GEORGIA JOURNAL OF SCIENCE

Volume 74 2016 Number 1

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GAS President’s Welcome and Report of the Academy Council

Greetings Academy Members and Guests,

Welcome to the 2016 Annual Meeting of the Georgia Academy of Science! The Academy is most grateful to President Burns for inviting our organization to Gordon State College. We are also thankful to Richard Schmude, members of the local arrangements committee, and the faculty, staff and students of Gordon State College for their hard work and hospitality. We are lucky to have about 71 oral presentations and 42 posters at this year’s meeting.

The Academy has had a productive year. Among other things the Council has instituted student travel awards, brought back poster awards, undertaken transitioning the GA J. of Sci. to an open, electronic format, and accepted an invitation from Young Harris College to host the 2017 annual meeting. Additional work of the Council can be found on our web page.

I hope you enjoy the meeting and your time in Barnesville.

Sincerely yours,

Shane A. Webb, President
Georgia Academy of Science
and
Professor of Biology
University of North Georgia
Dahlonega, GA
Dear Attendees:

It is my pleasure, on behalf of Gordon State College, to welcome the 2016 Annual Meeting of the Georgia Academy of Science to our campus.

We are proud to host organizations like yours that are dedicated to promoting science education and fostering scientific research.

Gordon State College is a residential state college in the University System of Georgia offering baccalaureate degrees as well as fully transferable associate level concentrations of study.

Approximately 4,000 students attend Gordon State College with 900 students living on our beautiful 235-acre campus.

I hope each of you enjoy your time at Gordon State College. We are glad you are here.

Sincerely,

Max Burns, PhD
President
GAS 2016 PROGRAM
Friday, April 1, 2016

11:00 am to 1:00 pm—Georgia Academy of Science Board of Directors Business Meeting:
Closed to Public, Dining Hall

12:00 pm to 5:00 pm—On-site Registration
Instructional Complex first floor lobby

2:00 pm to 4:45 pm—Oral Presentations
Section. I, Biological Sciences
Section. IV, Physics, Math., Computer Sci.

5:00 pm to 6:00 pm—Opening Remarks, Dr. Shane Web
Poster Presentations, Refreshments Served
Instructional Complex Fourth Floor Lobby Area

6:00 pm to 6:15 pm—Break

6:15 pm to 7:15 pm—Key Note Lecture by Dr. Mike Mahan

Faculty Professional Development outside of Publications!
Dr. Madan received his B.S. degree in Biology from Ball State University. Mike followed this with a M.A. in Student Personnel Administration and a few years later he received his Ed D degree in Science Education, Biology also from Ball State University. He has taught at both the High School and College level. He holds valid teaching licenses in Indiana, New Jersey, and Georgia for High School Biology and Science. He has also served as the Associate Director of Athletics at Rutgers, the State University of New Jersey. He has several honors including being named to the STEM Taskforce for the BOR of Georgia. In 2011, Dr. Mahan was selected by the National Association of Biology Teachers (NABT) for a development trip to Peru for investigation of Northern Peru. He is a member of several organizations including American Association for the Advancement of Science (AAAS) #16502922, the National Science Teachers Association (NSTA) # 1063656 and the National Association of Biology Teachers (NABT) #072958. He is a full member of Sigma XI, the National Science Honorary. He has also been successful in securing several grants related to education. Dr. Mahan has secured over $350,000 in grants the past two years. He is currently the Dean of the School of Education at Gordon State College.

7:30 pm to 8:15 pm—Soap making by Chemistry professors Dr. Clem Smetana.
Instructional Complex room 418

Continued
Saturday, April 2, 2016

7:00 to 8:00 am - Breakfast
Instructional Complex Third Floor Lobby

7:30 am to 11:45 am - Oral presentations
Section I: Biological Sciences
Section II: Chemistry
Section III: Earth and Atmospheric Sciences
Section IV: Physics, Math., Computer Sciences
Section V: Biomedical Sciences
Section VI: Philosophy and History of Science
Section VII: Science Education
Section VIII: Anthropology
Instructional Complex Room 111
Instructional Complex Room 205
Instructional Complex Room 207
Instructional Complex Room 119
Instructional Complex Room 209
Instructional Complex Room 220
Instructional Complex Room 222
Instructional Complex Room 224

12:00 pm to 1:00 pm - Lunch
Highlander Hall

1:00 pm to 1:30 pm - Student awards and Open Business Meeting
Highlander Hall

1:45 pm Barnesville Walking Tour, meet in
Highlander Hall
Dr. Schmude will escort participants to Barnesville Lamar County Public Library
FRIDAY PAPER PRESENTATIONS

*Denotes student presenter
**Denotes student research in progress

Section I: Biological Sciences
Building--Instructional Complex, Room 207
Johnathan G. Davis, Presiding

3:00 ASPECTS OF FORAGING DYNAMICS IN COSTA RICAN LEAF-CUTTER ANTS**, Krista McDonald*, Kyle Mobley*, Paris White* and M. Davis

3:15 ONTOGENETIC CHANGES IN STOMATAL DENSITY OF MONSTERA DELICIOSA LEAVES, Chris LaRussa*, T. Bennett* and M. Davis


3:45 Break

4:00 COMPARING ABUNDANCE AND DIVERSITY OF GROUND-DWELLING ARTHROPODS BETWEEN TWO FOREST TYPES, Carson L. Bowers* and C.B. Zehnder

4:15 PATTERNS IN SNAKE BEHAVIOR IN RESPONSE TO INCREASING HUMAN INTERACTION**, Andrew J. Lyons* and J.G. Davis

4:30 USE OF PECTORAL FIN RAYS TO AGE SICKLEFIN REDHORSE AND EFFECT OF STREAM DISCHARGE ON ANNUAL GROWTH, Fernando Serrano* and J.G. Davis

Posters (will be displayed 5:00 to 6:00 pm)

Section IV: Physics, Mathematics, Computer Science and Technology
Building--Instructional Complex, Room 119
L. Ajith DeSilva, Presiding


2:15 ROTATIONAL SPECTRA AND NITROGEN NUCLEAR QUADRUPOLE COUPLING FOR THE CYANOACETYLENE DIMER, Ian P. Dorell*, Philip R. Davis* and Lu Kang

2:30 THERMAL ANALASYS OF BOROSILICATE GLASS FOR ITS BIOLOGICAL APPLICATIONS**, Gregory Humble*, Kisa S Ranasinghe and Delbert E. Day
2:45 SPIN WAVE FEYNMAN DIAGRAM VERTEX COMPUTATION PACKAGE, Alexander Price*, Philip Javernick and Trinanjan Datta
3:00 A MATLAB GUI TO STUDY ISING MODEL PHASE TRANSITION, CurtisLee M. Thornton* and Trinanjan Datta
3:15 Break
3:30 THE EFFECT OF PRESSURE AND TEMPERATURE ON THE ELECTRICAL RESISTANCE OF GRAPHITE POWDER**, Hannah Watkins*, Katlyn Brumelow* and Ben de Mayo
3:45 ANTI-SUPERCONDUCTIVITY IN DIAMOND NANO-PARTICLES**, Katlyn Brumelow*, Hannah Watkins* and Ben de Mayo
4:00 PHOTOCATALYTIC DEGRADATION OF CONDO RED WITH TiO₂ NANO-PARTICLES UNDER VARIOUS LIGHT SOURCES**, Sarah G. Martino*, Ajith DeSilva and Himanshu Narayan
4:15 CAN ANTI-FERROMAGNETISM AND ANISOTROPIC SUPER-CONDUCTIVITY COEXIST IN IRON PNICTIDES?** Joseph Newman* and Theja De Silva
4:30 STUDYING THE INTERPLAY BETWEEN SUPERCONDUCTIVITY AND ANTI-FERROMAGNETISM THROUGH BOSE-FERMI MIXTURES ON OPTICAL LATTICES**, Jeremy Brackett* and Theja De Silva

Posters (will be displayed 5:00-6:00 pm)

SATURDAY PAPER PRESENTATIONS
*Denotes student presenter
**Denotes student research in progress
Section I: Biological Sciences
Building--Instructional Complex, Room 111
Johnathan G. Davis, Presiding
8:45 ASSESSMENT OF BRET BETWEEN NANOLUM AND VARIOUS FLUORESCENT DYES**, Holly R. DuPlain, A.C. Spencer and N. Lambert
9:00 FEEDING PREFERENCE OF THE CILIATE, TETRAHYMENAE PYRIFORMIS, Rachel A. Perez*, Ashlyn B. Coffey*, and F.S. Corotto
9:15 BASELINE WATER MONITORING OF THE OHHOPEE RIVER**, Kaitlin Warren*, J. Hilburn, and J. Wedincamp
9:45 EVOLUTIONARY DIVERGENCE OF HOXA2 GENE EXPRESSION WITHIN THE DEVELOPING HINDBRAIN OF VERTEBRATE EMBRYOS, Adam Davis and E. Stellwag
10:00 Break and Section Business Meeting
Posters (will be displayed Friday 5:00-6:00 pm)
POSTERS

IMPERVIOUS SURFACE, LAND USE TYPE, AND MACROINVERTEBRATES IN THE SOUTH ATLANTA METRO AREA, Christopher H. Kodani


MODELING RANAVIRUS EPIDEMIOLOGY IN COMMON FROGS (RANA TEMPORARIA) IN THE UNITED KINGDOM VIA RECURRENCE RELATIONS**, Nicholas A. Adams*, A.L.J. Duffus, and J.C. George

MOLECULAR IDENTIFICATION OF PREY FROM A MATERNITY COLONY OF BRAZILIAN FREE-TAILED BATS (TADARIDA BRASILIENSIS) IN LAMAR COUNTY, GEORGIA**, Carson L. Bowers*, Andrew M. Wright*, M.J. Bender, G.M. Ionta and S.E. Jackson-Rosario

BLEACHING AND RECOVERY RATES OF EXAIPTASIA PALLIDA BY TEMPERATURE MANIPULATION** D.T. Brunzelle* and M.M. Mays

ARE PARTIAL RANAVIRUS MAJOR CAPSID PROTIEN SEQUENCES ENOUGH FOR PHYLOGENETIC RECONSTRUCTION?? Jennifer B. Campbell*, S.E. Rosario, and A.L.J. Duffus

LEAF LITTER DECOMPOSITION AND COLONIZATION BY AQUATIC MACROINVERTEBRATES IN SULLIVAN CREEK, GEORGIA, Brandon Clanton*, J. Proud*, A. Stansell*, N. Varela*, and M.J. Bender

TESTING AN EXERCISE PROGRAM TO REDUCE PROBABILITY OF ANTERIOR CRUCIATE LIGAMENT INJURY**, Alison F. Cox* and J.G. Davis

THE EFFECT OF CARBON DIOXIDE ON THE SEA ANEMONE EXAIPTASIA PALLIDA **, Danielle E. Heald* and M.M. Mays

IDENTIFICATION OF NEW microRNAS IN CHLAMYDOMONAS REINHARDTII**, Lindsey Howell*, G. Borchert, and D. Chevalier

COMPARISON OF AGE AND GROWTH OF MOXOSTOMA SPP. IN BRASSTOWN CREEK, GEORGIA**, Elana Newman, Fernando Serrano*, and J.G. Davis


MACROINVERTEBRATE COLONIZATION AND DECOMPOSITION OF FLOWERING DOGWOOD, HICKORY, AND SWEETGUM LEAVES IN A PIEDMONT STREAM, Alexis Wimberly*, Katherine E Odegaard*, Cynthia Ocegueda*, Mason D Patten* and M.J. Bender

COMPARATIVE EFFECT OF SALICYLIC ACID/CINNAMIC ACID AND THEIR REDUCED COUNTER PART; SALICYLALDEHYDE/ CINNAMALDEHYDE ON THE ARGENTINE ANT (HYMENOPTERA: FORMICIDAE),** Benjamin Curry*, Matthew Ringler-Lantz*, Megan Babb*, C. Kang, and C. Lee

EXPLORING BIOINFORMATICS MODULE FOR USE IN AN INTRODUCTORY BIOCHEMISTRY COURSE,**Vwerosuo Uzezi*, and C. Lee
Section II: Chemistry  
Building--Instructional Complex, Room 205  
Daniel Holley Presiding

8:00 A SIMPLE METHODOLOGY FOR MEASURING OSMOLYTE EFFECTS ON AMINO ACID SOLUBILITY: EFFECTS OF GLYCINE BETAINES AND PH ON GLUTAMIC ACID SOLUBILITY** Dylan Jones*, J.G. Cannon

8:15 QUANTIFICATION METHODS FOR RNA BASES USING HIGH PERFORMANCE LIQUID CHROMATOGRAPHY**, Quadreka S. Burgess*, Linda de la Garza

8:30 [3+2] CYCLOADDITION REACTIONS OF ARYL NITRILE OXIDES AND DIENES, Gloria de la Garza*, James C. Lord, Cody Philips and Jenny M. Baxter Vu

8:45 [3+2] CYCLOADDITION REACTIONS OF NITRILE OXIDES AND DIENES: EFFECT OF REACTION CONDITIONS ON REGIOSELECTIVITY, Bernabe Tucker*, Gloria de la Garza, Jesse Prince, and Jenny M. Baxter Vu

9:00 Break

9:15 SIZE INDEPENDENCY OF THE GLASS TRANSITION IN CONFINED POLYSTYRENE NANOPARTICLES, Nicole M. Sikes*`, Rubicelys Torres Guzman, D. Wade Holley

9:30 SYNTHESIS AND CHARACTERIZATION OF NOVEL NANOTHERMOMETERS**, Delphine Baumert,* George Larsen, Simona Hunyadi Murph

9:45 ANTI-ICING WITH NOVEL PDMS COATING, Liqiu Zheng, Domonique Stewart and K. C. Chan

Break and Section Business Meeting

Posters (will be displayed Friday 5:00-6:00 pm)

POSTERS

CONCENTRATION AND SUBSTITUENT EFFECT ON THE ANTIBACTERIAL ACTIVITY OF SCHIFFE BASE PHENOXY-IMINE COMPOUNDS, Xiaomei Zheng, K.C. Chan, Louise Wrensford, Josh Moore and Ashaunte Davis

TOXICOLOGY STUDIES OF BENZO[c]CINNOLINES USING ZEBRAFISH EMBRYO MODEL, ** Victoria Stephens* and Ghislain Mandouma

CRYSTAL STRUCTURE OF CO-CRYSTAL OF 2-METHYLMIDAZOLE AND 4-NITROPHENOL, M. Tanner Dawson* and Kenneth L. Martin

CRYSTAL STRUCTURE OF CO-CRYSTAL OF 1,2-DIMETHYLMIDAZOLE AND 4-NITROPHENOL**, Connor J. Wright* and Kenneth L. Martin

CHARACTERIZATION OF TRANSCRIPTION FACTORS FROM THE EXTREMOPHILE THERMUS THERMOPHILUS **, Hyejin Um* and Michael Van Dyke

EVALUATING EMPIRICAL MODELS OF OSMOLYTE EFFECTS ON BIOPOLYMERS USING METHODS USING ONE SEMESTER UNDERGRADUATE RESEARCH

https://digitalcommons.gaacademy.org/gjs/vol74/iss1/1

ESTIMATION OF SOIL PARTITION COEFFICIENTS USING X-RAY FLUORESCENCE**, C. Lupse, J. Allison, and P. Nolibos


SYNTHESIS OF CHIRAL IMINES AND AMINES ON SILICA**, Jesse Wayson*, Chelsea Desbiens, McCray Malcolm, and John T. Barbas

Section III: Earth and Atmospheric Sciences
Building--Instructional Complex, Room 207
Samuel Mutiti, Presiding

7:30 PREVALENCE OF BRUCELLA SUIS, CAMPYLOBACTER JEJUNI, ESCHERICHIA COLI O157:H7, AND YERSINIA ENTEROCOLITICA IN GEORGIA’S FERAL PIG COMMUNITIES**, Jyoti K. lamâ* and Dave Bachoon

7:45 PHYTOREMEDIATION CAPACITY OF TITHONIA ROTUNDIFOLIA FOR LEAD CONTAMINATED SOILS**, Megan R. Corley* and Samuel Mutiti

8:00 WATER QUALITY AND ALGAL DIVERSITY ASSESSMENT OF THE KAFUE RIVER**, Mutande K. Tembo *, S. Mutiti and K. Manoylov


8:30 SIMULTANEOUS EXTRACTION OF CHLOROPHYL AND PHYCOCYANINE FROM CYANOBACTERIA WITH OCTANOL-WATER**, Hailey Rials* and J.E. Schneider, Jr.

