA, cells collected, and RNA isolated and reverse transcribed. Primers for LHR and glyceraldehyde -3- phosphate dehydrogenase (GAPDH) were ordered and are currently being optimized against MgCl₂ concentration, primer concentration, and cycle number. Once the primers have been optimized, mRNA levels will be determined using quantitative polymerase chain reaction (PCR). It is anticipated that LHR expression will be reduced in cells treated with PFOA.

REGENERATION OF RETINAL GANGLION CELLS IN EMBRYONIC ZEBRAFISH FOLLOWING GLUTAMATE EXCITOTOXICITY, Tiffany C. Goebel* and Linda G. Jones,**

Young Harris College, Young Harris, GA 30582. The retina of the eye is composed of multiple layers of cells that work together to relay visual information to the brain. In most organisms, severe retinal damage can lead to permanent neuronal loss. Zebrafish (*Danio rerio*) have been shown to possess the ability to regenerate and replace retinal cells, specifically retinal ganglion cell (RGC) axons and photoreceptors from a population of progenitor cells, the Müller glia cells which are found in the retina of both zebrafish and mammals. In this study, we would like to determine whether RGC will regenerate following glutamate excitotoxicity and whether this response is limited to certain dose or time constraints of treatment or recovery. Immunohistochemistry of control and glutamate-treated embryonic zebrafish using an anti-acetylated tubulin antibody to newly formed neurons and their axons will be used to examine regeneration of the RGC and their axons. The Hu C/D antibody which labels RGC (in addition to a number of other cell types) will also be used to confirm regeneration of RGC (regardless of axonal regeneration). Understanding the regenerative processes exhibited by zebrafish could have important implications in potential treatments for ocular diseases such as glaucoma (found in mammals), in which RGC are destroyed. Funding for this project was from the Young Harris College Undergraduate Research Initiative.

ALPHA ENOLASE(ENO1) EXPRESSION MIGHT BE A VITAL COMPONENT OF THE IMMUNE RESPONSE TO CHLAMYDIA TRACHOMATIS INFECTION, Khamia Ryans, Camilla C. ILLYusuf Omosun and Qing He,**

Clark-Atlanta University, Morehouse School of Medicine, Atlanta, GA 30314. *Chlamydia trachomatis* (*C. trachomatis*) is one of the most prevalent sexually transmitted diseases, in the United

States with over one million Chlamydia infections reported in 2011. Chlamydia infection can cause pelvic inflammatory disease (PID), ectopic pregnancy, chronic pelvic pain, and infertility in women. A major challenge in Chlamydia vaccine effort is that Chlamydia infections do not only induce protective immunity but also immune mediated pathology. In this study we attempt to find the mechanism(s) underlying this immunopathology induced by Chlamydia. Preliminary studies in our lab have confirmed that IL-10 deficiency results in the rapid clearance of genital Chlamydia infection. Proteomic results indicated Alpha-Enolase (ENO1) may be upregulated in *C. trachomatis* infected IL-10 deficient cells. ENO1 is a glycolytic enzyme associated with generating ATP and is present on the surfaces of neutrophils, monocytes and bacteria. To determine the mechanisms involved in the protection elicited in IL-10KO mice we determined the levels of ENO1 expression in BMDCs, from WT and IL-10KO mice, infected for 1 and 2 hours with Chlamydia. Our study showed a significant increase in ENO1 expression in IL-10KO DCs compared to WT DCs. This result suggests that in IL-10KO mice ENO1 might be important in the early activation of the dendritic cells in the immune response against Chlamydia.

Section VI: Philosophy and History of Science
Science Hall W1004
E.T. McMullen, Presiding

8:30 **COMMON TACTICS USED BY THE PSEUDOSCIENCES INCLUDING CREATIONISM**, John V. Aliff, Georgia Perimeter College Online, Auburn, GA 30011. Pseudosciences can be defined with certain propagandistic appeals common to their goal of eliciting belief in certain methods or paradigms, untested or untestable by the scientific method. Most Georgia scientists (as reported in the GAJSCI, 1976) hold a religious faith and are perplexed by the claims made by the pseudosciences. Their tactics include: 1.) Conflation: Conflation is seen by the inference that mistakes or outright mal-appropriations of quotes and conclusions of scientists prove their obverse point that their belief system is correct. 2.) Appeals to persecution assert that scientists are deliberately rejecting their ideas because of political bias. 3.) Particularly applicable to the medical sciences, anecdotal evidence or the labelling of a product as “natural” is offered as “proof” of efficacy. 4.) Pay for service may occur as book authors or charlatans offer their products to selected audiences; *e.g.*, the elderly or conservative churches. All these and other tactics result from a mistaken idea of the general public that science, be it Physics, Astronomy, Paleontology, Archeology, *etc.*; must confirm events or beliefs in their holy scriptures. Theologically speaking, the demand that science “prove” the Bible can be looked on as a crisis of faith in their supernatural beliefs.

9:00 **A UNIVERSAL DEFINITION OF EVOLUTIONARY PRINCIPLES**, Eugene R. Mesco, Dalton State College, Dalton, GA 30720. The establishment of biological evolution as a key guiding principle for understanding life on earth has enhanced numerous areas of study. Extension of the principles of evolution into other disciplines has been problematic. Challenges to the use of evolution in other disciplines often center on the issue of the material substrates that serve the role of DNA. In this model, a redefinition of evolutionary principles is based on the recognition of information as a coded pattern of matter of energy. This borrows from previous work in telecommunications, which establishes information as a code neutral entity distinct from the technology of transmission. This model defines evolution as a natural process in any system having the following properties: 1) High fidelity replication of information with survival of replicated information; 2) Information replication uses expendable technology; 3) The replicated in-

formation is inert relative to the thermodynamic processes involved in the technology of replication; 4) A quantifiable resistance to entropy; and 5) the system displays intentionality. These cumulative properties will be shown to be applicable to both biological and social systems, allowing a consistent definition of evolution (or *negentropy*) as a universal property of specific entities.