8:45 CORN AS A DRINKING WATER PURIFICATION METHODS AND MEDIUM**, Allison Pourquoi* and Samuel Mutiti

9:00 A STUDY OF SHORT TERM GREYWATER USE ON ORNAMENTAL CABBAGE GROWTH, SOIL QUALITY, AND GROUNDWATER QUALITY**, Mary Plauche* and Allison R. VandeVoort

9:15 ANALYSIS OF MiOcene CORAL DIAgEnesis USING SCANNING ELECTRON MICROSCOPY, Jasmine C. Truitt* and Donald M. Thieme

9:30 SEDIMENTOLOGY AND STRATIGRAPHY OF THE UVALDA MEGA-MEANDER, OCONEE RIVER, GEORGIA**, Christopher R. Sipes* and B.E. Suther


10:00 Section Business Meeting
10:30 STRATIGRAPHY AND PRESERVATION OF FOSSILS IN TWO OUTCROPS AT THE OAKY WOODS WILDLIFE MANAGEMENT AREA, Donald M. Thieme and Thomas Thurman

**Posters (will be displayed Friday 5:00 to 6:00 pm)**

**POSTERS**

MORPHOLOGICAL ASSESSMENT OF PALEOPATHOLOGY IN LATE PLEISTOCENE GIANT BISON FROM COASTAL GEORGIA**, Scott Raulerson*, A. Mead

FILTRATION AND REMOVAL OF EXCESS NUTRIENTS IN GROUND AND SURFACE WATER BY WETLANDS AT LAKE LAUREL IN MILLEDGEVILLE, GEORGIA**, Cayla Sheehan*, Emily Cruce*, Carly Nielsen, Gabriel Kustick*, Samuel Mutiti and Christine Mutiti

CHANGES IN URBAN RUNOFF’S WATER QUALITY ALONG A MAN-MADE WETLAND**, Hope Telder*, Victoria Thomas*, Samuel Mutiti and Christine Mutiti

CLAY ‘SLUDGE’ AND GYPSUM MIXTURES EFFECT ON FECAL BACTERIAL IN ENVIRONMENTAL SAMPLES**, Lillie Brannen* and Dave Bachoon

TRANSPORT CHARACTERISTICS OF SILVER AND COPPER NANOPARTICLES THROUGH SAND COLUMNS**, Demichael Winfield*, Samuel Mutiti and A. Banston

**Section IV:  Physics, Mathematics, Computer Science and Technology**

**Building--Instructional Complex, Room 119**

L. Ajith DeSilva, Presiding

8:45 IS \([\text{sgn}(x)]^2 = 1\)?, Kale Oyedeji and Ronald E. Mickens

9:00 SECOND-ORDER ITERATION SOLUTION TO AN EQUATION OF ABEL, Ronald E. Mickens

9:15 PERMUTATION GROUPS AND NEARLY EVEN CHORDS, Candace L. Carroll and Neil M. Boumpani

9:30 NOISE MITIGATION INSIDE THE CONTROL AND TEST ENCLOSURE TO MODEL OPTIMUM QUITE AIRCRAFT CABIN, Hasson M. Tavossi

9:45 DETERMINATION OF EFFECTIVE PARAMETER OF ARTIFICIAL MATERIAL WITH MIE SCATTERING THEORY, Arun K Saha

10:00 **Section Business Meeting**

10:30 SIGNIFICANCE OF TEACHING AND LEARNING METHODS IN MECHANICS COURSES: CHALLENGES IN ENROLLMENT AND RETENTION IN ENGINEERING, B. Hojjatie, E. Zimmermann*, R. Ledger* and H. Rashidi

10:45 A MONTE CARLO CALCULATION OF THE OPTICAL PATH LENGTH IN SIMPLE SYSTEMS, Javier E. Hasbun

11:00 RUBBERBAND BEHAVIORS IN 3D, K. C. Chan and Lily Zheng

11:15 NEAR-INFRARED BRIGHTNESS MEASUREMENTS OF SATURN + RINGS, Richard W. Schmude, Jr
11:30 VARIABILITY OF MARS’ TEMPORARY NORTH POLAR CAP, Richard W. Schmude, Jr

**Posters (will be displayed Friday 5:00-6:00 pm)**

**POSTERS**

PHOTOLUMINESCENCE OF CDSE/ZNS QUANTUM DOTS UNDER VARIOUS PRESSURES**, Joshua Harwell*, Ajith DeSilva and Neal Chesnut
A SEARCH FOR HEAVY ELEMENTS IN THE FAINT PLANETARY NEBULA M 1-80**, A. E. Clark* and N. C. Sterling
HEAVY ELEMENTS IN SOUTHERN HEMISPHERE PLANETARY NEBULAE**, Nathan D. Morgenstern*, N. C. Sterling and D. V. Wood*
PARAMETRIC STUDY OF ELECTROMAGNETIC HEATING, Kelly M English* and Arun K Saha
SPEED OF SOUND IN DIFFERENT ANTI-FREEZE CONCENTRATIONS**, Alex Ferre*, Bobby Powell and Ben Jenkins

Section V: Biomedical Sciences
Building--Instructional Complex, Room 209
Seyed H. Hosseini, Presiding

8:00 COMPARING LEVELS OF CYP1A1 EXPRESSION IN MOUSE HEPATOCYTES FOLLOWING EXPOSURE TO INDIGO IN THE PRESENCE OR ABSENCE OF BIOFLAVONOIDS**, Kallie J. Epperson* and Jennifer C. Schroeder.
8:15 EXAMINING CYP1A1 EXPRESSION IN MOUSE HEPATOCYTES FOLLOWING EXPOSURE TO HICKORY SMOKE CONCENTRATE IN THE PRESENCE OR ABSENCE OF BIOFLAVONOIDS**, Christian D. Hambrick* and Jennifer C. Schroeder.
8:30 INVESTIGATION OF ANTIFUNGAL PROPERTIES OF SANGUINARIA CANADENSIS EXTRACT AGAINST CANDIDA ALBICANS, Jordana C. Freitas*, and Andrea L. Kwiatkowski.
8:45 DISRUPTION OF MIXED SPECIES BIOFILMS BY NATURALLY SOURCED CHEMICALS AS AN ALTERNATIVE IRRIGANT FOR ROOT CANAL TREATMENTS**, Matthew T. Heard* and Andrea L. Kwiatkowski.
9:00 Break
9:30 ASC AIDS IN PROTECTION AGAINST INFERTILITY POST CHALMYDIA INFECTION, DN. McKeithen*, Y Omosun1, K Ryans, F Eko, CM Black, JU Igietseme1, GA Ananaba, VM Dixit, U Blas-Machado and, Q He1.

10:00 Break and Section Business Meeting
**Posters (will be displayed Friday 5:00-6:00 pm)**
POSTERS

FUSOBACTERIUM NUCLEATUM MUTANT CONSTRUCTION USING TRADITIONAL CLONING AND CRISPR BASED SYSTEMS**, Kyle R. Dennis*, and Andrea L. Kwiatkowski.

THE ROLE OF DIFFERENT FORMS OF EXERCISE ON AEROBIC FITNESS IN NCAA FEMALE LACROSSE PLAYERS **, Jaclyn Kernohan* and Linda G. Jones.

ALTERATIONS IN BEHAVIORAL RESPONSES FOLLOWING ACUTE EXPOSURE TO ALCOHOL IN ADULT ZEBRAFISH **, Kristina Kauffman* and Linda G. Jones.

IMMUNOHISTOCHEMICAL ANALYSES REVEAL CHANGES IN ASTROCYTIC DENSITY IN THE DORSAL RAPHE NUCLEUS AFTER STRESS, India Nichols*, Chuma Okere, Ketema Paul.

Section VI: Philosophy and History of Science
Building--Instructional Complex, Room 220
Charmayne E. Patterson, Presiding

9:00  AN HISTORICAL SKETCH OF NINETEENTH CENTURY GEOLOGY – A FEW DISCOVERIES AND CONTRIBUTIONS OF EARLY NATURAL PHILOSOPHERS AND THEIR JOURNALS. Elliott O. Edwards Jr.

9:30  ARE COUNTERFACTUAL HISTORIES REALIZABLE? Ronald E. Mickens and Charmayne Patterson.

10:00 Break and Section Business Meeting

Posters (will be displayed through 5:00-6:00 pm)

Section VII: Science Education
Building--Instructional Complex, Room 222
Peter Roessle, Presiding

9:00  BETTER OR WORSE? A LONGITUDINAL ASSESSMENT OF VARIATION IN STUDENT PERFORMANCE IN FRESHMAN BIOLOGY COURSES, Charlotte Christy.

9:30  USING STUDENTS' REFLECTIONS TO IMPROVE INSTRUCTION: ACTION RESEARCH, Ozden Sengul* and Renee S. Schwartz.

10:00 Break and Section Business Meeting

Section VIII: Anthropology
Building--Instructional Complex, Room 224
Teresa P. Raczek, Presiding

7:45  TRAUMA PATTERNING ON RIBS AS AN INDICATOR OF BLAST FORCE TRAUMA, Michael McClung*

8:00  UNDERSTANDING THE PAST: ANALYZING HOW RESIDENTS OF PANCHMATA, INDIA RELATE TO ARCHAEOLOGICAL FINDINGS, Irina Paymer*

8:15  LIFE IN THE MEWAR PLAINS: ARTIFACT ANALYSIS AT THE SITE OF PANCHMATA, Katelyn M. Anderson*
AN ETHNOGRAPHIC AND ARCHAEOLOGICAL COMPARISON OF FLOOR COMPACTNESS USING THE POCKET PENETROMETER, Charles K. Brummeler

ARCHAEOLOGICAL EXCAVATIONS AT THE DABBS SITE: AN INVESTIGATION OF MISSISSIPPIAN PERIOD LIFE IN THE ETOWAH RIVER VALLEY, Terry G. Powis, Jason Whatley, Jamison Jewitt, Lindsey Goff*, and Katherine Lane

PALEOETHNOBOTANY OF THE DABBS SITE, Amber Avery*, Leslie Raymer, Terry G. Powis

UNDER CONSTRUCTION: LANGUAGE AND ASSEMBLAGES OF IDENTITY, Daniel S. Garner*

A CROSS CULTURAL ANALYSIS OF CUSS WORDS, Austin Cross*

CONTROLLING CURSING: A STUDENT'S CONFORMITY TO NEW IDENTITY CONSTRUCTS, Tanner Martin*

Break

AN ETHNOLINGUISTIC ANALYSIS OF ‘HEALTHY’ EATING IN YOUNG ADULTS, Sydney T. O’Brien*

CHILDHOOD OBESITY IS MORE THAN OBESITY: A STUDY OF HEALTH DISPARITIES AND INEQUALITIES IN COMMUNITY BASED PROGRAMS, Symantha N. Dawson

WE ARE OUR OWN BODYGUARDS, Alexandra Illidge*

SOCIAL STRATIFICATION AND ITS EFFECTS ON USAGE PATTERNS OF A TRAIL IN CARROLLTON, GA, Jonathan W. Baugh*

Posters (Posters will be displayed Friday 5:00 to 6:00 pm)

POSTERS

PRELIMINARY ANALYSIS OF THE PALEOINDIAN AND ARCHAIC LITHIC ASSEMBLAGES FROM SITE 9R1381, RICHMOND COUNTY, GEORGIA, Janaka A. Greene*, Ashley M. Smallwood, Thomas A. Jennings

PHOTOGRAMMETRY AND ITS APPLICATION TO ARCHAEOLOGY, Lindsey A. Goff*

AN ASSESSMENT OF DIETARY TRENDS IN SOLDIERS FROM NAPOLEON’S GRAND ARMY USING STABLE CARBON AND NITROGEN ISOTOPE ANALYSIS, Sammantha Holder*, Laurie J. Reitsema, Tosha Dupras, and Rimantas Jankauskas

BIOARCHAEOLOGICAL SEX ESTIMATION: UTILIZING TIBIA MEASUREMENT ANALYSIS ON ANCIENT CRETAN POPULATIONS, Princess A. Wilson*
FRIDAY PAPER PRESENTATIONS
*Denotes student presenter
**Denotes student “in progress” research

Section I: Biological Sciences
Location: Instructional Complex Room 207

Johnathan G. Davis, Presiding

3:00  ASPECTS OF FORAGING DYNAMICS IN COSTA RICAN LEAF-CUTTER ANTS**, Krista McDonald*, Kyle Mobley*, Paris White* and M. Davis, University of North Georgia, Dahlonega, GA 30597. Leaf-cutter ants (Atta spp.) are eusocial hymenopterans in the neotropics and neosubtropics with a complex caste system. The ants cut leaves from forests surrounding the ant nest and transport leaf fragments back to the nest. There, leaf fragments are processed and provisioned to mutualistic fungi that, in return, provide food to the ants. The leaf-cutter ant worker caste exhibits size polymorphism and is divided into size-based subcastes that perform specific duties. We investigated aspects of foraging behavior in two worker subcastes (small workers, or minims, and larger foragers) in the cloud forest near San Luis, Puntarenas, Costa Rica in late June 2015. Foragers transporting leaf fragments in six foraging columns were captured, and their head size and the size of the transported leaf fragment were measured. We also counted the number of minims occasionally riding (hitchhiking) on each transported leaf fragment. Mean leaf fragment wet mass was 3.17x greater than the mean wet mass of the forager transporting the fragment (mean fragment wet mass = 16.4 mg; mean forager wet mass = 5.17 mg), and the surface area of transported leaf fragments increased linearly with increased forager size ($F_{1,176} = 24.2, P = 0.000002$). The number of minim hitchhikers on leaf fragments varied from 0-4 ($\bar{x} = 0.5$), and the number of hitchhikers increased linearly with increased fragment size ($F_{1,4} = 12.49, P = 0.039$). Mean leaf fragment surface area was 52.9 mm$^2$, and foragers transported smaller leaf fragments during windy conditions than in less windy conditions ($t = 3.53, df = 175, P = 0.0005$). Our results will be compared to those reported previously for leaf-cutter ants in other tropical forests.

3:15  ONTOGENETIC CHANGES IN STOMATAL DENSITY OF MONSTERA DELICIOSA LEAVES, Chris LaRussa*, Todd Bennett* and M. Davis, University of North Georgia, Dahlonega, GA 30597. Swiss cheese plant (Monstera deliciosa Liebmann) is a secondary hemiepiphytic arum (Angiospermae: Araceae) native to the neotropics. Leaves of young M. deliciosa are small, entire, and adpressed to the trunk of the host tree. Leaves of older plants develop fenestrations and incisions between lateral veins, forming dissected blades held away from the host. We examined stomatal density in M. deliciosa to assess whether mean density differed in regions of the leaf blade that represent sites of future fenestrations/incisions. Leaves were collected from each of 25 M. deliciosa plants in the tropical cloud forest near San Luis, Puntarenas, Costa Rica in June 2015. Mean stomatal density was determined at the mid-point of each leaf blade in three regions: (1) immediately adjacent to the leaf midrib, (2) immediately adjacent to a lateral vein, and (3) an area of future fenestration/incision (FFI) between two lateral veins. Stomatal density in FFI regions was significantly lower than regions immediately adjacent to the midrib and lateral vein (one-way
ANOVA; $F_{2,222} = 122.84$, $P < 0.001$, followed by Tukey-Kramer post-hoc test. Several advantages of fenestration development in *M. deliciosa* have been proposed, including increased root water capture and camouflage from vertebrate predators. A recent mathematical model proposes that the development of fenestrations in *M. deliciosa* leaves can reduce variance in plant growth in sunflecked tropical forest understories, thus increasing mean plant fitness. If so, reducing stomatal density in FFI leaf regions in *M. deliciosa* might have an associated fitness consequence.

3:30 DOCUMENTING CHANGES IN MOTH SPECIES RICHNESS AND ABUNDANCE CAUSED BY URBANIZATION**, Stephen Lewis*, O’Neilia Francis*, Aminat Kilani*, Jasmine Musgrove*, Roxana Pena Popo*, Matheus Almeida*, 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 difference +5°C of nighttime temperatures in Atlanta relative to Athens presents a natural experiment to test such predictions on moth species common to Georgia. 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 three shared species making both lists and 11 of the most common Athens species absent from the Atlanta area. Additionally, while 6% of individuals observed in Athens come from the 7 species collectively called “lichen moths,” less than 0.1% of Atlanta moths come from these species. 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. They also show that urbanization, even in a highly forested city, can have radical effects on species dependent on sensitive food sources.

4:00 COMPARING ABUNDANCE AND DIVERSITY OF GROUND-DWELLING ARTHROPODS BETWEEN TWO FOREST TYPES, Carson L. Bowers* and C.B. Zehnder, Georgia College and State University, Milledgeville GA, 31061. Forest arthropods play critical roles in their surrounding ecosystems serving as pollinators, herbivores, decomposers, predators and prey. The diversity and abundance of these arthropods can be influenced by a number of factors including tree species, tree density, and the diversity of tree species within the stand. In this study, the abundance and diversity of ground dwelling invertebrates was surveyed between monoculture loblolly pine areas and mixed deciduous forested areas within Bartram Educational Forest, Baldwin Co. GA. Three plots of each forest type were sampled using five pitfall traps per site. Samples were collected over six months from April to September 2015 with insects being identified to order and other arthropods to class. Deciduous plots showed higher order diversity (11) than coniferous sites (8.66) ($t_{10}=3.26$; $p=0.0085$). Diplopoda was the highest in overall abundance (23.8% of total) while Coleoptera was the most common insect order collected (19.5% of total).
Highest arthropod abundance was seen in May (509), and lowest overall abundance was seen in August (111). Additional research will investigate the effect of forest type on the prevalence of different insect feeding guilds and if the patterns documented in 2015 continue to hold.

4:15 PATTERNS IN SNAKE BEHAVIOR IN RESPONSE TO INCREASING HUMAN INTERACTION**, Andrew J. Lyons* and J.G. Davis, Young Harris College, Young Harris, GA 30582. Snakes are misunderstood predators, perceived as dangerous and unpredictable. To address this perception, this research tested the response of native snake species in the southeastern United States, as well as captive-bred specimens, to increasing levels of interaction with humans. We hypothesized that snakes will not respond aggressively to an approaching individual, contrary to the commonly-held, public view of natural snake aggression. Interactions with snakes were based on three levels of human interaction and consisted of an initial approach (walking directly towards the snake), a stand-by response (standing beside the snake within striking distance), and a touch response (contacting the snake utilizing a snake hook). The recorded reactions of each snake were categorized as defensive, fleeing, and no reaction. Defensive behaviors of snakes were recorded as performing gape, feigning a bite, biting, and demonstrating display tactics. Snake species, snake size, location, occupied habitat and air temperature were also recorded. Statistical tests will calculate the probability of a snake to exhibit a behavior based upon interaction levels, and a model will be built to predict snake response based upon measured variables. Observationally, wild caught snakes were more likely to attempt to flee than behave defensively. Captive-bred snakes responded differently, responding mostly to touch and not to other interactions.

4:30 USE OF PECTORAL FIN RAYS TO AGE SICKLEFIN REDHORSE AND EFFECT OF STREAM DISCHARGE ON ANNUAL GROWTH, Fernando Serrano* and J.G. Davis, Young Harris College, Young Harris, GA 30582. The sicklefin redhorse (SFR) *Moxostoma* sp. is a rare Catostomid fish in the upper Tennessee River watershed of western North Carolina and north Georgia whose listing status is under review. Status reviews rely on the best available scientific data, but age data, which is used to estimate population survival, growth rates, and recruitment for SFR, is difficult to collect and usually involves sacrifice of sampled individuals. We tested the utility of aging SFR with pectoral fin rays, which is a non-lethal procedure, from SFR collected in the spring of 2014 and 2015 from Brasstown Creek, GA. Pectoral fin rays were aged blindly and independently by two readers. Annual growth increments were measured with the use of ImageJ software to determine growth rates. Growth models constructed from growth curves were similar to published data. Captured SFR (n=48) were tagged for future tracking and population estimation. Using age data, we compared growth rates of SFR to stream discharges. Annual growth did not vary significantly in response to annual stream discharge (P=0.40) although, among seasons, spring discharges (P=0.19) had the greatest effect on growth. SFR are long-lived (max observed age=21 years) and experience slow growth after reaching sexual maturity. Factors such as climate change and landscape development may alter discharge but may not affect SFR growth. Future research will investigate other factors such as temperature.
Section IV: Physics, Mathematics, Computer Science, Engineering and Technology
Location: Instructional Complex Room 119
L. Ajith DeSilva, Presiding

2:00 MAXIMALLY EXPOSED OFFSITE INDIVIDUAL DOSE ASSESSMENT METHODOLOGY FOR NESHAP COMPLIANCE AT THE SAVANNAH RIVER SITE, K. R. Moore*1, B. H. Stagich1, G. T. Jannik2, K. L. Dixon2, J. R. Newton1, 1Augusta University, Augusta, GA 30912 and 2Savannah River National Laboratory, Aiken, SC 29808. The Environmental Protection Agency requires the use of the computer model CAP88 PC to estimate doses for demonstrating compliance with 40 CFR 61, the National Emission Standard for Hazardous Air Pollutants (NESHAP). The model requires site specific input of various parameters that determine how the radioactive effluents from onsite facilities are dispersed and transported to the offsite general public. For demonstrating NESHAP compliance, the Savannah River Site (SRS) currently groups all onsite radioactive releases into a single center-of-site location for determining the annual dose to the maximally exposed individual (MEI). For this study, worst-case sector analyses were performed to address potential ground-level and stack releases from 20 SRS operational areas. The worst-case sector is the sector and distance where an offsite MEI would receive the highest annual dose due to a potential release from an onsite facility. The worst-case sector doses were then combined to determine the overall worst case sector and, therefore, the highest MEI dose from all onsite facilities. The results presented a 30% MEI dose increase when compared to the former method. Acknowledgements go to the Department of Energy, Augusta University’s Physics and Chemistry Departments, and Savannah River National Laboratory.

2:15 ROTATIONAL SPECTRA AND NITROGEN NUCLEAR QUADRUPOLE COUPLING FOR THE CYANOACETYLENE DIMER, Ian P. Dorell*1, Philip R. Davis*1, Lu Kang1, 1Kennesaw State University, Marietta, GA 30060. The rotational spectra of cyanoacetylene dimer, (HCCCN)2, were recorded using Balle-Flygare type Fourier transform microwave (FTMW) spectrometers. The low J transitions were measured down to 1.3 GHz at very high resolution, FWHM ~1 kHz. The spectral hyperfine structure due to the 14N nuclear quadrupole coupling interactions are well-resolved below 4 GHz using a low frequency spectrometer at the University of Arizona. The experimental spectroscopic constants were fitted as: B0 = 339.2923310(79) MHz, DJ = 32.152(82) Hz, H = -0.00147(20) Hz, eqQ(14N1) = -3.9902(14) MHz, and eqQ(14N2) = -4.1712(13) MHz. The vibrationally averaged dimer configuration is H–C≡C≡N ... H–C≡C≡N. Using a simple linear model, the vibrational ground state and the equilibrium hydrogen bond lengths are determined to be: r0(N ... H) = 2.2489(3) Å and re(N ... H) = 2.2315 Å. The equilibrium center-of-mass distance between the two HCCCN subunits is $r_{com} = 7.0366$ Å. Using the rigid procession model, the vibrational ground state center-of-mass distance and the pivot angles which HCCCN subunits make with the a-axis of (HCCCN)2 are $r_{c.m} = 7.0603$ Å, $\theta_1 =$
13.0°, and θ2 = 8.7°, respectively. The calculated hydrogen bond energy of (HCCCN)2 is 1466 cm⁻¹ using the MP2/aug-cc-PVTZ method in present work.

2:30 THERMAL ANALYSIS OF BOROSILICATE GLASS FOR ITS BIOLOGICAL APPLICATIONS**, Gregory Humble*¹, Kisa S Ranasinghe¹, Delbert E. Day², ¹Kennesaw State University, Marietta, GA 30060, ²Missouri Science Technology University, Rolla, MO 65409. A borosilicate glass doped with cerium oxide is investigated for biological applications. As a part of the broader study, a thermal study of the borosilicate glass doped with different wt% of cerium oxide was conducted using SDT Q 600 differential thermal analyzer. A glass sample of 30mg, 400-500 µm particle size of different types of glass was heated to 1200°C, to obtain glass transition, crystallization and melting temperatures. The glass samples were then heated to 900°C at several heating rates between 2°C/min to 100°C/min and compared with the glass samples made with different wt % of cerium.

2:45 SPIN WAVE FEYNMAN DIAGRAM VERTEX COMPUTATION PACKAGE, Alexander Price*¹, Philip Javernick² and Trinanjan Datta¹, ¹Augusta University, Augusta, GA, 30912 and ²University of North Carolina at Chapel Hill, Chapel Hill, NC 27599. Spin wave theory is a well-established theoretical technique that can correctly predict the physical behavior of ordered magnetic states. However, computing the effects of an interacting spin wave theory incorporating magnons involve a laborious by hand derivation of Feynman diagram vertices. The process is tedious and time consuming. Hence, to improve productivity and have another means to check the analytical calculations, we have devised a Feynman Diagram Vertex Computation package. In this talk, we will describe our research group’s effort to implement a Mathematica based symbolic Feynman diagram vertex computation package that computes spin wave vertices. Utilizing the non-commutative algebra package NCAlgebra as an add-on to Mathematica, symbolic expressions for the Feynman diagram vertices of a Heisenberg quantum antiferromagnet are obtained. Our existing code reproduces the well-known expressions of a nearest neighbor square lattice Heisenberg model. We also discuss the case of a triangular lattice Heisenberg model where non collinear terms contribute to the vertex interactions.

3:00 A MATLAB GUI TO STUDY ISING MODEL PHASE TRANSITION, CurtisLee M. Thornton* and Trinanjan Datta, Augusta University, Augusta, GA 30912. We have created a MATLAB based graphical user interface (GUI) that simulates the single spin flip Metropolis Monte Carlo algorithm. The GUI has the capability to study temperature and external magnetic field dependence of magnetization, susceptibility, and equilibration behavior of the nearest-neighbor square lattice Ising model. Since the Ising model is a canonical system to study phase transition, the GUI can be used both for teaching and research purposes. The presence of a Monte Carlo code in a GUI format allows easy visualization of the simulation in real time and provides an attractive way to teach the concept of thermal phase transition and critical phenomena.

3:15 **Break**
3:30 THE EFFECT OF PRESSURE AND TEMPERATURE ON THE ELECTRICAL RESISTANCE OF GRAPHITE POWDER**, Hannah Watkins*, Katlyn Brumbelow*, and Ben de Mayo, University of West Georgia, Carrollton, GA 30118. Pressures up to 3000 per square inch (20.7 MPa) and temperatures down to liquid nitrogen (-196 C) were applied to commercially supplied lab grade graphite powder samples from Scholar Chemistry, Inc. Plastic PLA 3-D printed sample holders were used in a 4-wire resistance configuration along with a platinum resistance temperature detector, RTD, from Omega Engineering. Also used were a Dake Machine Tools 10 ton hydraulic press and a custom made Labview virtual instrument, which collected the data at a rate of 2 sets of readings per second. An Optima brand load cell was used to determine the force. The data were analyzed using Excel software. The resistance of the samples increased linearly from around 7 Ω at room temperature to around 37 Ω at LN2 (liquid nitrogen, -196 C). Upon warming the resistance dropped precipitously to around 20 Ω, then decreased linearly to around 7 Ω at room temperature. Increasing the pressure depressed the curve loops' values while preserving their overall shapes. Work supported by the Georgia Space Grant Consortium-NASA.

3:45 ANTI-SUPERCONDUCTIVITY IN DIAMOND NANO-PARTICLES**, Katlyn Brumbelow*, Hannah Watkins*, and Ben de Mayo, University of West Georgia, Carrollton, GA 30118. In conventional superconductivity, a sample's resistance decreases as its temperature decreases until at the critical temperature, the resistance drops to zero. Upon then increasing the temperature, when the critical temperature is reached, the resistance jumps back to a finite value. In this work, as the temperature decreased from room temperature (23.9 C) the conductance of the sample of powdered diamond nano-particles (Synthesized Diamond, 52-65%, 4-25 nm, NanoAmor, Inc.) dropped precipitously (within a half second) from around 8 x 10^-9 1/Ω to zero at a critical temperature of around 245 K. When the temperature was then increased, at a temperature of around 265 K the conductance jumped suddenly from zero back to 8 x 10^-9 1/Ω: "anti-superconductivity." The sample holders were constructed out of PLA plastic with a 3-D printer; a custom built LabView virtual instrument measured the resistance of the samples and of the platinum resistance temperature detector (Omega Engineering) at a rate of two times a second. The data are analyzed using Excel software. Work supported by the Georgia Space Grant Consortium-NASA.

4:00 PHOTOCATALYTIC DEGRADATION OF CONGO RED TiO₂ NANOPARTICLES UNDER VARIOUS LIGHT SOURCES**, Sarah G. Martino*, Ajith DeSilva¹, Himanshu Narayan², ¹Department of Physics, University of West Georgia, Carrollton, GA 30118, USA.²Department of Physics and Electronics, National University of Lesotho, Roma 180, Lesotho, Southern Africa. Photocatalytic degradation of Congo red dye with anatase TiO2 nanoparticles under various light-sources is investigated. As-received TiO2 nanoparticles of average size 10 – 15 nm were used. Three light sources, emitting from UV to visible wavelengths, were chosen for irradiation. Photocatalysis under incandescent bulb produced maximum degradation of about 90% in 90 minutes. The same sample degraded about 86% and 85% within the same time-period under Mercury and UV sources, respectively. The fastest initial degradation however was observed with the Mercury light source. The observations may be explained on the basis of emission...
and absorption characteristics of the various light sources and the experimental solutions, respectively. The authors would like to acknowledge the financial support by UWise and SRAP programs at UWG.

**CAN ANTI-FERROMAGNETISM AND ANISTROPIC SUPER-CONDUCTIVITY COEXIST IN IRON PNICTIDES?**

Joseph Newman*, Theja De Silva, Department of Chemistry and Physics, Augusta University, Augusta, GA 30912.

By treating both anti-ferromagnetism (AFM) and superconductivity (SC) on an equal footing, we investigate the possible coexistence of AFM and SC of recently found high-temperature superconducting compounds. Assuming that the electron pairing is mediated by the spin fluctuations and using a mean-field theory, we derive a set of gap equations for both AFM and SC order parameters. In the spirit of the second order phase transition, we then linearize the gap equations using various base functions for superconducting order to include the different pairing symmetries. By analyzing the solution of our linearized equations, we then discuss the possible coexistence of AFM and anisotropic SC in these compounds.

**STUDYING THE INTERPLAY BETWEEN SUPERCONDUCTIVITY AND ANTI-FERROMAGNETISM THROUGH BOSE-FERMI MIXTURES ON OPTICAL LATTICES**

Jeremy Brackett*, Theja De Silva, Department of Chemistry and Physics, Augusta University, Augusta, GA 30912.

Motivated by the recent experimental progress with ultra-cold atoms, we investigate the physics of a Bose-Fermi mixture on a two dimensional optical lattice. We treat the system parameters such that 2-component fermions are in a deep external trap and weakly interacting bosons are in a shallow external trap, however both of these atoms are subjected to the same optical lattice. In this parameter regime, the bosons form a Bose-Einstein condensate and mediate an attractive interaction between fermions through low energy Bose excitations. As a result, the dynamics of the fermions can be described by the single band Hubbard model that involves on-site repulsive interaction and elementary excitation mediated attractive interactions. Using a mean field theory, we derive an effective action up to the quartic order in both d-wave superconducting and anti-ferromagnetic order parameters. Using this Landau energy functional, we then discuss the phase transition and study the competition and/or cooperation of anti-ferromagnetism and d-wave superconductivity in the system.

**Posters (will be displayed Friday 5:00 to 6:00 pm)**

3:00  **Break**

**SATURDAY PAPER PRESENTATIONS**

*Denotes student presenter

**Denotes student “in progress” research

Section I:  Biological Sciences

Location:  Instructional Complex Room 111

Johnathan G. Davis, Presiding

8:45  ASSESSMENT OF BRET BETWEEN NANOLUC AND VARIOUS FLOURESCENT DYES**

Holly R. DuPlain, A.C. Spencer and N. Lambert, Augusta University,
Augusta, GA, 30912. Bioluminescence emits light via a chemical reaction that occurs when a substrate is reacted upon by luciferase enzymes. Bioluminescence Resonance Energy Transfer (BRET) is a technique that relies on the use of a luciferase (energy donor) to transfer energy to a nearby fluorescent protein or dye (energy acceptor). If the donor and acceptor are in close proximity and their emission and excitation spectra overlap, the acceptor absorbs energy from the donor which results in emission of light at a longer wavelength. This spectral shift can be quantified. Because of the widespread applications and utility of luciferases, many assay systems have been developed that make use of various luciferases as energy donors. One such luciferase is NanoLuc (Nluc). In order to explore the use of Nluc as an energy donor in BRET, the gene for Nluc was cloned into the plasmid vector pET21c(+). Formation of recombinant DNA was verified by agarose gel electrophoresis. After transformation of the recombinant plasmid into E. coli BL21 cells, the Nluc protein containing a C-terminal His6 tag was over-expressed and purified using affinity chromatography. The purification yielded a relatively pure protein with a molecular weight of 19 kDa as judged by SDS-PAGE. The activity of the protein was verified by measuring its ability to generate light in the presence of coelenterazine. The ability of Nluc in conjunction with various acceptors, both attached and free at varying concentrations, to perform BRET will be assessed using luminometry and fluorescence spectroscopy.