9:30 A (HEURISTIC) PHILOSOPHICAL ANALYSIS OF DIMINISHING INTEREST IN STEM FIELDS, Charmayne E. Patterson and Ronald E. Mickens, Clark Atlanta University, Atlanta, GA 30314. Despite recent attempts to encourage participation in the STEM (Science, Technology, Engineering and Mathematics) fields, there has not been a marked increase in students entering these disciplines. In an attempt to understand why this is so, we are posing the question, “Does one’s upbringing and personal beliefs impact their decision to enter the STEM fields?” If there is in fact a correlation between the two, it would indicate that strategies aimed at increasing involvement will not be successful if there is a clash between a *priori* personal beliefs and the principles and methodologies which form the basis of the natural sciences. The main purpose of this presentation is to examine these issues through the lenses of a “heuristic” philosophical analysis. Our major conclusion is that conflicts between alternative “worldviews” of “methodologies” may be important factors in limiting the numbers of individuals who seek careers involving high level scientific research.

10:00 Section Business Meeting

10:30 AN ACCOUNT OF JOHN AND WILLIAM BARTRAM’S VISIT TO THE ORPHAN HOUSE AND WORMSLOE, SAVANNAH, GEORGIA IN 1765, Elliott O. Edwards, Jr., Bartram Trail Conference, Savannah, GA 31410. The Explorations of John & William Bartram continue to enthuse natural historians since their first trip to the south in 1765. John Bartram (1699-1777) Botanist to King George III, travelled to Florida on a one-year botanical trip to Georgia and Florida that included a survey at Shell Bluff, Georgia, taking his son William Bartram (1739-1824) to collect seeds and specimens for friends and fellow gardeners. This was William’s first botanical expedition and would inspire him to lay the groundwork for his own career as a naturalist. While on their expedition, they stopped off in Savannah on September 25, 1765. They would visit George Whitefield at the Orphan House (Bethesda) and later travel to Wormsloe, the property of Captain Noble Jones, the father of the Revolutionary patriot Noble Wymberly Jones. To commemorate their visit to these historic sites in Savannah, two William Bartram Trail markers are being installed, one at each site. The marker for Wormsloe was installed in the Fall of 2013 and the marker for Bethesda will be installed in the Spring of 2014. This paper will also include a biographical sketch of John and William Bartram and sketches of the sites: Wormsloe and Bethesda. The Bartram Trail Conference, which was established to commemorate the Travels of William Bartram, will be installing the markers, also to be discussed.

11:00 PIMPING “GOD”: AN ANALYSIS OF POPULAR WRITINGS ON MODERN SCIENCE AND MATHEMATICS, Ronald E. Mickens and Charmayne E. Patterson, Clark Atlanta University, Atlanta, GA 30314. The main focus of this presentation is to investigate the use of the word “god” in the title of books and articles written for general audiences on various topics related to modern science and mathematics. In particular, we give a brief history of popular science writings, what were the perceived needs and requirements for such writings, and the conflicts which often arose between the authors and publishers. We also discuss “who is a scientist” and how this issue influ-

ences both what is written and how these productions are interpreted. Further, we show that there is, for the authors of these works, a clear distinction between “god” and “God”. Our major conclusions are that these writings are created to provide explanations of advanced, sophisticated scientific and mathematical concepts to the general, but educated, public; however, such works are read by few professional scientists, and understood by only a small minority of the general public who purchase them for study.

11:30 **THE PATTERN OF HAECKEL’S PICTURES**, Tom McMullen, Georgia Southern University, Statesboro, GA 30460. Ernst Haeckel (1834–1919) was a key advocate and popularizer of evolution, but it was always with his own twist. With no proof, he published the first tree of evolution in 1866. By contrast, Charles Darwin’s *Origin of Species* had pictured only branches. In 1866, Haeckel drew a series of fictional minuscule organisms he called ‘Monera.’ This would be his pattern, popularizing evolutionary ideas with no scientific proof. The frontispiece of Haeckel’s 1868 *Natürliche Schöpfungsgeschichte*, pictured human and animal heads in an evolutionary sequence. In the text, he stated that the “lowest humans” such as the ‘Australian Negro’ and the ‘African Negro,’ stood much nearer to the ‘highest apes’ than to the ‘highest human,’ the ‘Indo-German.’ Haeckel had no proof of evolution among humans, but he called it science. Again, he went beyond Darwin who had avoided human evolution in his *Origin*. Also in Haeckel’s book were his ‘proofs’ of evolution, which were really misrepresented embryonic drawings. First, in three pictures of the very same embryo, he claimed they were each of a dog, a chick and a turtle embryo. Then he doctored other embryo drawings to support his contention that embryonic development recapitulated evolutionary development. Scientists have shown this concept to be false along with his embryo drawings. Overall, we see Haeckel’s pattern was to popularize evolution by creating drawings of his speculations and claiming them to be scientific.