9:00 FEEDING PREFERENCE OF THE CILIATE, TETRAHYMENA PYRIFORMIS, Rachel A. Perez*, Ashlyn B. Coffey*, and F.S. Corotto, University of North Georgia, Dahlonega, Georgia, 30597. Tetrahymena pyriformis is a single-cellular alveolate that uses cilia to filter-feed on small particles. The fact that T. pyriformis ingests non-nutritive material, such as latex beads and carbon particles, along with nutritional ones, led to the hypothesis that the organism feeds non-selectively. One recent article, however, calls this hypothesis into question. We sought to investigate feeding preference in T. pyriformis by determining its rate of phagocytosis on three types of 3 μm polystyrene beads, each at two concentrations. Beads had either: a neutral surface, one that was negatively-charged through carboxylation, or a positively-charged, aminated surface. To determine feeding rate, we mixed one type of bead with T. pyriformis and made slides from that mixture at three time points. Since beads accumulate in T. pyriformis over time, the slope of the best-fit line provides a measure of feeding rate. Thirty such measures were obtained for each type of bead and concentration. ANOVA revealed that both bead-type and concentration had significant effects on feeding rate, but there was no hint of an interaction. T. pyriformis fed 54% more rapidly on positively-charged beads than on the ones that were negatively charged. The rate of feeding on neutral beads fell in between the other two. Our study provides new evidence that T. pyriformis feeds selectively. Since surface charge plays a role, electrostatic interactions, as often occur when receptors bind ligands, appear to underlie that selectivity.

9:15 BASELINE WATER MONITORING OF THE OHOOPEE RIVER**, Kaitlin Warren*, J. Hilburn2, and J. Wedincamp1, 1East Georgia State College, Swainsboro, GA 30401 and 2Altamaha Riverkeeper, Macon GA 31201. The Ohopee River in Georgia is a tributary in the Altamaha River, which is one of the...
largest watersheds in the United States consisting of approximately 14,000 square miles. Located in a mostly rural watershed, the Ohooppee River is a 303d designated stream due to effluent loading from wastewater treatment facilities. Four sampling stations located in northern and southern stretches along the Ohooppee River were monitored over a 4-month period. Sampling parameters included dissolved oxygen, conductivity, pH, temperature, alkalinity, phosphate and nitrate-nitrogen levels. Additionally, aquatic macroinvertebrates were sampled (insects, mollusks, & crustaceans) as they are bioindicators of water quality. Future plans include long-term sampling to determine potential influences of wastewater releases on the river health.

9:30 **CHANGES IN THE DIATOM ASSEMBLAGE IN THE NORTHEASTERN GULF OF MEXICO DURING 2011**, Courtney M. Bryller*¹, J. A. Nienow¹, and S. Wise², ¹Valdosta State University, Valdosta, Georgia 31698, ²Florida State University, Tallahassee, Florida 32306. We are conducting a multi-year study of phytoplankton in the vicinity of DeSoto Canyon, northeastern Gulf of Mexico. Our goal is to better understand phytoplankton community structure in this region and establish a baseline for comparison in the case of future environmental disasters. Throughout 2011 phytoplankton samples were collected from pre-determined stations along a transect extending southward from Pensacola, Florida. At each station, net-plankton (vertical tows of up to 100 m, using a 25µm mesh net) samples were collected for the analysis of larger forms. Samples were condensed, digested with nitric acid and potassium dichromate and either mounted in Naphrax for light microscopy or on aluminum stubs for scanning electron microscopy. At least 600 valves were counted for each sample at 1000x (LM) and identified to the lowest practical taxonomic level. Selected taxa were also imaged in SEM to verify identifications. Approximately 65 taxa were observed. These seem to form separate near-shore and off-shore assemblages, with the composition of the assemblages changing from month-to-month in response to environmental conditions. Our qualitative observations will be assessed using a combination of cluster analysis (to determine the structure of assemblages) and principle component analysis (to determine the dependence on environmental conditions). The high degree of variation in the assemblage illustrates the need for long-term continuous monitoring of phytoplankton assemblages.

9:45 **EVOLUTIONARY DIVERGENCE OF HOXA2 GENE EXPRESSION WITHIN THE DEVELOPING HINDBRAIN OF VERTEBRATE EMBRYOS**, Adam Davis¹ and Ed Stellwag², ¹Gordon State College, Barnesville, GA 30204, ²East Carolina University, Greenville, NC 27858. Hoxa2 is a developmental regulatory gene that functions to pattern the rhombomeres, or segments of the hindbrain, and the cranial nerves that form from the rhombomeres during animal embryonic development. Previous studies in tetrapods, namely mouse and chicken embryos, have shown that vertebrate Hoxa2 gene expression is regulated in rhombomere 3 (r3) and r5 by cis-regulatory elements (CREs) located in the genomic DNA upstream of Hoxa2. Further, CREs within the intron of Hoxa2 were shown to direct its expression in r4. Since Japanese medaka fish (*Oryzias latipes*) hoxa2a shows a conserved expression pattern in the hindbrain to that of Hoxa2 of mouse and chicken, we hypothesized that the CREs directing medaka
hoxa2a expression would be conserved in function with tetrapods. This hypothesis was tested using transient and stable-line transgenic analyses of reporter gene constructs containing wild-type and deletion derivatives of the upstream enhancer region (UER) of medaka hoxa2a. Contrary to our expectations, the medaka hoxa2a UER directed reporter gene expression in r4 but not r3 and r5. Further, through genomic DNA sequence alignment of the Hoxa2 UER from several vertebrates, we observed the presence of conserved Hox/Pbx and Prep/Meis binding sites. These sites have been shown in several studies to direct Hox gene expression in r4. These results suggest that there are evolutionarily divergent mechanisms that direct Hoxa2 gene expression in r3, r4, and r5 between teleosts and tetrapods.

10:00 Section Business Meeting
Posters (will be displayed Friday 5:00 to 6:00 pm)

POSTERS

IMPERVIOUS SURFACE, LAND USE TYPE, AND MACROINVERTEBRATES IN THE SOUTH ATLANTA METRO AREA, Christopher H. Kodani, Clayton State University, Morrow, GA 30260. This study investigated how the macroinvertebrate communities of 20 different stream sites in the south metropolitan Atlanta area were affected by their surrounding watersheds. Macroinvertebrates were collected using D-frame nets and identified to taxonomic order as per Georgia Adopt-A-Stream volunteer monitoring protocols. A water quality index (WQI), indicating both the diversity and pollution sensitivity of the macroinvertebrate community was calculated for each stream. Two ways of describing the study sites were compared to determine which would be the best predictor of the WQI. One method was a categorization of a site’s adjacent land use into 5 discrete categories: forests, wetlands, suburban day-use parks, housing subdivisions, and parking lots. The other method was to quantify each watershed’s impervious surface area using Geographical Information System (GIS) analysis. When the data were compared, a watershed’s impervious surface area proved to be a more reliable predictor of the stream’s WQI than a study site’s land use type. Linear regression revealed that sixty-two percent of the variation in the macroinvertebrate community was explained by the amount of impervious surface area within the upstream watershed. Furthermore, the relationship between WQI and impervious surface was linear. Because of this, it can be concluded that any amount of damage to a watershed, even a small amount, can adversely affect a stream’s macroinvertebrate assemblage and that there is no threshold for the amount of damage that a community can sustain.

OBSERVATIONS OF THE GENUS NANONEIS (BACILLARIOPHYTA) IN THE NORTHEASTERN GULF OF MEXICO. J. A. Nienow¹, A. K. S. K. Prasad² and S. Wise². ¹Valdosta State University, Valdosta GA 31698, and ²Florida State University, Tallahassee, FL 32306. In 2011, we began a systematic investigation of phytoplankton in the northeastern Gulf of Mexico as part of an investigation of the after-effects of the Deepwater Horizon blowout. During this research we frequently encountered members of the genus Nanoneis in the vicinity of the shelf break at the head of DeSoto Canyon, about 50 km off the coast of Florida, at
depths of 25 to 75 meters. The genus Nanoneis Norris is unique among diatoms in that each valve possesses a single raphe slit extending from one pole toward the center of the valve. The large numbers of cells permitted a detailed examination of the fine structure of the frustule using both scanning and transmission electron microscopy. Aliquots of air-dried or acid-cleaned material were mounted on aluminum stubs, sputter coated, then examined with a JEOL 6480 LV SEM. Additional cleaned aliquots were mounted on formvar-coated grids and examined using a JEOL 1200EX TEM. The most common form showed clear affinities to Nanoneis longta Li et Gao, matching published descriptions with respect to valve shape, position of the raphe, and density of costae. However, its size range, 3 - 27 micrometers, is greater than previously reported for N. longta. A single areola is present between each pair of costae, near the valve mantle. The areolae are occluded by cribra with a hexagonal array of poroids. A marginal structure consisting of an elevated half-cylinder of silica runs along the perimeter of the valve above the areolae; this structure has not been described previously.

**MODELING RANAVIRUS EPIDEMIOLOGY IN COMMON FROGS (RANA TEMPORARIA) IN THE UNITED KINGDOM VIA RECURRENT RELATIONS**, Nicholas A. Adams*, A.L.J. Duffus, and J.C. George. Gordon State College, Barnesville, GA 30204. Ranaviruses are globally emerging pathogens in lower vertebrates. They began to emerge in the United Kingdom in the mid-1980s and early 1990s in common frogs (Rana temporaria). The ranavirus(es) present in UK common frogs present two disease syndromes that are not necessarily mutually exclusive, the ulcerative and hemorrhagic forms. Here we use recurrence relations to examine the following question: Given any number of interactions with other frogs, how many ways are there for a frog with no form of the disease to acquire one or both forms, or to remain well. Once the recurrence relation is established, we consider what this information tells us about the likelihood of transmission.

**MOLECULAR IDENTIFICATION OF PREY FROM A MATERNITY COLONY OF BRAZILIAN FREE-TAILED BATS (TADARIDA BRASILIENSIS) IN LAMAR COUNTY, GEORGIA**, Carson L. Bowers*, Andrew M. Wright*, M.J. Bender*, G.M. Ionta*, and S.E. Jackson-Rosario*. 1Georgia College & State University, Milledgeville, GA 31061 and 2Gordon State College, Barnesville, GA 30204. Predator-prey relationships are a crucial component of community ecology, and predator-prey studies inform our understanding of how predator populations influence the density and distribution of prey populations and vice versa. Bats are known to significantly influence populations of their insect prey and impact regional agricultural production when insect pests are consumed as prey. Although bats in the southeastern United States are typically considered to be generalist insectivores, previous diet studies suggest that some species exhibit prey preferences. However, most of these studies rely on morphological identification of dietary items, and may be biased towards hard-bodied or easily identified prey items. Additionally, direct observation of predation events and prey items consumed is often impractical due to the nocturnal nature of bats. Using DNA-based techniques we will identify prey from fecal samples collected from a colony of Brazilian free-tailed bats between May and September 2015.
Prey genera and species will be recognized by comparison of the oxidase subunit I gene of cytochrome c (COI) isolated from fecal samples to sequences in GenBank and the Barcode of Life Data System (BOLD), thus allowing for the inference of trophic linkages between these bats and their prey populations in Lamar County, GA.

BLEACHING AND RECOVERY RATES OF EXAIPTASIA PALLIDA BY TEMPERATURE MANIPULATION** D.T. Brunzelle* and M.M. Mays, Young Harris College, Young Harris, GA 30121. Coral reefs are valued ecosystems due to their function as coastal barriers, tourist sites, commercial fisheries habitat, and sites of biomedical research. Due to the increase in global temperatures and coral bleaching, research is investigating the impact of increased sea surface temperature (SST) on coral reef ecosystem mortality. This experiment explored the dynamics of the relationship between a common sea anemone in the Florida Keys, Exaiptasia pallida, with the symbiotic algae, Symbiodinium, before, during, and after elevated temperature bleaching. Water temperatures were manipulated for three treatments at 20°C (control), 26.5°C, and 30.5°C. Temperatures were based on historical data and current averages in the Florida Keys and ranged from a non-stressful winter to previous summers of high stressing SST’s. Treatments were reduced back to ambient temperatures of 20°C. Cell counts per unit weight of anemone were recorded during pre-stressing, stressing and recovery periods in order to calculate algal cell loss and gain rates. Cell counts will be analyzed using ANOVA to assess the impact of temperature stressing. We hypothesize that anemones in the higher temperature treatment will have a faster algal loss rate and a slower recovery rate compared to the lower stressing temperature. Because Exaiptasia pallida is a model organism for coral, potential findings will help predict future effects of increasing SST’s and calculate time intervals for recovery to form more detailed methods of coral reef management.

ARE PARTIAL RANAVIRUS MAJOR CAPSID PROTEIN SEQUENCES ENOUGH FOR PHYLOGENETIC RECONSTRUCTION?** Jennifer B. Campbell*, S.E. Rosario, and A.L.J. Duffus, Gordon State College, Barnesville, GA 30204. Ranaviruses are globally emerging pathogens in lower vertebrates and we are only beginning to understand their pattern of emergence and the relationships between the different isolates. The sequence of the major capsid protein (MCP), or a portion of it, is commonly used to assess the relationships between viral isolates and strains. In this study, we compare phylogenetic trees built with partial (~140bp) and complete (~1400bp) MCP sequences to determine the validity of using only partial sequences for phylogenetic comparisons. We predict that the utility of partial MCP sequences will be limited and that full MCP sequences will produce more reliable trees.

LEAF LITTER DECOMPOSITION AND COLONIZATION BY AQUATIC MACROINVERTEBRATES IN SULLIVAN CREEK, GEORGIA, Brandon Clanton*, J. Proud*, A. Stansell*, N. Varela*, and M.J. Bender, Gordon State College, Barnesville, GA 30204. Small streams are typically heterotrophic systems dependent on input, primarily in the form of leaf litter, from surrounding riparian areas. Healthy streams in forests typically contain a diverse
assemblage of aquatic macroinvertebrates that colonize leaf litter, using it as habitat or a food source. In turn, they serve as food for aquatic carnivores. However, invertebrate colonization and suitability of litter as food varies through time as leaves progressively decay. Therefore, stream energetics are influenced by leaf litter decomposition rates and use by the macroinvertebrate community. To assess the influence of time on colonization and decomposition, we conducted a leaf litter experiment in Sullivan Creek located in Upson County, GA. Sixty mesh bags containing leaf litter were anchored in the stream using rebar. Twelve leaf packs were retrieved on days 7, 14, 28, 35, 42, and the macroinvertebrate community inhabiting each leaf pack was extracted and identified to taxonomic order. Leaves were air dried, and dry mass was used as an index of decomposition. Decomposition and total invertebrate abundance differed significantly across the sample period (ANOVA; P < 0.05), but not in diversity. Decomposition progressed throughout the sample period, but total abundance peaked on day 28. When compared to other studies, leaf packs were colonized by few invertebrates (x̄ = 8.75/litter bag) with little taxa richness (2.4/bag). It is likely that the low abundance and taxa richness observed was due to a combination of multiple factors including land use upstream, stream size, weather events, sampling methodology, and study duration.

TESTING AN EXERCISE PROGRAM TO REDUCE PROBABILITY OF ANTERIOR CRUCIATE LIGAMENT INJURY**, Alison F. Cox* and J.G. Davis, Young Harris College, Young Harris, GA 30582. Various studies have suggested that female athletes have an increased risk for anterior cruciate ligament (ACL) injury compared with the opposite sex, due to greater knee laxity during the menstrual cycle. Many proposed prevention initiatives can limit injury occurrence. We implemented an ACL injury prevention program to determine whether ACL injury can be limited during the menstrual cycle. The program required individuals from a college women’s soccer team to complete 15 minutes of plyometric exercises, 2 to 3 days a week during the team’s regular season and post-season. The experimental group (n=6) is expected to have less frequent ACL injury and knee pain than the treatment group (n=6) due to increased participation in plyometric and knee strengthening exercises. Injury rates will be categorized by severity (no pain, some pain, intense pain, ACL damage, ACL tear). Due to limited sample size, a survey was administered to college female soccer players to ascertain data on ACL injury occurrence. Correlation analysis will attempt to correlation ACL injury with menstruation as well as other factors including minutes played in game situations, practice frequency and duration, and previous injury.

THE EFFECT OF CARBON DIOXIDE ON THE SEA ANEMONE *EXAIPTASIA PALLIDA**, Danielle E. Heald* and M.M. Mays, Young Harris College, Young Harris, GA 30582. Global warming and increasing levels of CO2 in the atmosphere is an increasing environmental concern due to its role in ocean acidification. Although much is known about the effects of ocean acidification on some organisms like clams and coral skeletons, little is known about how acidification affects the symbiotic relationships present in nearly all hard and soft corals between symbiotic dinoflagellates of the genus *Symbiodinium* and the host coral. The anemone *Exaiptasia pallida* is a perfect model organism to examine
the effects of acidification on symbiosis in a host that lacks a skeleton. I intend to test the impact of ocean acidification on the relationship between the anemone, *Exaiptasia pallida*, and their symbiotic dinoflagellates. Three ten gallon tanks containing eight anemones each were set up. One tank was kept at an environmental pH of 7.9-8 while the other tanks were manipulated by adding 5% HCL in five milliliter increments daily until reaching a pH of 7.3 in one tank and 6.8 in the other. Anemones were subjected to the low pH for two weeks, and symbiotic health was monitored before altering the pH, at one week, and at two weeks by evaluating anemone size and number of *Symbiodinium* present using a hemocytometer. Preliminary results suggest that soft bodied organisms like *Exaiptasia pallida* and their *Symbiodinium* are unaffected by a lower pH, indicating that the main action of environmental damage to the current levels of ocean acidification occurs in skeleton or shell-building organisms. Understanding how soft-bodied coral and anemones are impacted by ocean acidification can lead to better management decisions as the community in a coral reef changes with lower pH.