Section VII: Science Education
Science Hall W1001
Mike Sakuta, Presiding

9:00 **PARALLAX: A LAB FOR INTRODUCTORY ASTRONOMY STUDENTS**, Amanda L. Mashburn*, Bob Powell and Ben Jenkins, University of West Georgia, Carrollton, GA 30118. In astronomy, parallax is the angular displacement in apparent position of a celestial body, most commonly a star, when observed from two widely separated lines of sight, or viewpoints. The distance between these viewpoints is called a baseline. Parallax, measured in arc seconds, is inversely proportional to its distance in parsecs from the observer. A daytime laboratory exercise has been created and tested to give students experience measuring the parallax angle of campus objects and calculating the distances to them. A Brunton surveyor’s compass was used to measure the bearings along two lines of sight to obtain a parallax angle, and then the students measure the baseline, or the distance between the two lines of sight. The students use these two measurements to calculate how far away the object is. In a typical trial, a baseline of 16.5 m has a parallax angle of 7.8 degrees. This gives a calculated distance of 117.9 m, although the actual distance is 117.5 m, which is a 0.4% error. This laboratory exercise was tested with one section of introductory astronomy students during the Fall Semester 2013. Half of the students obtained a 1.7% error, while the other half had percent errors of 10% or higher. Student work was supported by a UWG UWide Grant.

9:15 **MAKING WRITING A PRIORITY IN EIGHTH GRADE PHYSICAL SCIENCE CLASSES****, Allyson L. Martin* and R. A. Cooper, Brenau University, Norcross, GA 30071. Teachers have witnessed a decline in students' writing ability over the past several years. Based on anecdotal evidence, students dread writing, which is lacking in grammar, style, mechanics, and content. Due to the emphasis placed on math and reading on the Georgia Criterion Referenced Competency Test (CRCT), writing across content areas has become less of a priority in some classrooms (Kingsbury, 2007). The implementation of Common Core Georgia Performance Standards requires writing across the curriculum; teachers must find a way not only to motivate students to write, but also to instruct them in how to write in the content areas as well. Performed in four eighth grade physical science classes, this study focused on the implementation of standard specific writing instruction to increase students' writing ability. The 100 students in the study comprised 20 English Language Learners, 14 students with disabilities, and 66 others not in the aforementioned categories. The teaching strategy of using the 6+1 traits by Ruth Culham was used as the framework for writing instruction. These traits are a set of strategies that have seven main categories of focus. Every three weeks, students participated in a variety of writing exercises such as article summaries and response essays that focused on technical and expository writing, as well as peer and self-editing strategies. These writing assignments were graded based on the particular trait that was the focus for that three-week period, using the Write to Learn software for assessment. It is a computer-based program that uses the rubrics from the 6+1 Traits to assess students' writing. This software was also used to measure growth in overall writing ability through the use of a pre- and post-test.

9:30 **LEARNING MATHEMATICAL MODELING WITH A PROGRAMMABLE MODELING ENVIRONMENT**, Brian C. Brodsky, University of West Georgia, Carrollton, GA 30118. This study investigated the potential benefits of using the programmable modeling environment NETLOGO in the context of the teaching and learning of mathematical modeling. Mathematical modeling can be seen as a cyclic process where the modeler transitions through a series of models and situations in an attempt to solve a problem (Blum, 2011). When viewing mathematical modeling in this way, mathematical modeling competency can be seen as the modeler's ability to contemplate and validate the various stages of the modeling process, the range at which the modeler can handle the various situations, and the level of mathematical and technical sophistication that the modeler is capable of using during the modeling process. With this frame as the background, NETLOGO's tutorial documentation and a journal kept by the author during his first experiences with NETLOGO were studied. Two important benefits emerged during documentary analysis: a) when using a programmable modeling environment, the programmer must transition through cyclic process analogous to the mathematical modeling process; b) through the construction and use of simulations in the programmable modeling environment, modelers gain opportunities to validate and reflect on the various stages of the mathematical modeling process.

9:45 **KINEMATICS, DYNAMICS, AND MATH: YEAR I OF SMITE**, Bob Powell, David Leach, Ann Robinson, Sharon Kirby and David Todd, University of West Georgia, Carrollton, GA 30118. The University of West Georgia received funding in October 2012 for a two-year grant for Science and Math Institutes for Teacher Education (SMITE) from the Georgia Department of Education's Math Science Partnership Program. Ninety participants from area schools were selected for a summer institute of two weeks in June, 2013 held on the campus of the University of West Georgia. Participants

studied the physics topics of kinematics and dynamics with appropriate math topics. All topics were aligned with Georgia standards. Separate classes were held for teachers in grades 3–5, middle school, and high school. Follow-up sessions included a day at Six Flags to study motion and forces at the amusement park and a Saturday session in September on the campus of the University of West Georgia. Targeted schools were asked to send teams of mathematics teachers and science teachers in order to build collegiality and alignment between math and science classes. The objectives of the projects were to improve content knowledge and confidence while encouraging the use of teaching strategies using research-based activities, small group learning, and reflections. Assessment via pre-tests and post-tests showed statistically significant improvement in both science and math for the majority of these classes.

10:00 **Section Business Meeting**

10:30 **EMPIRICAL EVIDENCE OF THE EFFECTIVENESS OF CONCEPT MAPPING AS A LEARNING INTERVENTION FOR BOTH RESIDENT AND DISTANCE LEARNING NMT STUDENTS**, Gregory Passmore, Georgia Regents University, Augusta, GA 30912. Metacognitive learning strategies are based on instructional learning theory, which promotes deep, meaningful learning. A baccalaureate level Nuclear Medicine Technology (NMT) program was used to demonstrate that both resident students, and distance learning students enrolled in an online section of the program, perform better when traditional instruction is supplemented with the concept mapping metacognitive learning strategy. Two separate quasi-experimental longitudinal investigations were conducted, one for resident students and one for distance learning students. The control group for each investigation relied on traditional homework problems and question-answer sessions alone. The treatment groups additionally used the concept map as the template for misconception identification and remediation interactions. The resident student treatment group was matched to the resident control group using SAT scores. Both distance-learning groups relied on personal communications to be conducted via email correspondence. The course final examination was used as a quantitative comparison between the performance of concept mapping students and non-mapping students. Resident students demonstrated a significantly greater mean final examination score for the concept mapping group when compared to the non-concept mapping group ($F = 5.123$, $p = 0.0340$), with an appropriately large effect size (1.88). Distance students demonstrated a significantly greater median final examination score for the concept mapping group when compared to the non-concept mapping group ($Z = -2.0381$, $p = 0.0415$), with an appropriately large effect size (2.65). In conclusion, concept mapping is a metacognitive learning intervention that effectively enabled meaningful learning in both the resident student and distance-learning student environments used by some NMT programs.