**IDENTIFICATION OF NEW microRNAs IN CHLAMYDOMONAS REINHARDTII**, Lindsey Howell*, G. Borchert*, and D. Chevalier*, 1East Georgia State College, Swainsboro, GA, 2University of South Alabama, Mobile, Al. MicroRNAs are small, single-stranded, noncoding RNAs. Their function is to regulate gene expression by binding to their target mRNAs resulting in either the specific degradation of these mRNAs or the block of their translation. MicroRNAs are involved in nearly every biological process such as cell cycle control, apoptosis, and several developmental and physiological processes including stem cell differentiation. MicroRNAs have been identified in bacteria, fungi, animals, and plants, including algae. *Chlamydomonas reinhardtii* is a single-cell green alga. It is a well-established biological model organism due to its ease of culturing and suitability for genetic manipulations. For example, *Chlamydomonas reinhardtii*, is used to study basic processes of cell biology including cell movement and recognition. Our objective for this project is to identify new microRNAs from *Chlamydomonas reinhardtii*. We are using a bioinformatics approach to analyze small *Chlamydomonas* RNAs sequences available in the NCBI database and then compare these sequences to all the known miRNAs. Our research is important because misexpression of miRNAs has been linked to several human diseases. MiRNAs may be used as indicators and therapeutic tools for certain human diseases. MiRNAs may be used as indicators and therapeutic tools for certain human diseases. The identification of new miRNAs from *Chlamydomonas reinhardtii* has the potential to increase our knowledge of miRNA in this species.

**COMPARISON OF AGE AND GROWTH OF MOXOSTOMA SPP. IN BRASSTOWN CREEK, GEORGIA**, Elana Newman*, Fernando Serrano*, and J.G. Davis, Young Harris College, Young Harris, GA 30582. Brasstown Creek in the upper Tennessee River watershed of north Georgia contains five species of Catostomids in the genus *Moxostoma* (the redhorses), representing one of the most biodiverse streams for *Moxostoma* in the U.S. Recent studies of *Moxostoma* in Canadian and Midwestern U.S. rivers have estimated ages and growth rates of redhorses by using pectoral fin rays, a non-lethal procedure, and have compared these estimates to other structures useful for aging. Pectoral fin rays were collected in
DETERMINATION OF THE BINDING SITE OF ADENOVIRUS E4 ORF3 AND DDX6**, Julia A. Weinrich*, M.R. Lawson, and K.A. Karen, Georgia College & State University, Milledgeville, GA 31061. Adenovirus is often associated with localized infections in areas such as the respiratory or intestinal tract. It is a double-stranded DNA virus with a 36kb genome encoding 30-40 genes. The life cycle begins with the viral genome entering the cell and activating early gene transcription. E4orf3 is an early gene that activates the synthesis of late viral proteins and shuts down host cell protein synthesis. Ddx6 is a cellular protein present in cytoplasmic processing bodies (P-bodies), which are responsible for regulating gene expression by degrading mRNAs and repressing host cell translation. Ddx6 is known to bind to the Ad5 E4orf3 protein, but not the Ad9 E4orf3 protein. Chimeras are being created using different combinations of both the Ad9 and Ad5 E4orf3 genes in order to narrow down the binding site of Ad5 E4orf3 to Ddx6. Locating this binding site will be accomplished by transfecting the plasmids into the cells and doing co-immunoprecipitations with the Ad5/Ad9 chimeric E4orf3 and Ddx6 proteins. The co-immunoprecipitations will facilitate determination of the binding site of E4orf3 for Ddx6, which will ultimately help in the study of the function of this binding during an infection. Currently, work is still being done on E4orf3 chimera cloning and transfection protocol optimization. Since adenovirus is a model for both virus and cellular biology, knowledge of these interactions could elucidate additional functions of the cellular P-bodies as well as be applicable to other viruses.

MACROINVERTEBRATE COLONIZATION AND DECOMPOSITION OF FLOWERING DOGWOOD, HICKORY, AND SWEETGUM LEAVES IN A PIEDMONT STREAM, Alexis Wimberly*, Katherine E Odegaard*, Cynthia Ocegueda*, Mason D Patten* and M.J. Bender, Gordon State College, Barnesville, GA 30204. Stream communities are often supported by and reliant on outside sources of nutrients and organic material. In many streams, leaf litter adds significant amounts of organic matter to the aquatic system, serves as substrate for invertebrates, and may be the primary source of nutrients consumed by many aquatic macroinvertebrates. However, leaves vary in composition, nutrient content, and decomposition rate and therefore likely vary in suitability for aquatic macroinvertebrates. To assess the influence of three leaf types on macroinvertebrate colonization and leaf decomposition, we conducted an in situ leaf litter experiment in a stream in Upson County, GA. We collected leaves from flowering dogwood (*Cornus florida*), hickory (*Carya* sp), and sweetgum trees (*Liquidambar styraciflua*) adjacent to our sampling stream and placed them in mesh bags (N=60) that were anchored to the stream bed. Twelve bags were
removed weekly between 1 October and 5 November 2015 and all macroinvertebrates in each litter bag were identified. Dipterans (N=286) were the most commonly represented order within the 525 invertebrates collected. Ephemeropterans (N=78) and aquatic snails (N=94) were commonly encountered, but we found no significant influence of leaf type on invertebrate colonization. Based on changes in dry mass we found a significant influence of leaf type on decomposition (ANOVA; P<0.001), hickory leaves decomposed the slowest and sweetgum leaves decomposed the fastest. Our colonization results contradict those of many similar studies, suggesting varying responses due to leaf types examined, study design, and stream characteristics. Additionally, the low abundance of invertebrates collected may have precluded our ability to detect statistical differences in colonization based on leaf type.

COMPARATIVE EFFECT OF SALICYLIC ACID/CINNAMIC ACID AND THEIR REDUCED COUNTERPART; SALICYLALDEHYDE/ CINNAMALDEHYDE ON THE ARGENTINE ANT (HYMENOPTERA: FORMICIDAE),** Benjamin Curry*, Matthew Ringler-Lantzy*, Megan Babb*, C. Kang, and C. Lee, 1Gordon State College, Barnesville, GA 30204 and 2Washington State University, Pullman, WA 99164. The Argentine ant, Linepithema humile (Mayr), is a serious pest in the southern US. We tested the effect of plant salicylic acid metabolites as a safe alternative to controlling Argentine ants. Previously, we reported a severe lethal effect of salicylic acid, benzoic acid and cinnamic acid in this descending order. Minor effect of both acetyl salicylic acid and acetaminophen, and a lack of rescuing effect of ascorbate on salicylic acid indicate that apparent lethal effect of salicylate is probably not due to oxidases- or oxygenases-mediated quinone or radical formation. In this report, the lethal effect of their reduced partner molecules, namely, cinnamaldehyde and salicylaldehyde, was tested by adopting identical protocols to compare with the relative lethal effects of the corresponding acid forms. Cumulative mortality of three sets of 20 Argentine ants was estimated after 3-day exposure to a salicylaldehyde and cinnamaldehyde and other target powder compounds in 10% sucrose food solution (four repeated experiments). Preliminary results indicated a severe lethal effect of those aldehydic compounds and a greater potency than their acidic counterparts. The potential redox reaction could be catalyzed through the ant-origin reductases in their digestive or respiratory system.

EXPLORING BIOINFORMATICS MODULE FOR USE IN AN INTRODUCTORY BIOCHEMISTRY COURSE,**Vwerosuo Uzezi*, and Cathy Lee, Gordon State College, Barnesville, GA 30204. The use of computational skills in resolving some problems in the sciences such as biochemistry is ever increasing. Recent advances in computer analysis and compilation of data has made bioinformatics a necessity for biochemistry and other sciences. Generally, a biochemistry course taught in 50 to 90 minutes does little to expose the student to any bioinformatics skills which are important in assisting a career in today’s biochemistry field. For this reason, we approach the introduction of bioinformatics education in two ways: incorporation of bioinformatics modules and experiences into the biochemistry course or providing the reader with ideas on how they can develop bioinformatics modules for use in their own classrooms. The module gives the student an opportunity to understand how to access biological information from
Section II: Chemistry

Location: Instructional Complex Room 205
Daniel Holley Presiding

8:00 A SIMPLE METHODOLOGY FOR MEASURING OSMOLYTE EFFECTS ON AMINO ACID SOLUBILITY: EFFECTS OF GLYCINE BETaine AND PH ON GLUTAMIC ACID SOLUBILITY** Dylan Jones*, J.G. Cannon1, 1Middle Georgia State University, Cochran, GA 31014. Osmolytes are small organic molecules that help cells regulate water concentration under stress. Measuring the interactions of osmolytes with proteins and other biopolymers is difficult, but essential to a complete understanding of water stress responses in cells. We have been developing and testing methods using model compounds and equipment available in most undergraduate chemistry labs—a water bath, high precision balance, and volumetric pipettes—to reexamine and expand upon some of the data sets upon which empirical models of osmolyte interactions have been built. By studying the effects of glycine betaine on glycine and glutamic acid solubilities, we have established that we are able to make solubility measurements within 10% error on high solubility compounds. We also uncovered a likely error in previously published results showing that glycine betaine decreases the solubility of glutamate much more than published values. Our methods do not give accurate results for low solubility compounds. Work is ongoing to determine the effects of pH on glutamic acid solubility in the presence of glycine betaine.

8:15 QUANTIFICATION METHODS FOR RNA BASES USING HIGH PERFORMANCE LIQUID CHROMATOGRAPHY**, Quadreka S. Burgess*, Linda de la Garza, Valdosta State University, Valdosta, GA 31698. Nucleosides are nitrogenous bases covalently attached to a sugar, without the phosphate group as in nucleotides. RNA nucleosides, adenosine, guanosine, cytidine, thymidine, and uridine, are identified and separated using High-Performance Liquid Chromatography (HPLC). RNA nucleosides are significant due to the presence of these compounds in many biological samples. An Agilent Technologies 1260 Infinity HPLC is used. Standards of pure and mixed RNA bases of approximately 0.2 mg/mL are run using a flow of 1 mL/min and a solvent system of 95% water and 5% methanol. A gradient elution is explored to optimize the separation. A 5 cm EC-C18 modified column is used. Detection of analyte is done at the 254 nm wavelength. From the standard solutions, the peaks in the chromatogram of the mixture are identified; using a calibration curve and the standard addition method the nucleosides are quantified.

8:30 [3+2] CYCLOADDITION REACTIONS OF ARYL NITRILE OXIDES AND DIENES, Gloria de la Garza*, James C. Lord, Cody Philips and Jenny M. Baxter Vu, Valdosta State University, Department of Chemistry, Valdosta, GA 31698. The construction of complex, versatile molecules from unsaturated hydrocarbons, abundant in petrochemical feedstock, is highly desirable. Cycloaddition reactions of 1,3-dipolarophiles with mono-unsaturated olefins are
well documented and have proven to be a robust method for converting readily available petrochemicals into valuable synthetic intermediates. While cycloaddition reactions of 1,3-dipolarophiles with dienes has also been reported in the literature, the full potential of this transformation has not been exploited. This work focuses on the [3+2] cycloaddition reaction between aryl nitrile oxides and unsymmetrical dienes. The nitrile oxides are generated in situ from the corresponding aryl oximes. Although the current work only discusses the results of the yields and regioselectivity of the cycloaddition products, efforts toward converting these products into biologically active molecules will be the focus of future investigations in our research lab.

8:45 [3+2] CYCLOADDITION REACTIONS OF NITRILE OXIDES AND DIENES: EFFECT OF REACTION CONDITIONS ON REGIOSELECTIVITY, Bernabe Tucker*, Gloria de la Garza, Jesse Prince, and Jenny M. Baxter Vu, Valdosta State University, Department of Chemistry, Valdosta, GA 31698. The construction of complex, versatile molecules from unsaturated hydrocarbons, abundant in petrochemical feedstock, is highly desirable. Cycloaddition reactions of 1,3-dipolarophiles with mono-unsaturated olefins are well documented and have proven to be a robust method for converting readily available petrochemicals into valuable synthetic intermediates. While cycloaddition reactions of 1,3-dipolarophiles with dienes has also been reported in the literature, the full potential of this transformation has not been exploited. This work focuses on the [3+2] cycloaddition reaction between phenyl nitrile oxide and isoprene. Various conditions for the generation of nitrile oxide from either the oxime or the chloroxime were investigated to determine the effect of reaction conditions on regioselectivity of the products. Although the current work only discusses the results of the cycloaddition reaction itself, efforts toward converting the products of these reactions into biologically active molecules will be the focus of future investigations in our research lab.

9:15 SIZE INDEPENDENCY OF THE GLASS TRANSITION IN CONFINED POLYSTYRENE NANOPARTICLES, Nicole M. Sikes*, Rubicelys Torres Guzman, D. Wade Holley1,1 Columbus State University, Columbus, GA 31907. The effect of confinement on the glass transition temperature (Tg) has been studied in thin films, nanocomposites, and nanoparticles. Keddie et al studied Tg as a function of film thickness and found that while Tg decreased with decreasing film thickness when the film was on a gold substrate, there was an increase in Tg with decreasing film thickness when the film was on silicon substrate. Thin films are a popular system to study; however understanding other systems is crucial to understanding the fundamental effects of confinement. Polymer nanoparticles are an attractive system due to their potential as drug delivery agents, however the studies on them are limited and the results are in poor agreement. However most researchers have claimed to find that Tg is dependent on the size of the nanoparticles. Here temperature-varied fluorescence spectroscopy was used to study the glass transition temperature of polystyrene nanospheres of varying sizes (including sizes far below what has been actively investigated in the literature) and anomalous size independent Tg for particles below a certain size was found.
9:30 SYNTHESIS AND CHARACTERIZATION OF NOVEL NANOTHERMOMETERS* DELPHINE BAUMERT,* George Larsen, Simona Hunyadi Murph, Savannah River National Laboratory, Aiken, SC 29803  Delphine.Baumert@srnl.doe.gov National Conference on Undergraduate Research. Nanothermometers enable the measurement of local temperatures at nanoscale dimensions (1-100 nm), which can provide insight into many biological and industrial applications. Previously synthesized nanothermometers are similar to molecular beacons, consisting of fluorescently labeled stem-loop DNA strands linked to gold nanoparticles (AuNPs) via a thiol-gold linkage. The principle behind their operation is that the fluorophore is quenched by the nanoparticle due to the self-binding of the stem-loop DNA at low temperatures. As the nanothermometers are heated, the stem-loop unfolds at its characteristic melting point, and as a result, the fluorophore is no longer in the quenching region of the nanoparticle and a dramatic rise in fluorescence will occur. The temperature response of the nanothermometer can be selected by optimizing the sequence of the DNA strand. Typically, the AuNPs only serve to quench the fluorophores in these types of nanothermometers. However, by anchoring stem-loop DNA to functional nanoparticles, a new type of system is created, one which can provide tailored functionality and also real-time, local temperature information. For example, AuNPs can be used for their catalytic, plasmonic and visible light properties, Fe2O3 nanoparticles can be used for their magnetic and photocatalytic properties, and Pd can be used for catalysis or hydrogen storage. In an effort to create nanothermometers that also possess these multifunctional properties; we have successfully synthesized a variety of nanothermometers supported by a variety of nanoparticles, including Au, Au-Fe2O3, Pd, Pd-Fe2O3, and Au-Pd-Fe2O3 nanoparticles. The obtained nanothermometers are currently being characterized by fluorescence spectroscopy, scanning electron microscopy, UV-Vis spectroscopy, and phase analysis light scattering (PALS).

9:45 Anti-icing with novel PDMS coating Liqiu Zheng, Demontique Stewart and K. C. Chan Albany State University, Albany GA 31705. Polydimethylsiloxane (PDMS) belongs to a group of polymeric organosilicon compounds that are commonly referred to as silicones. It is transparent and hydrophobic under ambient condition. To date, to our best knowledge no one has attempted it as a coating material in anti-icing research. Various substrates coated with PDMS demonstrated excellent super-hydrophobicity. The wettability of Copper substrate was altered significantly, while the contact angle on iron plate was not as much as expected although it still falls into hydrophobic category ( contact angle larger than 90°). The further anti-icing research will be conducted in an environment chamber. The surface morphology and chemical composition will be characterized to exploring the mechanism of super-hydrophobicity and anti-icing. This research would pave the way for devising multi-functional anti-icing surfaces which promises wide applications in various fields.