10:45 **A PRELIMINARY ASSESSMENT OF GAME-BASED LEARNING IN ORGANIC CHEMISTRY I LECTURE**, Pamela M. Leggett-Robinson, Georgia Perimeter College, Decatur, GA 30034. Organic chemistry is considered one of the toughest science courses and is mainly taught through traditional methods. Students of the 21st century find it very difficult to engage in learning Organic Chemistry through traditional methods of teaching as their learning needs have changed. Students in Organic Chemistry I (CHEM 2641) were introduced to game-based learning via participation (game playing throughout the semester) and game design (end of semester project). Game-based learning incorporates all types of learning styles as well as factual, conceptual, proce-

dural, and meta-cognitive knowledge. The games designed and played in CHEM 2641 are adaptations of favorite board games or TV game shows, *i.e.*, ORGNO! (BINGO), OrganoLand (Candy Land), Nomenopoly (Monopoly), Stereojeopardy! (Jeopardy!). Each game addresses course/student learning objectives, allows students to spend more time on task with difficult concepts/topics, and provides a continual review of the subject matter. Quantitative feedback was collected from CHEM 2641 students through questionnaires following each gaming activity. The findings demonstrate the use of gaming as an enjoyable, alternative, and effective teaching tool for learning Organic Chemistry and mastering areas of difficulty. Preliminary results collected from the final exam assessment were used to determine the effects of gaming on the retention of organic chemistry content.

11:00 DIAGNOSTIC EVALUATION OF UNDERPREPARED STUDENTS IN FIRST SEMESTER GENERAL CHEMISTRY (A PRELIMINARY STUDY), Peter A. Roessle¹, S. Payne¹, M. Atteya², M. Trani², M. Nelson², M.F. Burkart³ and A. Dutta³, Georgia Perimeter College - ¹Newton Campus, Covington, GA 30014, ²Clarkston Campus, Clarkston, GA 30021 and ³Dunwoody Campus, Dunwoody, GA 30338. A measurable and consistent number of students at Georgia Perimeter College have been found to underperform in the First Semester General Chemistry Course (CHEM 1211). In order to be able to effectively re-mediate this situation, students who are potentially “at risk” must be identified, the reasons for underperformance should be understood, and appropriate remedial steps taken to address the problem. Preliminary research conducted during the 2012–2013 academic year focused on evaluating factors within the cognitive and affective domains of chemistry learning relative to course outcomes as measured by the ACS First Semester Paired Question Exam (PQE). Specific factors evaluated included math skills, prior exposure to chemistry, critical thinking, attitude, and motivation. Three of these factors, math skills, exposure to chemistry, and level of critical thinking, were found to individually and collectively correlate with course outcome as measured by the PQE. These results suggest that a placement exam addressing these three factors be used to assess the likelihood of success in CHEM 1211, and be able to identify potentially “at risk” students. This project was funded by a Georgia Perimeter College STEM Initiatives Mini Grant.

11:15 ESTABLISHMENT OF AN ONGOING PHENOLOGY PROJECT AS A RESEARCH PROJECT AND EDUCATIONAL MODEL**, Eugene R. Mesco, Dalton State College, Dalton, GA 30720. The USA National Phenology Network (<https://www.usanpn.org>) is an ongoing consortium of scientists, citizens and various groups engaged in the collection and analysis of data relevant to understanding climate changes. Phenology is the study of annual variations in biological properties in organisms. As an initial area of study, deciduous leaf changes over the course of the year are an easily measurable variable. Two years of data were collected covering variations in seven distinct deciduous species, present on the Dalton State campus, in relation to spring leaf growth and autumnal apoptosis and color changes. Percentage and times of leaf color change and leaf drop in the fall, as well as leaf budding and growth in the spring were established for a baseline data set. An outreach project with a local elementary school was discussed. Analysis of environmental variables and timing of phenological changes were reviewed. Discussion of program challenges and opportunities were also covered. This initial study included the following specimens: American Beech (*Fagus grandifolia*), American chestnut (*Castanea dentata*), Black cherry (*Prunus serotina*), Eastern poison ivy (*Toxicodendron radicans*), Flowering dogwood (*Cornus florida*), Mountain laurel (*Kalmia latifolia*),

Red maple (*Acer rubrum*), Sourwood (*Oxydendrum arboreum*), Tuliptree (*Liriodendron tulipifera*) {tulip poplar}. Data to be presented include changes from September 2013 through March 2014.