10:00 Section Business Meeting
CONCENTRATION AND SUBSTITUENT EFFECT ON THE ANTIBACTERIAL ACTIVITY OF SCHIFF BASE PHENOXY-IMINE COMPOUNDS, Xiaomei Zheng\(^1\), K.C. Chan\(^1\), Louise Wrensford\(^1\), Josh Moore\(^2\) and Ashaunte Davis\(^1\), \(^1\)Albany State University, Albany GA31705 and \(^2\)Westover High, Albany GA31707.

Schiff bases and their metal complexes play a vital role in medicine, biological system, chemistry and industries. Schiff bases and their metal complexes exhibit bioactivities including anticancer, antibacterial, antifungal and anti-inflammatory. In this research, a series of four phenoxyimine (PHI) Schiff bases bearing halogen substituents on the phenolate moiety and N-aryl moiety aniline ring were synthesized: 1) ligand1: N-(dibromosalicylidene)-3,5-dichloroaniline(L1), 2) ligand2: N-(dibromosalicylidene)-3,5-bis(trifluoromethyl)aniline (L2), 3) ligand 4 N-(3,5-dichlorosalicylidene)-3,5-dichloroaniline (L4), and 4) ligand5: N-(3,5-dichlorosalicylidene)-3,5-bis(trifluoromethyl)aniline (L5). The PHI compounds were screened as antibacterial agents for four bacterial strains: Serratia marcescens, Escherichia coli, Bacillus subtilis and Micrococcus luteus. The results indicated that all four PHI Schiff bases exhibit very high antibacterial activity against Bacillus subtilis, Micrococcus luteus, Escherichia coli and little activity towards Serratia marcescens. The electron-withdrawing halogen substituents on the phenolate moiety had a significant effect on the antibacterial activity towards three bacterial strains. The antibacterial activity increased with decreasing electronegativity of the halogen substituents. The electron-withdrawing substituents on the N-aryl moiety showed little effect on the antibacterial activity. The effect of the concentration of Schiff bases on the antibacterial activity was also investigated. The results revealed that the antibacterial activity of Schiff bases increased with increased concentration of compound until a certain concentration. 200 ng was the optimal amount of agent; beyond 200 ng, there was no significant change in antibacterial activity.

TOXICOLOGY STUDIES OF BENZO[c]CINNOLINES USING ZEBRAFISH EMBRYO MODEL, Victoria Stephens\(^*\) 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 anti-rheumatoid, as well as antimitotic properties. A novel two-step synthetic method to prepare benzo[c]cinnoline 4 and its derivatives (compounds 5-7) is proposed. The new procedure is suitable for self- and cross-coupling condensations. Cross-coupling of different brominated nitroarenes was moderate to high yielding in comparison to self-dimerization as shown in the preparation of biarylated compounds 3-6. The yields of reactions are quantitative as no polymerization is observed in the solvent-less process. The zebrafish embryo model was chosen for toxicology studies of the benzo[c]cinnolines because it is one of the few vertebrate in which morphological malformations due to external agents can be tracked in real time. Thus, toxicity and teratogenicity data from zebrafish could be extrapolated for
useful prediction of acute toxicity in rodent, and even mammals. Benzo[c]cinnolines synthesized in this project were to be ranked in terms of their toxicity, and teratogenicity to the zebrafish embryo.

**CRYSTAL STRUCTURE OF CO-CRYSTAL OF 2-METHYLMIDAZOLE AND 4-NITROPHENOL**, M. Tanner Dawson* and Kenneth L. Martin, Berry College, Mt. Berry, GA 30149. Equal moles of 2-methylimidazole and 4-nitrophenol were combined in ethanolic solution. After slow evaporation of the mother liquor, a mass of yellow crystals was obtained. The crystals were put back into solution using deionized water. After slow evaporation of a portion of the water, nice orthorhombic prisms formed. The single crystals were taken to Emory University’s X-ray Crystallography Laboratory and a diffraction data set (consisting of 30278 Mo-Kα X-ray reflections) was collected at 90 K. A unit cell with \( a = 24.1768(6) \) Å, \( b = 55.1296(14) \) Å, \( c = 7.1907(2) \) Å, \( \alpha = \beta = \gamma = 90^\circ \), and Fdd2 space group was found with \( R(\text{int}) = 0.0413 \). Each asymmetric unit involves pairs of 2-methylimidazole and 4-nitrophenol molecules in differing crystallographic environments. Neighboring acid and base molecules hydrogen bond to each other. One of the acid-base pairs involves a disordered hydrogen cation (as supported by the NMR spectrum, which evidences both molecules and corresponding ions in solution) and a disordered methyl group. The way that the phenol and imidazole molecules stacked within the crystal created channels large enough for water molecules. These channels are occupied by chains of disordered water molecules, which hydrogen bond to each other and to the phenol and imidazole molecules.

**CRYSTAL STRUCTURE OF CO-CRYSTAL OF 1,2-DIMETHYLMIDAZOLE AND 4-NITROPHENOL**, Connor J. Wright* and Kenneth L. Martin, Berry College, Mt. Berry, GA 30149. Equal moles of 1,2-dimethylimidazole and 4-nitrophenol were combined in ethanolic solution. After slow evaporation of the mother liquor, a mass of yellow crystals was obtained. The crystals were put back into solution using methanol. After slow evaporation of a portion of the methanol, nice blocks formed. The crystals were taken to Emory University’s X-ray Crystallography Laboratory and a diffraction data set (consisting of 2727 Mo-Kα X-ray reflections) was collected at 90 K. A unit cell with \( a = 9.2425(24) \) Å, \( b = 19.6462(52) \) Å, \( c = 6.3811(17) \) Å, \( \alpha = 90^\circ, \beta = 132.5116(23)^\circ, \gamma = 90^\circ \) was found. It was ascertained that the crystals are chiral and that they grow as twins. No un-twinned crystal was found. A second data set (consisting of 1341 Cu-Kα X-ray reflections) was collected in order to assist with determination of the absolute configuration of the structure. A unit cell with \( a = 9.2810(4) \) Å, \( b = 19.6899(8) \) Å, \( c = 6.4002(2) \) Å, \( \alpha = 90^\circ, \beta = 132.4781(15)^\circ, \gamma = 90^\circ \) was found. Preliminary analysis of the data suggests that each unit cell contains two pairs of 1,2-dimethylimidazole and 4-nitrophenol molecules. Once the phase problem has been solved, the crystal structure will be presented.

**CHARACTERIZATION OF TRANSCRIPTION FACTORS FROM THE EXTREMOPHILE THERMUS THERMOPHILUS**, Hyejin Um* and Michael Van Dyke, Kennesaw State University, Kennesaw, GA 30144. The power of modern genetic sequencing has yielded a wealth of knowledge in the past decades, with the genomes for thousands of organisms now fully sequenced. However, the function of many
genes and the biological roles of their encoded products are still not well characterized. Given the sequence-specific DNA-binding properties of transcription factors, it is possible to purify them, identify the responsible polypeptide(s), determine their consensus binding sequences, and identify their genomic binding sites. Thus, one can go from cellular extract to proposed biological regulatory roles in relatively short order. Our goal is to identify and characterize previously unknown TFs in the extremophile *T. thermophilus* using the novel combinatorial technique, Restriction Endonuclease Protection Selection Amplification (REPSA). REPSA does not require any prior knowledge of a ligand in order to determine its preferred binding site on duplex DNA and has been previously utilized successfully to identify binding specificity for a variety of ligands. FadR is a transcriptional regulator in *T. thermophilus* that has been implicated in fatty acid biosynthesis. A binding sequence for FadR has been previously identified, however it was not determined by combinatorial means. We expect REPSA to identify more specific consensus binding sequences for FadR than those presently available, thereby demonstrating the utility of this approach for transcription factor discovery in organisms like *T. thermophilus*. This research is expected to lead to a greater understanding of bacterial biology at a molecular level and ultimately advance public health by characterizing orphan regulatory proteins that can be critical players in many different microbial diseases.

**EVALUATING EMPIRICAL MODELS OF OSMOLYTE EFFECTS ON BIOPOLYMERS USING METHODS USING ONE SEMESTER UNDERGRADUATE RESEARCH PROJECTS**, Jonathan G. Cannon¹, D. Jones¹, D.J. Booker¹, E.O. Alabi¹, J. Patel¹, J.I. Garcia¹, ¹Middle Georgia State University, Cochran, GA 31014. The transfer free energy and the local-bulk partitioning models are two empirical models that have been used to quantify and predict osmolyte effects on biopolymers—particularly proteins—in a variety of conditions. There are significant discrepancies in the predictions of these two models, particularly in the case of negatively charged groups on biopolymers. To resolve these differences, we have performed measurements of the effects of the osmolyte glycine betaine on the solubility of neutral and negatively charged amino acids. We have found that undergraduates with only one chemistry course behind them can carry out accurate solubility measurements on highly soluble amino acids working in the lab only a few hours a week for a semester. Unfortunately, it is not possible with simple tools to accurately measure low solubilities with tools typically available in an introductory chemistry laboratory. We have also found that glycine betaine reduces the solubility of glutamate more than was previously reported in the literature. This last result favors the local-bulk partitioning model. Our ongoing work is exploring how changes in pH and temperature affect solubility of amino acids in the presence of osmolytes to test further theoretical models of osmolyte effects on biopolymers.

**ESTIMATION OF SOIL PARTITION COEFFICIENTS USING X-RAY FLUORESCENCE**, C. Lupse, J. Allison, and P. Nolibos, University of North Georgia, 3820 Mundy Mill Rd., Oakwood, GA 30566. We have investigated the use of X-ray fluorescence (XRF) in estimating soil partition coefficients for copper and lead on soil samples from two locations. After measuring the copper
and lead originally in the soil via XRF, we equilibrated the soil with a solution of known metal concentration, and then used XRF a second time to assess the metal content of the soil after equilibration. The difference in metal content of the soil between the first and second XRF analyses was used as the adsorbed fraction of metal in the calculation of Kd. We have compared Kd values obtained for copper and lead using the XRF technique with Kd values obtained by the more traditional approach of using atomic adsorption to estimate the metal concentration in the solution after equilibration and accounting the metal removed from solution as adsorbed. The Kd values computed by the two methods have been compared using standard statistical analyses to assess whether they give statistically similar results.

**REVERSE PHASE HPLC/UV–VIS ANALYSIS OF ETHER EXTRACTS FROM YELLOW-STRIPED OAKWORM**, J. Howell, R. Patel, M. Melnychuk, A. Thomas, P. Nolibos, T. Howell, University of North Georgia, 3820 Mundy Mill Rd., Oakwood, GA 30566. A chromatographic method was developed to analyze ether extracts from yellow-striped oakworm (Anisota peigleri) using reverse phase HPLC with UV-Vis detection. The objective was to obtain a chemical profile of the extract that will allow for the characterization of the components via spectroscopic methods. Also, similar extracts from the leaves that serve as the main diet of the worms will be analyzed by the same method for comparison of their chemical profiles.

**A METHOD DEVELOPMENT COLUMN CHROMATOGRAPHIC SEPARATION OF METHANOL EXTRACTS FROM YELLOW-STRIPED OAKWORM**, R. Posey, J. Ellenburg, A. Thomas, P. Nolibos, T. Howell, University of North Georgia, 3820 Mundy Mill Rd., Oakwood, GA 30566. A column chromatographic system was developed to isolate chemically-independent fractions from a methanol extract from yellow-striped oakworm (Anisota peigleri) using a silica gel column. At least five separate components eluted through the column were recognized visually by their color or with the aid of an UV lamp. Subsequently, a methanol leaf extract (made from leaves that constitute the diet of the oakworm) was separated by the same chromatographic method. Bands in common between the worm and the leaf extracts were analyzed using spectroscopic techniques including Infrared and/or NMR to determine if the components present are chemically identical or related.

**SYNTHESIS OF CHIRAL IMINES AND AMINES ON SILICA**, Jesse Wayson*, Chelsea Desbiens, McCray Malcolm, and John T. Barbas, Valdosta State University, Valdosta, GA 31698. We have continued our research on the synthesis of several new chiral amines and chiral imines. Several of these amines have mono-substituted and bi-substituted aromatic rings. We have used as starting materials substituted aromatic aldehydes and (S) or (R)-α-Methylbenzylamines. The reactions were carried out on silica surfaces with or without solvents. All reactions were facile and proceeded at room temperatures giving high yields of the products. Specific rotations were obtained of pure samples of all amines. In the synthetic procedure, typically 2.0 g of activated silica were added to 10 mL of an ethereal solution of equimolar quantities (2.0x10−3 mol) of an aldehyde and a primary chiral amine. The flask was equipped with a stirring bar and a drying
tube. The mixture was stirred briefly and allowed to stand for 15 minutes to 30 minutes at room temperature. Completion of the reaction to the imine stage was monitored by GC-MS. The reduction step was carried out in the same pot by adding 0.15 g of sodium borohydride, followed by the addition of a few drops of water. Progress of the reduction was monitored by GC-MS. Upon completion, the sample was filtered, and the silica was washed five times with 5 mL aliquots of ether. Yields of the amines were quantitative. Traces of the starting aldehyde or amine if present, were removed by column chromatography. Products were analyzed by IR, GC, GC-MS, and proton and C-13 NMR, and by polarimetry.

**THE SYNTHESIS AND CHARACTERIZATION OF POLYMERIC NANOGELS**, HuiRui Washington, Nicole Sikes, Daniel Holley, Columbus State University, Columbus, GA 31907 The class of materials known as soft nanoparticles has excited much recent interest. We have synthesized a series of polystyrene and polymethylmethacrylate nanogels of varying size and cross-link density to determine the impact of these parameters on the glass transition temperature of the nanogels in aqueous solution. The nanogels are synthesized using a novel semi-continuous microemulsion polymerization method and are characterized using gel permeation chromatography, IR, 1H NMR, DLS, and DSC.

**Section III: Earth & Atmospheric Sciences**

**Location**: Instructional Complex Room 207

Samuel Mutiti, Presiding

7:30 PREVALENCE OF BRUCELLA SUIS, CAMPYLOBACTER JEJUNI, ESCHERICHIA COLI O157:H7, AND YERSINIA ENTEROCOLITICA IN GEORGIA’S FERAL PIG COMMUNITIES**, Jyoti K. Lama* and Dave Bachoon, Department of Biological and Environmental Sciences, Georgia College & State University, Milledgeville, GA, 31061. Feral pigs carry zoonotic pathogens and can disseminate these pathogens to domestic pigs, other wildlife, and humans. Fecal samples were collected from 56 feral pigs from eight counties in Georgia. DNA was extracted from the fecal samples and assayed using qPCR for Brucella suis, Campylobacter jejuni, and Escherichia coli O157:H7. Out of 56 samples analyzed, B. suis was detected in 25% of the pigs and E. coli O157:H7 were detected in 14% of the feral pigs. However, C. jejuni was not detected in any of the pig samples. In addition, fecal samples will be analyzed for Yersinia enterocolitica. Feral pigs represent a growing threat to public health and agriculture in the State of Georgia.

7:45 PHYTOREMEDIATION CAPACITY OF TITHONIA ROTUNDIFOLIA FOR LEAD CONTAMINATED SOILS**, Megan R. Corley* and Samuel Mutiti, Georgia College and State University, Department of Biological and Environmental Sciences, Milledgeville, GA, 31061. Phytoremediation is a process that uses plants to mobilize and accumulate heavy metals in the roots, stems and leaves. This study investigates using Tithonia rotundifolia in phytoremediation of soils contaminated with different lead species. T. rotundifolia was grown in soils contaminated with either lead nitrate or lead carbonate. At harvest, the plants were separated into roots, stems, leaves, flowers and seeds, so that translocation of lead within the plant could be determined. Preliminary results showed that lead concentrations in the roots ranged from 30 to 300 ppm. Lead concentration
in the stems ranged from 30 to 100 ppm. In the leaves, lead concentrations were from 10 to 15 ppm. Lead in the flowers ranged from 0 to 3 ppm and seed concentrations were from 0 to 6 ppm. There was significant translocation of lead throughout the *T. rotundifolia* plant, which implies that this plant could potentially be useful in phytoremediation.

8:00 WATER QUALITY AND ALGAL DIVERSITY ASSESSMENT OF THE KAFUE RIVER**, Mutande K. Tembo *, Samuel Mutiti and Kalina Manoylov, Department of Biological and Environmental Sciences, Georgia College & State University, Milledgeville, GA 31061. The Kafue River is one of Zambia’s most economically significant rivers and has, therefore, attracted a lot of industries and mining activities within its watershed. In this study the water quality of the river was investigated using physicochemical parameters, surface water geochemistry and algal analysis. The chosen study site is located in a part of the watershed that is downstream of yeast making, fertilizer producing and leather tanning industries. The Kafue River in this area is also heavily affected by the *Eichhornia crassipes* weed, which has colonized this reach of the river and disturbed the ecosystem. Water samples were collected in Zambia’s cold-dry season (May to July) from four locations along the river. For algal analysis composite samples were collected from each sampling locality. Results showed that pH values were all within the neutral range (6.8 to 7.2) but nitrate and phosphorus levels were very high (3.2 to 8.4 ppm and over 0.6 to 3.6 ppm respectively). These conditions would be perfect for *E. crassipes* proliferation and eutrophication during the hot and dry season that follows the cold season. An examination of the algal community of the river showed a dominance of filamentous green algae (e.g. *Stigeoclonium*, *Oedogonium* and *Chaetophora*) and high nutrient diatoms (such as *Nitzschia* and *Navicula*). Most of the diatoms were not physiologically active; potentially due to water pollution in the area.