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*, Georgia State University, Atlanta, GA 30302. This study examined the effects of using visual statistics software (ViSta) on undergraduate students' achievement in elementary statistics, and the role of cognitive and non-cognitive factors in their achievement. An experimental design was implemented with a sample of approximately 282 undergraduate students. The modified trichotomous framework of goals, cognition, and achievement was used as the theoretical foundation to categorize the cognitive and non-cognitive predictors related to student achievement. Five data analysis methods were utilized: Wilcoxon rank statistics, multiple nonlinear regression analysis, reliability analysis, fidelity of implementation analysis, and problem-solving analysis. It was concluded that using the ViSta program increases undergraduate students' achievement in statistics, mainly through having positive impacts on their knowledge, self-efficacy, and attitudes toward statistics. Results of this study benefit statistics education at the undergraduate level, encourage the design of future research and experimental studies on a more comprehensive scale, and aid in preparing students to become actively engaged in their own learning.

PEER LED TUTORING FOR PRINCIPLES OF CHEMISTRY I AND II, Amy Cook,

Georgia Perimeter College, Decatur, GA 30034. The Principles of Chemistry is a gateway course that is required for most STEM degrees. The course has a higher than average failure rate due to the difficulty of the subject material. Performance in the course can determine whether a student will continue pursuing a degree in the STEM field. To increase the success rate, in the fall of 2011, a Peer-Led Tutoring Program was developed for the Principles of Chemistry I for students at the Decatur Campus of Georgia Perimeter College, a two-year college near Atlanta, Georgia. The Peer-Led Tutoring Program provided the students the opportunity to work with former students who were successful in the course. Sessions for General Chemistry II began in Spring 2012 semester. The students who attended the sessions improved their grades by an average of 10%.

LESSONS FROM A PLACE OF LIGHT: LESEDI CULTURAL VILLAGE**, Ashley

M. Plummer*, Georgia State University, Atlanta, GA 30302. The purpose of the Embracing Indigenous Mathematical Knowledge Systems Study Abroad Program was to explore and bring perspective to the inherent and varied contents and contexts in which South African tribes integrate mathematical principles into architecture, beadwork, weaving, and other cultural activities. Part of this program entailed visiting Lesedi Cultural Village in Johannesburg, South Africa, which highlighted the cultures of the Zulu, Sotho, Xhosa, Pedi, and Ndebele tribes of southern Africa. This study illustrated the integration of tribal social practices and technology with high school mathematics in both Common Core Georgia Performance Standards Coordinate Algebra and Analytic Geometry courses through the Thinglink in-image interaction tool. Beyond simply mathematizing cultures, ethnomathematics was used to expand student perspectives on foreign cultures through understanding the mathematical practices of the people. Thinglink is interactive; video, text, and photographs are placed directly on media to add meaning to pictures, and

maps. Participants navigated a map of the Lesedi Cultural Village with information about the Zulu rondawel, for example, and then answered questions pertaining to volume and surface area in context. Presenting information through Thinglink allowed participants to bridge social science and STEM fields for meaningful interactive educational experiences.

USING KNOWLEDGE SPACE THEORY TO EXTRACT CRITICAL LEARNING PATHS FOR STUDENTS LEARNING OF CALCULUS

Iman C. Chahine and Mark Grinshpon, Georgia State University, Atlanta, GA 30303. While improving STEM (Science, Technology, Engineering, and Mathematics) education in the United States has been a critical national concern, the pipeline of students entering STEM does not meet the current demand for future scientists and engineers. One of the reasons identified for this attrition has been students' underperformance in calculus classes and their inadequate preparation in precalculus content. This study employed Knowledge Space Theory (KST) as a theoretical and methodological framework to extract critical learning paths that depict student learning of calculus concepts. KST is a model for representing students' knowledge in a given context; it was originally developed by Doignon and Falgagne (1990) and been used both for theoretical analysis of knowledge and for designing practical solutions to teaching and learning. Findings of the KST analysis revealed different student learning pathways based on test grade data. We argue that these learning pathways provide insights into students' learning of calculus as well as guide instructors in their search for better practices for teaching undergraduate mathematics courses. Several projects have been funded by the STEM mini-grants program.

BRIDGING OF CULTURES THROUGH ETHNOMATHEMATICS: AN INVESTIGATION OF ZULU BONE DIVINATION PRACTICES

M. I. McGlone*, Georgia State University, Atlanta, GA 30302. The purpose of this study was to illustrate connections and/or influences between the Zulu divination system and other cultures in Africa through ethnomathematics. Ethnomathematics is the study of the underlying beliefs of a culture by extracting cultural and mathematical knowledge from their day-to-day activities and practices. The Sangomas or diviners of the Zulu tribe are well-respected figures within their communities because they heal and protect their people through interpretations using bone divination. The regalia worn by the Sangomas also hold secrets and stories of the culture that link the Zulu with other cultures. Using ethnomathematics and the examination of different collections of divination tablets, bones, animal artifacts, and clothes, it can be concluded that the Zulu divination system can be linked with not only other Nguni sub-cultures such as the Sotho and Pedi but also with the Sikidy divination in Madagascar.

Section VIII: Anthropology

Science Hall W1053

Teresa P. Raczek, Presiding

8:30 SKELETAL ANALYSIS OF TWO INDIVIDUALS FROM A ROMAN CEMETERY IN IERAPETRA, CRETE, GREECE**

April M. Tolley* and S. K. Smith, Kennesaw State University, Kennesaw, GA 30144. The Greek Archaeological Service excavated a Roman cemetery in Dialektaki, Ierapetra, on the Island of Crete, Greece. Among the tombs was Tomb 22, which contained artifacts and the remains at least two adult individuals. The tomb is oriented east-west and measures 1.25 meters long, .47 meters wide, and .39 meters deep. It is a slightly damaged grave that contained four Corinthian paving stones, one of which was intact, and the other three were fragmentary. The

skeleton of Individual 1 is approximately 50% complete, and the individual was buried in a supine position with the head oriented east. The upper arms were parallel to the body, and the forearms were angled inward with the hands resting on the pelvis. Individual 2 is represented by a small number of fragmentary bones. This paper presents research that is part of a larger study of human remains from Ierapetra area Roman burials, which will be the first full analysis of Roman burials from Crete.