8:15 CHANGES IN ALGAL POPULATIONS IN GEORGIA FARMS PONDS WITH TIME**, Derick R. Thompson*, Hailey A. Rials, Hunter E. Gay, Jimmy Wedincamp, Jr. and J.E. Schneider, Jr., East Georgia State College, Swainsboro, GA 310401. We addressed the question, to what extent are algae populations stable over changing seasons? In particular, we monitored three farm ponds located on the same farm for 18 months, from September of 2014 to February of 2016, with respect to their algae populations. Our hypothesis was that former population patterns would reestablish themselves when similar environmental conditions returned. Pond samples preserved in Lugol’s reagent were allowed to settle in either a settling chamber or wells of a 12- or 384-well culture plate for 24 hours prior to analysis with an inverted microscope. Algae and cyanobacteria were counted and the algae species present expressed as a percentage of the total number of algal organisms. The results as of this writing follow the algae populations collected in the summer of 2014, the winter of 2015, and the late summer of 2015, where a significant change in the populations occurred. Two of the ponds had an 80-90 percent predominance of one algal species in the summer of 2014 (a cyanobacterium, in one case). This pattern changed to a more varied population in the winter sampling. The second summer sampling and the February 2016 sampling will be reported in the presentation. Special gratitude and credit for algae identification go to Michael F. Chislock, Brianna K. Olsen,
and Alan E. Wilson of Auburn University. The support of East Georgia State College, and Alan Wilson and the USGS - National Institutes for Water Resources grant to him is gratefully acknowledged.

8:30 SIMULTANEOUS EXTRACTION OF CHLOROPHYL AND PHYCOCYANINE FROM CYANOBACTERIA WITH OCTANOL-WATER**, Hailey Rials* and J.E. Schneider, Jr., East Georgia State College, Swainsboro, GA 31081. Harmful algal blooms are an increasing threat to the health and safety of fresh water lakes, ponds, and streams, in part due to the potential presence of toxin-producing strains of cyanobacteria, but also due to overgrowth of the algae that can lead to depletion of oxygen in the water. Cyanobacteria are characterized by the presence of phycocyanin, a blue-green, proteinaceous, water soluble pigment, while other types of algae are characterized by chlorophyll a, a green, hydrophobic pigment. Therefore, the amounts of phycocyanin and chlorophyll in water bodies approximates the amounts of cyanobacteria and total algae, respectively, in the water samples. Simultaneous extraction of phycocyanin and chlorophyll from cyanobacteria with octanol-water was performed by first concentrating measured amounts of pure cultures of algae strains by either centrifugation or filtration, then storing the concentrated material on the filter or as a pellet in a frozen state. Upon thawing, measured amounts of octanol-water were added and the mixture agitated until there was no green color remaining in the cells, which could be seen as a concentrated layer at the interface, with the upper octanol layer colored green, corresponding to extracted chlorophyll, and the lower aqueous layer colored blue, corresponding to phycocyanin. The intensities of the pigments were measured by optical density. Work in progress is focused on optimizing the extraction for environmental samples, and measuring the pigments by fluorescence. Funding is provided by East Georgia State College.

8:45 CORN AS A DRINKING WATER PURIFICATION METHODS AND MEDIUM**, Allison Pourquoi * and Samuel Mutiti, Department of Biological and Environmental Sciences, Georgia College and State University, Milledgeville, GA 31061. One of the major challenges facing our planet today is the availability of safe drinking water. Millions of people around the globe do not have access to a safe source of drinking water. Pathogens (bacteria, viruses and protozoa) are among the major contaminants of concern. The presence of these pathogens in drinking water has adverse effects on human health, and is a very common problem in less industrialized countries and some rural areas in developed countries. The United Nations estimates that millions of people die every year from drinking water contaminated with pathogens. This study investigates the use of crushed corn to filter or disinfect bacteria from drinking water. Escherichia coli solution in a saline solution, stream water and deionized water were used in the study. Bacteria were quantified using IDEXX and Coliert 18. Results from this study showed that corn was an extremely effective filter for bacteria in water.

9:00 A STUDY OF SHORT TERM GREYWATER USE ON ORNAMENTAL CABBAGE GROWTH, SOIL QUALITY, AND GROUNDWATER QUALITY**, Mary Plauche*, Samuel Mutiti, and Allison R. VandeVoort, Department of Biological and Environmental Sciences, Georgia College and State University, Milledgeville, GA 31061. Greywater reuse is a sustainable water practice that has potential for crop
and landscape irrigation, among other uses, as growing populations and changing climate affect water availability and quality worldwide. Concerns associated with greywater reuse focus on soil quality and the potential buildup of organic material and salts. Composition of greywater varies and depends on geography and products used in the household, but it generally includes chemicals originating from personal hygiene and cleaning products, and hair and skin from the human body. Greywater has been accurately replicated synthetically in a number of previous studies. In this study, synthetic greywater was used to irrigate ornamental cabbage plants for eight weeks to simulate short-term landscaping reuse of greywater. Soil and groundwater were tested every four weeks for nitrate, phosphate, and sulfate concentrations, and pH; plant growth was measured every two weeks for height, diameter, and number of leaves. Rainwater was also analyzed after rain events for potential effects to the study system. Previous research has been conducted on greywater reuse for irrigation, but observing the effects of greywater on an entire system, including groundwater, has not been completed by other researchers. The study site was next to a lake where the water table was close to the surface, making groundwater more susceptible to effects from greywater and more easily studied. We hypothesize that the greywater will not have a significant impact on soil and groundwater quality and plant growth, due to the short-term greywater use, and rain diluting the greywater. Funding for this study was from the Georgia College Sustainability Fee Council.

9:15 ANALYSIS OF OF MIOCENE CORAL DIAGENESIS USING SCANNING ELECTRON MICROSCOPY, Jasmine C. Truitt* and Donald M. Thieme, Valdosta State University, Valdosta, GA 31698. We report preliminary results of analysis of Miocene limestone, agate, and fossil corals using the scanning electron microscope (SEM) at Valdosta State University. Using the SEM, we have been able to identify domains of SiO₂ which result from replacing aragonite, calcite, and other minerals of the coral skeleton. These are “cryptocrystalline” quartz domains smaller than 20 microns. We have also identified somewhat larger domains in “druse” zones as well as grains of detrital quartz and other minerals. The fossil samples were obtained from outcrops of the Miocene Hawthorn group along the Withlacoochee River between Valdosta and the Florida state line.

9:30 SEDIMENTOLOGY AND STRATIGRAPHY OF THE UVALDA MEGA-MEANDER, OCONEE RIVER, GEORGIA**, Christopher R. Sipes* and B.E. Suther, Kennesaw State University, Kennesaw, GA 30144. Large, terminal Pleistocene meandering paleochannels (“mega-meanders”) are preserved along many rivers in the southeastern Atlantic Coastal Plain, including the Oconee River in Georgia. Discharge estimates based on the slope-area method and channel boundaries delineated from stratigraphy rely on accurate identification of the paleochannel bed material versus younger paleochannel fill. This study characterizes the sedimentology and stratigraphy of the Uvalda mega-meander of the Oconee River by measuring grain size composition and mass loss-on-ignition (LOI) of a representative stratigraphic section from the paleochannel. The profile was sampled by bucket auger, and morphologic characteristics of soil and sediment were described, noting lithologic properties and stratigraphic contacts. Samples were collected in ~5 cm depth increments. LOI was measured after
heating for four hours at 550°C, and grain size analysis by pipette and sieve methods is underway. The profile contains 2.2 m of fine-grained abandoned channel fill, which consists predominantly of massive, gray clay and abruptly overlies coarse channel bed sands. LOI in channel fill represents both organic matter content and structural water loss from clay minerals, ranges from 3-30%, and is consistently higher than values for channel bed sands. Gravel content by weight is 10-18% in channel bed sediments, decreases abruptly from 5 to 0.2% between 2.2 and 2.0 m depth within the basal channel fill, and is negligible (0-0.05%) in the upper 2.0 m of fill. Sand, silt, and clay determination is in process. Preliminary results support the stratigraphic position of the channel bed interpreted from field descriptions and affirm that gravel and total sand content are reliable parameters for discriminating channel bed from basal channel fill sediments in this setting.

9:45 EVALUATION OF DENDROLOGIC CARBON SEQUESTRATION THROUGH THE USE OF GIS AND REMOTE SENSING**, Scott Raulerson*, Samuel Mutiti and Christine Mutiti, Department of Biological and Environmental Sciences, Georgia College & State University, Milledgeville, GA 31061. Atmospheric CO₂ concentration has been increasing steadily and already reached alarming levels. In recent years, it has become extremely important to be able to quantify carbon sequestration and quantify the carbon stock of the planet, especially with current global warming trends. One of the carbon stocks that has attracted attention of researchers is carbon stored in trees, dendrologic carbon. Determination of tree carbon sequestration is traditionally a labor-intensive process that must be completed in the field with numerous tedious measurements. This study quantifies dendrologic carbon storage using GIS and remote sensing techniques so that these calculations could be done in a lab and over large tracts of land. Light Detection and Ranging (LiDAR) data and satellite imagery were analyzed using computer programs (ArcMap and ERDAS), and a model to estimate biomass and carbon content was created. Reference data of tree type, diameter at breast height (DBH), and height were collected in the field to help calibrate lab models. Results from the lab models were also compared to field results. Accuracy of the model on any given area was heavily dependent upon the resolution of the satellite and LiDAR data. Maps displaying carbon concentrations over the study areas (areas covered by the models) were created. These maps will be used to determine the contribution of the study sites to the local, regional and global carbon storage.

10:00 Section Business Meeting

10:30 STRATIGRAPHY AND PRESERVATION OF FOSSILS IN TWO OUTCROPS AT THE OAKY WOODS WILDLIFE MANAGEMENT AREA, Donald M. Thieme1 and Thomas Thurman2, 1Valdosta State University, Valdosta, GA 31602 and 2Warner Robins, GA, 31093. Middle Georgia represents a key area for Coastal Plain stratigraphy. Estuarine and shallow marine facies found in the kaolin belt interfinger and grade laterally into Tertiary carbonates which are highly fossiliferous and important regional aquifers. At Oaky Woods Wildlife Management Area in Houston County, Eocene rocks crop out immediately overlying the “Twiggs clay” formation described both in the kaolin belt and in
nearby limestone quarries (e.g. CEMEX, Elko Road). We follow the previous field description of one outcrop by Paul Huddlestun in identifying the Tobacco Road formation from calcareous sand containing echinoids and other marine fossils. Of particular interest here are echinoids which Huddlestun and Hetrick identified as intermediate between *Periarchus pileussinensis* and *Periarchus quinquefarious*, both of which are also found in this outcrop. We also describe a second outcrop which is stratigraphically up section and also contains fossils of Jacksonian age (Priabonian stage of the Eocene). This is the Ocmulgee formation, a shallow marine limestone which appears to interfinger with the Tobacco Road sand in the Upper Eocene stratigraphy of middle Georgia.

**Posters (will be displayed Friday 5:00 to 6:00 pm)**

**POSTERS**

**MORPHOLOGICAL ASSESSMENT OF PALEOPATHOLOGY IN LATE PLEISTOCENE GIANT BISON FROM COASTAL GEORGIA**, Scott Raulerson* and Alfred J. Mead, Department of Biological and Environmental Sciences, Georgia College & State University, Milledgeville, GA 31061. Determining the physical conditions and behaviors of prehistoric humans and non-human mammals is often times a difficult task. Any evidence of the environments in which these organisms lived in has usually been erased. One method of determining the societal conditions of humans is through the assessment of bone pathologies associated with diseases and injuries. The same kind of analyses can be performed on non-human taxa as well. Different diseases or injuries leave different evidence on the bones that can be observed in fossil remains. The prevalence of these diseases and injuries in a population can be reflective of the behaviors or stressors which made impacts on the species. This study examines skeletal material from the late Pleistocene Giant Bison, *Bison latifrons*. The fossils were excavated from Clark Quarry near Brunswick, Georgia and are housed in the Georgia College Natural History Collection. Indications of disease, deformation, and trauma are noted and possible stressors are proposed.

**FILTRATION AND REMOVAL OF EXCESS NUTRIENTS IN GROUND AND SURFACE WATER BY WETLANDS AT LAKE LAUREL IN MILLEDGEVILLE, GEORGIA**, Cayla Sheehan*, Emily Cruce*, Carly Nielsen, Gabriel Kustick*, Samuel Mutiti and Christine Mutiti, Department of Biological and Environmental Sciences, Georgia College & State University, Milledgeville, GA 31061. Wetlands often function as excellent natural and cost-effective filtering mechanisms for both surface and groundwater. They have been naturally and artificially constructed worldwide to buffer aquatic environments from pollutants and improve or restore the conditions of associated water bodies. The goal of this study was to determine the effectiveness of the wetlands at Lake Laurel in Milledgeville, Georgia in the filtering out contaminants in water flowing from upstream, potentially polluted by nonpoint agricultural sources. Samples of surface water were collected from three sites: upstream, in the wetlands, and a pond located downstream of the wetlands. Groundwater samples were only collected from the upstream and pond sites. At the each sampling locations, pH, conductivity, temperature, and dissolved oxygen were measured using YSI multi-parameter...
probes. Piezometers were installed and used to retrieve groundwater samples and to collect physicochemical parameters in the field. HACH colorimeters were utilized to quantify nitrate and phosphate concentrations in the samples. Preliminary results show that this wetland system is successful as a natural buffer and effectively filters excess nutrients from both surface water and groundwater, improving the overall health of this aquatic system.

**CHANGES IN URBAN RUNOFF’S WATER QUALITY ALONG A MAN-MADE WETLAND**, Hope Telder*, Victoria Thomas*, Samuel Mutiti and Christine Mutiti, Department of Biological and Environmental Sciences, Georgia College and State University, Milledgeville, GA. The wetlands at the Oconee River Greenway in Milledgeville, Georgia are built on a historic site; the former site of McMillan Brick Works factory, a trailer park and an open air dump site. This historical land use has potential to impact the chemistry and quality of water flowing through the park. Other studies have shown that wetland filtration of runoff prior to entering a larger water body reduces the negative effects of nutrients and other pollutants. This study investigates the effectiveness of the Greenway wetland system in improving water quality of urban runoff. Water quality parameters including dissolved oxygen, pH, phosphorous, and nitrate concentrations were analyzed along a runoff flow path. Results from three sampling rounds indicate a decreasing trend in nitrate and phosphate levels along the flow path through this wetland system. This trend suggests that the wetland is consistently improving the water quality downstream. Soil, groundwater, plant, metal and bacteria analyses are currently being undertaken to obtain a complete and clear picture of what water quality improvements are taking place in different parts of this wetland system.

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

**TRANSPORT CHARACTERISTICS OF NANOPARTICLES THROUGH SAND COLUMNS**, Demichael Winfield*, Samuel Mutiti, Allie Banston and Allison R. VandeVoort Department of Biological and Environmental Sciences, Georgia College & State University, Milledgeville, GA 31061. The use of nanotechnology and nanoparticles has seen a dramatic increase in recent years. Their production and use can be found in a variety of industries including chemical, metallurgical, medical, food and clothing industries, among others. This widespread usage is also likely to result in an increase in the presence of these particles in the
environment. So far, very few studies have been conducted to determine the
effects of these particles in the environment and their movement in groundwater.
This study, therefore, investigates the fate and transport of silver nanoparticles
through saturated porous media. Silver nanoparticle transport was modeled in
1D soil columns and 2D physical aquifer models. These models were also tested
for their abilities to reduce silver nanoparticle concentrations in groundwater.
The sediments were initially flushed with deionized water and then saturated
with synthetic groundwater before running nanoparticle standards (pulse flow)
through them. A combination of analytical methods (ICP-OES, colorimetry, and
AAS) was used to measure the concentration of the nanoparticles. Sorption
isotherms were also determined using laboratory batch experiments.