8:45 OSTEOLGY OF A BURIAL VESSEL FROM THE LATE PREHISTORIC/EARLY CONTACT PERIOD PINE HARBOR SITE (9MC64)**, Amanda C. Shively*, Georgia Southern University, Statesboro, GA 30458. Pine Harbor (9MC64) is a Late Prehistoric to Early Contact period archaeological site on the Georgia coast near Sapelo Sound. In 1978, several burials were excavated during salvage operations at the site by Fred Cook and Frankie Snow; however, they were not formally analyzed using modern methods of physical anthropology. This research focuses on osteological examination of a single urn burial's contents from that site. Ongoing analyses aim to provide data on the minimum number of individuals represented in the urn, as well as details of age, sex, and apparent health of the individual(s) interred. Methods of analysis include visual examination and precise measurements, and as needed, a dissection scope and reconstruction tools. Data generated from this study will hopefully shed light on burial demographics at Pine Harbor and practices of its native occupants. This study is supported by the Georgia Southern University Department of Health and Kinesiology.

9:00 LATE WOODLAND AND EARLY MISSISSIPPIAN BURIAL PATTERNS IN NORTH GEORGIA**, Anthony Chieffo* and Ashley Estep*, Kennesaw State University, Kennesaw, GA 30144. Little information is known archaeologically about burial practices during the Late Woodland (AD 800-1000) period in north Georgia, however there is substantially more data from the succeeding period, the Early Mississippian (AD 1000-1250). Our paper focuses on identifying what burial practices were performed during each period, from grave location to body position, orientation, and goods interred with each individual. Taken together, we can see what pattern(s) persisted or changed through time. If changes did occur it would be important to understand why they happened. If there is a noticeable shift in how prehistoric Native Americans were buried from Late Woodland to Early Mississippian times, then determining the catalyst for this would be significant for archaeologists working in north Georgia. Our results, although preliminary in nature, would shed new light on burial practices across a five hundred year time span in a region that has not received much attention in Southeastern archaeology.

9:15 THE ACTUAL COST OF THE "DISPOSAL OF THE DEAD": A COMPARATIVE STUDY OF FUNERARY EXPENDITURE IN DALLAS, TX, 1902-1909, Z.W. Dirnberger, Kennesaw State University, Kennesaw, GA 30152. The George W. Loudermilk Undertaking company operated near the turn of the century, providing their services to both Black and White Dallasites. Using the daybooks of Loudermilk Undertaking (with a date range between 1902 and 1909), funerary spending will be compared across racial, gendered and age groups. This paper will detail the social discourses presented by mortuary variability, as well as offer a general critique of previous attempts at funerary cost analysis.

9:30 **SIX FEET OVER: A COMPARATIVE STUDY OF GRAVE MARKERS IN ATLANTA GEORGIA AND DALLAS TEXAS**, Megan R. Hoogstad*, Kennesaw State University, Kennesaw, GA 30144. How much information be obtained from a grave marker? Grave markers provide biographical and even some religious data, but can these stones tell more? Previous research on grave markers emphasizes socioeconomic status through a consideration of marker size. However, size is not necessarily the best socioeconomic indicator. This study presents the collection and analysis of grave data from 1902-1909 in Oakland Cemetery in Atlanta, GA with a detailed examination of gender, age, and race. The study tests the hypothesis that size and material of grave markers indicate socioeconomic status, and therefore, men's grave markers would be larger than women's and adult grave markers would be larger than those of children. The study further compares White grave markers with those of African Americans. The study finds that sex did not have a large factor in grave marker differences. Children's markers usually, but not always were smaller than those of the adults. Finally, African Americans on average had larger grave markers than the White population at Oakland Cemetery.

9:45 **ANALYSIS OF THE LAWTON SITE CLEAR-CUT COLLECTION****, Kimberly M. Shattuck*, Department of Sociology and Anthropology, Georgia Southern University, Statesboro, GA 30458. This study focuses on artifact analysis and cultural categorization of sites recorded in a logging clear-cut near the Middle Mississippian period (A.D. 1250 – 1350) Lawton mound site (38AL11) in Allendale County, South Carolina. The surveyed area is located within 1000 meters of 38AL11, and totals 127.3 acres. Methods of analysis include artifact sorting and quantification into chronologically-meaningful typological categories, and mapping of artifact clusters to identify individual sites. The dating of these sites and their proximity to Lawton will inform the larger question of variation in Mississippian settlement patterns. Both dispersed and nucleated settlement systems have been recorded in Mississippian chiefdoms, with a number of explanations suggested for their adoption. The clear-cut survey near Lawton provides an opportunity to test these differing models of settlement, and perhaps contribute to the overall question of sociopolitical organization in Mississippian societies. Support for this project was provided by the Department of Sociology and Anthropology, Georgia Southern University.

10:00 **Section Business Meeting**

10:30 **REDISCOVERING THE ARCHAEOLOGY OF WEST GEORGIA: A REANALYSIS OF DR. LEWIS LARSON'S 1974 ARCHAEOLOGICAL SURVEY OF CARROLL, HARALSON, AND PAULDING COUNTIES, GEORGIA****, J.R. Unterwagner and B.A. Coomes, University of West Georgia, Carrollton, GA 30117. The purpose of this research was to analyze the ceramic assemblage of 126 sites surveyed by Dr. Lewis H. Larson in his 1974 tri-county survey of Carroll, Haralson, and Paulding counties in the western piedmont province of Georgia. The goal of our analysis was to better understand prehistoric Native American habitation in the Upper Chattahoochee and Little Tallapoosa river valleys by assigning dates of occupation to each of the archaeological sites recorded in the survey. In completing this analysis, the results of our research will serve to better the understanding of prehistoric settlement patterns in our area and hopefully both promote and encourage future research on prehistoric Native American life in present-day western Georgia. After nearly forty years since the completion of the initial survey, the results we gather will ultimately provide a key piece of the puzzle in regards to the poorly-understood Woodland period occupation, not only in our own community but the Southeastern United States as well. Research funding provided by: UWG Student Research Assistance Program.

10:45 AN EXAMINATION OF CHERT WITHIN THE RIDGE AND VALLEY: CONDUCTING LITHIC ANALYSIS AT THE MIDDLE ARCHAIC SITE OF IN THE VALLEY SITE, BARTOW COUNTY, GEORGIA**, Selene Cannelli* and Ronnie Johnson*, Kennesaw State University, Kennesaw, GA 30144. In The Valley is a Middle Archaic campsite located in Bartow County, Georgia. Phase I and Phase II investigations were performed at the site in the fall of 2011 and spring 2012. The site is located on land formerly owned by the famed Georgian writer Corra Harris. During excavation chert flakes and shatter were found within the units. Multiple features were also identified at the site. A Morrow Mountain projectile point was located within one of the units, which contributed to the dating of the site. Analysis of the chert debitage followed the Sullivan and Rozen (1985) method of analysis. The analysis, coupled with background research of similar sites located in the area, has helped us conclude that In The Valley was a temporary camp where tools were finished or retouched, and nearby resources were collected. According to Blanton and Sassaman's (1989) adaptive flexibility model, residents were thought to move frequently, exploit resources, then move back to their base camp or onto other resource locations. This model helps strengthen our hypothesis that the site is a temporary hunting camp and guides us to further archaeological investigation of the site in north Georgia.

11:00 THE ROLE OF WATER SOURCES IN INFLUENCING SOCIAL INTERACTION BETWEEN THE AHAR BANAS COMPLEX AND PROXIMATE SOCIETIES**, Blake S Bottomley*, Kennesaw State University, Kennesaw, GA 30144. Since the early 1990's, a renewed interest in Indian archaeology has spurred a series of excavations in the country's northwestern states, including those at several sites of the Ahar Banas Complex (c. 3rd-2nd millennia BC) in Rajasthan's Mewar Plain. Based on discoveries of lithic and ceramic technology, building techniques, and faunal remains, some scholars have asserted that the Ahar Banas Complex shared a trade connection with the nearby Harappan Civilization. However, the role that geography and environment played in interactions between the Ahar Banas and neighboring societies has yet to be fully investigated. This paper examines how north Indian water sources influenced settlement and social interaction in the Ahar Banas Complex. I argue that assessing this culture from an environmental perspective will provide further insight not only to this region, but surrounding regions as well.

POSTERS

PRELIMINARY ANALYSIS OF A PROBABLE ARCHAIC HEARTH FEATURE IN PHINIZY SWAMP, AUGUSTA, GEORGIA**, April S. Boatwright*, Brittany A. Coomes*, Spencer J. Hill*, Ashley M. Smallwood and Thomas A. Jennings, University of West Georgia, Carrollton, GA 30118. This poster presents the preliminary results of the analysis of a feature excavated at site 9Ri381 located in Phinizy Swamp of Richmond County, Georgia. We use geographic information systems (GIS) to analyze the vertical and horizontal spatial relationship of artifacts and explore the distribution of burned artifacts and artifact types. The spatial distribution of the burned materials in unit N994 E987 appears to be evidence of a hearth in the southwestern half of the unit. Artifact analysis shows that 82 percent of the materials found in the unit are burned daub, burned clay clusters, burned steatite, fire-cracked rock, burned gravel, and charcoal; while only 18 percent non-burned materials are represented. In addition, quartz flakes were found scattered throughout the unit, with a higher percentage of quartz materials northeast of

the suspected hearth and only some quartz materials scattered within the hearth. The preliminary results from this spatial analysis of artifacts suggest this location of the site was an activity area associated with a hearth which was most likely a cooking feature surrounded by a small flint-knapping cluster. This research is supported by the Georgia Department of Transportation and Georgia Department of Natural Resources.

A SURVEY OF THE ASSEMBLAGE OF HOMINOIDEA GENOMES INVESTIGATED AND RECURRENTLY ANALYZED GENES IN PRIMATE GENOMICS**,

Jessica R. Engel*, Georgia State University, Atlanta, GA 30302. The basis of this study is to investigate which extant and fossil HOMINOIDEA genomes have been sequenced and which aspects of their genomes have received the most attention. Genomic research has vast potential for enhancing the construction of phylogenies and for understanding processes that were recently subjected to evolutionary forces. Extensive genomic research has been conducted with anthropoids, with an emphasis in the chimpanzee genome, as a comparison to modern humans. Additionally, the recent draft of the Neandertal genome allows for comparative studies with closer evolutionary relatives. This study summarizes the current genomes of HOMINOIDEA that have been explored and particular genome or gene comparisons drawing significant research attention in biological anthropology. The information gathered in this study analyzes current research for gaps in HOMINOIDEA genomics and identifies specific species comparisons and genetics features that need further investigation.

LOLITA FASHION AND THE DIGITAL IMAGE: SIGNIFICANCE OF PHOTOGRAPHY IN SOCIAL MEDIA**,

Chancy J. Gatlin*, Georgia State University, Atlanta, GA 30302. Lolita fashion is a synthesis of Japanese street fashion and Victorian era dress and Rococo costume that gained popularity on the streets of Tokyo, Japan in the early 1990s. The Atlanta Lolita and Japanese Street Fashion Community is comprised of over 330 women and men aged sixteen to sixty who have embraced and adopted Japanese Lolita fashion in and around the metro-Atlanta area. The community members host and participate in multiple meet-ups per month which consist of social gatherings at a restaurant, park, festival, shopping venue, etc., accompanied by a photography session which often outweighs the event both in length and in significance. The members of the community love to dress up and take pictures of themselves and each other. This paper is an ethnographic exploration of the significance of photography and self-images to the community members and the role these images play in perception management in social media. For this project, I utilized multiple ethnographic methods including participant observation, semi-structured interviewing, photography, and audio recordings. I have conducted interviews and participated in many community-sponsored events. I will consult readings on Lolita fashion, literature on photography and images, and ethnography of social media to analyze my findings.

THE APPLICATION OF ANTHROPOLOGY TO A STEM-BASED SUMMER PROGRAM IN FORENSIC SCIENCE,

Lara E. McCormick*¹, Jules Angel², Ana Casado² and Lori Critcher², ¹University of West Georgia, Carrollton, GA 30118 and ²The Ohio State University, Columbus, OH 43210. The summer learning program *Forensics in the Classroom* was initiated in 2007 as a summer bridge program to improve the math and science skills of inner-city youth throughout Columbus, OH. This presentation details the anthropological aspects of the program, such as ethnographic observations conducted prior to, during, and after each field season to better understand the culture of

the students involved with the program. Curriculum design was created using results of ethnographic assessments, integrating various aspects of biological and forensic anthropology. Teaching modules were designed into a 5-day rotational structure which included a) science basics, hypothetico-deductive reasoning and crime scene logistics, b) blood spatter analysis and basic trigonometry, c) biological anthropology integrating science and math standards for each grade level, d) impression evidence, pattern recognition, and algebra, e) evidentiary standards and courtroom procedures. From 2007 until 2013, program directors have modified multiple facets of this program to respond to outcomes and findings of the previous year. Over the past six years, updates and improvements have been made in areas such as: learning outcomes, curriculum standards to meet changing requirements for math and science education at the state and federal levels, and program logistics such as location and time length. This presentation reviews the improvements made to the program over its 6 year period, the planned improvements in future years in Ohio, and the beginning phases of a related outreach program offered through the Anthropology Department at the University of West Georgia. This presentation also offers suggestions for other educators interested in creating similar programs.

GATEKEEPING MELUNGEON HERITAGE: EXPERIENCES WITH GENETIC GENEALOGISTS, AND HOW THEY SHAPE AND DETERMINE IDENTITY, J.M. Starnes, Georgia State University, Atlanta, GA 30302. The Human Genome Project (HGP) primed and promoted advancement in genetic ancestry testing, which resulted in consumer testing that is more affordable and accessible. Some individuals use testing for personal reasons. Genetic ancestry is also used by amateur genetic genealogy researchers as a means of building prestige and legitimacy. My research began with an internship experience with a DNA testing company, and later, discussions with genetic genealogy researchers. My plan was to work with them to contribute to the body of work on the ancestry of the Melungeons of Appalachia. In attempting to carry out this plan of research and study, I encountered significant resistance and gatekeeping from both groups. The research that resulted now centers on the gatekeeping and status seeking behavior of the two groups, and how their influence shapes and determines Melungeon identity. I also include a review of past Melungeon genetic testing and a critique of the methods used by the two groups of genetic genealogists I encountered.

REGIONAL TAPHONOMY IN COLD, WET CLIMATES: EFFECTS OF THE FREEZE/THAW CYCLE ON TAPHONOMIC CONDITION OF IMMERSSED SKELETAL REMAINS**, Stephanie L. West*, University of West Georgia, Carrollton, GA 30118. Aquatic environments have a destructive effect on immersed bone tissue. This study tests the hypothesis H_1 : skeletal remains containing postmortem dismemberment marks (*i.e.* saw marks) submerged in lake water will lose their distinction of kerf wall and kerf floor impressions after the freeze/thaw cycle. This study was performed on fresh, macerated bone from domesticated pig, *Sus domesticus*. A new KR® handsaw was used to make three types of saw marks: false start scratches, false start kerfs, and sectioned cuts. Identical cuts of these three types were created on two sets of pig bones: one serving as the experimental sample and one serving as the control sample. Measurements of kerf length and kerf width were taken on the control and experimental samples. All samples were photographed using a standard camera and a stereomicroscope to document the presence of kerf marks. The experimental and control samples were immersed into water from Lake Carroll in Carrollton, Georgia for approximately 90 days. Control samples remained immersed in Lake Water at room temperature, while the experimental samples were placed in a freezer until the water sample became frozen. Every

30 days the experimental specimens will be thawed, measured, and photographed using the same materials and methods as the initial procedure. At the end of 90 days all the specimens will be removed from the freezer and thaw at room temperature. Documentation of saw marks will be completed with standard photography and stereomicroscopy; measurements will be taken of kerf width and kerf length, if present, and compared to the initial measurements to determine whether the freeze/thaw cycle impacted postmortem dismemberment mark evidence.

THE GEORGIA ACADEMY OF SCIENCE

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

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

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

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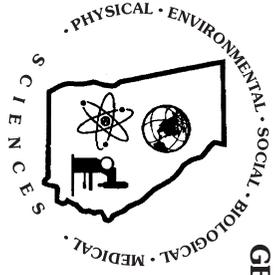
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