Section IV: Physics, Mathematics, Computer Science,
Engineering and Technology
Location: Instructional Complex Room 119
L. Ajith DeSilva, Presiding

8:45 Is \([\text{sgn}(x)]^2 = 1\) ?, Kale Oyedeji and Ronald E. Mickens, Morehouse College,
Atlanta, GA 30314, and Clark Atlanta University. The function \(\text{sgn}(x)\) is defined
as equal to (+1) for \(x > 0\), (-1) for \(x < 0\), and zero for \(x = 0\). Thus, this function
is discontinuous at \(x = 0\). An example of its application is to express \(x\) as \(x = \|x\|\text{sgn}(x)\). Another example appearing in the research literature is the (often)
made assumption that \([\text{sgn}(x)]^2 = 1\). We investigate the properties of the \(\text{sgn}(x)\)
function, including its values when raised to a positive, integer power, and
calculate the corresponding derivatives. The importance of this topic is directly
related to its use in the investigation of nonlinear oscillations. We conclude that
\([\text{sgn}(x)]^2 \neq 1\).

9:00 SECOND-ORDER ITERATION SOLUTION TO AN EQUATION OF ABEL,
Ronald E. Mickens, Clark Atlanta University, Atlanta, GA 30314. We investigate
the periodic solutions of the following Abel differential equation (*)
\[
dx/dt + x^3 = \sin t.
\]
This equation has no (known) solution in terms of the
elementary functions and, as a consequence, nontrivial analytical solutions are
only approximations to the actual solutions. To obtain such an approximation, we
first construct an approximating iteration scheme, i.e., (**) 
\[
\ddot{x}_{k+1} + x_{k+1} = \ddot{x}_k + x_k - \dot{x}_k - x_k^3 + \sin t,
\]
with \(x_0(t) = \text{asint} + \text{bcost}\). This procedure is based on requiring that the solution
\(x_{k+1}(t)\) be both bounded and periodic. It is found that a complete knowledge of
\(x_k(t)\) also requires the investigation of the next higher iteration function, \(x_{k+1}(t)\).
This work presents the calculation of \(x_1(t)\), which depends on having knowledge
of the particular solution for \(k = 1\). We also discuss the general applicability of our
iteration method to the construction of periodic solutions for nonlinear
differential equations modeling oscillations.

9:15 PERMUTATION GROUPS AND NEARLY EVEN CHORDS, Candace L. Carroll
and Neil M. Boumpani, Gordon State College, Barnesville, GA 30204. A perfectly
even chord is one that divides the scale evenly. By single semitonal
displacement, a perfectly even chord becomes a chord that is nearly even. Nearly
even chords are important in music in large part because of their consonance. For example, the major and minor triads are nearly even. Permutation groups may be used to model this single semitonal displacement from perfectly even chords to nearly even chords. **Keywords**: music theory, nearly even chords, permutation groups, symmetric group, Frédéric Chopin, Prelude in E minor Op. 28, No. 4, F Minor Mazurka, Op. 68, No. 4.

**9:30** NOISE MITIGATION INSIDE THE CONTROL AND TEST ENCLOSURE TO MODEL OPTIMUM QUITE AIRCRAFT CABIN, Hasson M. Tavossi, Department of Physics, Astronomy, and Geosciences, Valdosta State University, Valdosta, GA 31698. Noise intensity level, inside a control enclosure, and a test enclosure with different sound absorption characteristics are compared in order to arrive at an optimum noise level of 85 dB in the interior of an Aircraft cabin. The comparison is utilized to determine the cost effective means of reducing noise inside the aircraft cabin without addition of weight to the aircraft. The technique includes appropriate arrangements of the Helmholtz resonators, embedded in the cabin walls, with different absorption frequency characteristics, corresponding to the noise spectrum. Our experimental results, obtained for the test cavity with uniform distribution of perforations, and control cavity, show strong absorptions at specific resonance frequencies. The frequencies are related to the characteristic dimensions of the system that can be optimized to the required noise level reduction. Active noise cancelation is difficult to implement, requiring real-time acquisition and generation by transducers of the identical noise signal with opposite phase. Our proposed technique included a set of different Helmholtz resonators that are tuned to the most energetic noise frequency peaks. The cabin noise spectrum being specific to each aircraft interior model, the goal is to determine the resonators characteristics and surface distribution, for noise intensity reduction to the safe level inside the aircraft cabin.

**9:45** DETERMINATION OF EFFECTIVE PARAMETER OF ARTIFICIAL MATERIAL WITH MIE SCATTERING THEORY, Arun K Saha, Albany State University, Albany GA 31705. An artificial dielectric material is considered to have spherical dielectric particles in a host medium arranged periodically in all three dimensions. A plane electromagnetic wave incidence is considered on one side of the artificial material. Well known “Mie scattering theory” is utilized to calculate the scattered field at a certain point by a spherical object. Total field at a certain point inside the artificial material is calculated as the summation of all scattered fields from all individual neighboring particles plus the incident field at the point of investigation. From this calculated total field at that point, effective material parameter is determined after some mathematical manipulations. Calculated material parameter is then verified with COMSOL Multiphysics simulation software.

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

**10:30** SIGNIFICANCE OF TEACHING AND LEARNING METHODS IN MECHANICS COURSES: CHALLENGES IN ENROLLMENT AND RETENTION IN ENGINEERING, B. Hojjatie¹, E. Zimmermann*, R. Ledger*, and H. Rashidi²,³, ¹Valdosta State University, Valdosta GA, 31698, ²WiseMedTech LLC, Atlanta GA 30308, ³Georgia Institute of Technology, Atlanta GA 30332, While freshman
enrollment in Engineering Studies Program at Valdosta State University is relatively high (e.g., >190), only a small percentage of the students take our upper level courses and the number of students that complete the Regents’ Engineering Transfer Program (RETP) each year is generally low. Many engineering students change their majors to other fields not only because of their insufficient background in math and sciences but also because of lack of motivation in learning. This is partly due to lack of proper connection between the textbook materials and real world specifically in mechanics related courses. The objective of this study is to describe various methods of teaching and collaborative learning that we have used in mechanical engineering courses to motivate students in engineering. These methods include: application-based teaching and learning, exposing students to various engineering projects that demonstrate the importance of engineering curriculum and the impact of engineering on society; implementing hands-on projects that allow students to develop skills and knowledge required for industry; solving the same groups engineering problem by various methods and comparing numerical the results to understand interconnecting among various physical principles; and incorporating computational methods using MATLAB for analysis and graphical representation of problems. These methods seem to improve students learning and motivation in engineering.

10:45 A MONTE CARLO CALCULATION OF THE OPTICAL PATH LENGTH IN SIMPLE SYSTEMS, Javier E. Hasbun, Department of Physics, University of West Georgia, Carrollton, GA 30118. The optical path length (OPL) refers to the product of the refraction coefficient of a substance and the path that light takes in going through the substance from the source to the detector. According to Fermat’s principle, the OPL ought to be stationary. I present a Monte Carlo approach based on the work of Gould and Tobochnik [1] that calculates the optical path length for the refraction of a light ray traversing through two media with different refractive indices. The results of the calculation are compared with that obtained from Snell’s law. The method is also applied to reflection from which we expect that the angle of incidence equals the angle of reflection. A further application the method is used to study the effect of an exponentially variable index of refraction on the path taken by a light ray. The simulation developed has the beneficial purpose of enhancing our understanding of light’s behavior as it travels through different substances. [1] “An Introduction to Computer Simulation Methods” 2nd. Ed, H. Gould and J. Tobochnik (Addison Wesley, Reading MA, 1996)

11:00 RUBBERBAND BEHAVIORS IN 3D K. C. Chan and Lily Zheng, Albany State University, Albany, GA 31705. An ordinary rubberband is an amazing solid that can be stretched as much as 20X its original length, exhibiting a characteristic non-linear elongation vs. load. The question is whether such a nonlinear characteristics remains true for other two dimensions (the width and thickness) of the rubberband if the load is applied in the direction of elongation. Also, how would all three strained dimensions of the rubberband be related to each other? The measurements show that the elongation direction exhibits the typical 4th order polynomial behavior of elongation vs. load with an inflexion point. However, we notice that other two dimensions shrink and exhibit consistently a
quadratic behavior. The relationships of elongation vs. width, elongation vs. thickness, and width vs. thickness under the same stress will also be reported. Surprisingly the physics of the inner working of rubberband stretch is still not completely understood. The shrinking behavior could be used to test a recent theory on rubberband elasticity. Also investigated was the structural change in microscopic scale using SEM.

11:15 NEAR-INFRARED BRIGHTNESS MEASUREMENTS OF SATURN + RINGS, Richard W. Schmude, Jr., Gordon State College, 419 College Dr. Barnesville, GA 30204. The writer carried out whole-disk brightness measurements of Saturn and its rings. These measurements were made between April 26, 2014 and September 1, 2015. He used an SSP-4 solid-state photometer along with filters transformed to the Mauna Kea J and H system. These are sensitive to wavelengths of 1.15 to 1.35 and 1.5 to 1.8 micrometers. During the 2014-2015 apparition, Saturn’s ring tilt angle, as seen from the Earth and Sun, was near \( \beta = 24.5 \) degrees. It is concluded that the brightness values, in magnitudes, for \( \alpha > 1.5 \) degrees follow: (1) \( J = -10.756 + 0.0139\alpha + 5.0 \log [r \Delta] \), (2) \( H = -10.505 + 0.0272\alpha + 5.0 \log [r \Delta] \), where \( \alpha \) is the solar phase angle in degrees, \( r \) is the Saturn-Sun distance in au and \( \Delta \) is the Saturn-Earth distance in au. One au is the mean Earth-Sun distance. The -10.756 and -10.505 are the normalized brightness values for Saturn measured from this study; they correspond to a ring tilt angle of \( \beta = 24.5 \) degrees. The corresponding standard error of estimate values are 0.025 and 0.024 magnitudes for the J and H filters, respectively. The measured opposition surge values for \( \alpha = 0.22 \) degrees are 0.17 and 0.19 magnitudes for the J and H filters, respectively.

11:30 VARIABILITY OF MARS’ TEMPORARY NORTH POLAR CAP, Richard W. Schmude, Jr., Gordon State College, 419 College Dr. Barnesville, GA 30204. Images posted on the MRO MARCI Weather Report website, http://www.msss.com/msss_images/subject/weather_reports.html, were examined. The goal of this analysis was to look for variability in the shrinkage rate of the temporary North Polar Cap (NPC). Seven isolated bright spots corresponding to “Ierne”, “Olympia”, “Cecropia”, Korolev Crater, Louth Crater, Lomonosov Crater and an unnamed feature were used as reference points. Images, at specific seasonal dates, for each of the five apparitions between 2008 and 2015 were examined for variability. As a second test, the seasonal date at which the bright spots first appeared detached from the NPC, were recorded. Both tests reveal variations on the order of one to two degrees of latitude. Three conclusions from this study are: 1) the temporary NPC underwent small variations between 2008 and 2015; 2) the variations at one longitude were often different from those at other longitudes, and 3) the temperature alone may not explain cap shrinkage rates.
**Posters (will be displayed Friday 5:00 to 6:00 pm)**

**POSTERS**

**PHOTOLUMINESCENCE OF CdSe/ZnS QUANTUM DOTS UNDER VARIOUS PRESSURES**, Joshua Harwell*, Ajith DeSilva, Neal Chesnut, Department of Physics, University of West Georgia, Carrollton, GA 30118, USA. Quantum dots (QD) are nano-sized semiconductor particles whose electronic properties are different from bulk semiconductors. Their optical and electronic properties depend on the size which is due to confinement effects. Photoluminescence measurement of CdSe/ZnS core-shell QDs behavior has been investigated to pressure of 63.1 kbar at room temperature. Pressure was generated using a diamond-anvil cell with a culet size of 500 μm in diameter and was calibrated by the shift of ruby emission. The peak wavelength of the emission spectrum for the QDs is 617 nm at 1 atm (0 kbar). When increasing pressure to 28 kbar a blue-shift is observed which is about 0.3 nm/kbar. As pressure is further increased a slight red-shift is observed. The initial blue-shift can be attributed to the domination of the quantum confinement effect of CdSe/ZnS QDs. The observation of the red-shift above 28 kbar could be explained by the bulk property domination. The authors would like to acknowledge the financial support by UWise and SRAP programs at UWG.

**A SEARCH FOR HEAVY ELEMENTS IN THE FAINT PLANETARY NEBULA M 1-80**, A. E. Clark* and N. C. Sterling, University of West Georgia, Carrollton, GA 30118. We present the optical spectrum and a study of the chemical composition of the faint planetary nebula (PN) M 1-80. PN are the ejected envelopes of low mass stars (1-8 solar masses) at the end of their nuclear fusion lifetimes. We are determining the abundances of all detected elements, but are particularly interested in those heavier than zinc. Nuclear fusion in stars terminates at iron, beyond which fusion is endoergic. Elements heavier than iron are formed via a series of neutron (n) captures interleaved with beta decays. These “n-capture elements” can be produced during the second giant phase of low-mass stars, the stage preceding PN ejection, and subsequently “dredged up” to the envelope along with carbon from partial helium burning. Therefore n-capture elements can be enriched in a PN if they were produced by its progenitor star, and provide sensitive tracers of carbon production in low-mass stars. We observed M 1-80 with the 2.7-m Harlan J. Smith telescope at McDonald Observatory (TX) for a total integration time of 12.5 hours. Approximately 125 distinct emission lines were detected, including the first detection of the n-capture elements krypton and xenon in this PN. Our preliminary abundance analysis indicates that both Kr and Xe are strongly enriched in M 1-80, and we compute upper limits for other n-capture elements such as bromine and rubidium. This is one of the first studies of heavy element abundances in M 1-80, and our results will constrain nucleosynthesis and convective mixing processes in its progenitor star as well as its previously unknown carbon abundance.

**HEAVY ELEMENTS IN SOUTHERN HEMISPHERE PLANETARY NEBULAE**, Nathan D. Morgenstern*, N. C. Sterling and D. V. Wood*, University of West Georgia, Carrollton, GA 30118, We present near-infrared (2.0-2.4 μm) spectra of three Southern Hemisphere planetary nebulae (PN), obtained with the OSIRIS
spectrograph on the 4.1-m SOAR Telescope in Chile. A PN is the ionized ejecta of a low-mass (1-8 solar mass) star at the end of its life. The goal of these observations is to detect emission lines from the neutron(n)-capture elements selenium and krypton. Nuclear fusion of iron or heavier elements does not produce energy and therefore does not occur in stars. Trans-iron elements are instead produced by a series of neutron captures and beta decays (“n-capture nucleosynthesis”), which can occur in low-mass giant stars before PN ejection. The newly-synthesized n-capture elements, along with carbon from partial helium burning, are transported to the envelopes of giant stars by convective dredge-up. Therefore the enrichment of trans-iron elements such as Se and Kr in a PN indicate that n-capture nucleosynthesis and carbon production occurred in its progenitor star. Nebular spectroscopy also provides access to elements that cannot be detected in giant stars, revealing unique information regarding the synthesis of heavy elements in the Universe. We detect Se emission in IC 1297, while Hen 2-86 and IC 4776 exhibit emission lines from both Se and Kr. These are the first detections of n-capture elements in each of these PN. We present a preliminary abundance analysis, and discuss the implications for the interior structure and convective mixing in giant stars, as well as the production of carbon (an essential ingredient for life) in low-mass stars.

PARAMETRIC STUDY OF ELECTROMAGNETIC HEATING, Kelly M English* and Arun K Saha, Albany State University, Albany, GA 31705, Electromagnetic heating has wide variety of applications in industry. Recently this topic has found application in biomedical area for cancer cell killing with carbon coated ferrite Nano particles (CFN) under microwave radiation which can penetrate deep into human body. When an object is illuminated with electromagnetic wave, thermal heat is generated due to imaginary components of complex permittivity and permeability of the object. This heat generation depends on the value of imaginary component of permittivity and permeability, power label of incident wave, frequency, exposure time and size or dimension of the object. In this research, COMSOL Multiphysics simulation software is used to observe heat generation as temperature rise in the object with respect to all above factors. In the simulation, a dielectric block of dimension 22.86mm x 25mm x 8 mm is modeled inside a WR-90 rectangular waveguide and electromagnetic wave of TE10 mode (8.2 – 12.4 GHz) is applied to the object for this investigation. Recorded data shows that temperature rise increases with the increase of dielectric loss tangent (ratio of imaginary to real component of complex permittivity, permeability), frequency, power and exposure time. In future, the result of this investigation will be used to determine the dose of CFNs, which enhances the imaginary part of complex permittivity and permeability of CFN solution, to generate enough heat to kill cancer cell with microwave radiation. This research is supported by Center for Undergraduate Research, Albany State University, Albany GA.

SPEED OF SOUND IN DIFFERENT ANTI-FREEZE CONCENTRATIONS**, Alex Ferre*, Bobby Powell and Ben Jenkins, Department of Physics, University of West Georgia, Carrollton, GA 30118, USA. The speed of sound in differing concentrations of anti-freeze mixed into distilled water were measured using Iowa Doppler’s sound head equipment. A concentration of store brand anti-
freeze was slowly increased by 10% of total volume per trial and the speed of sound was calculated with the time of flight method. The speed was plotted against the percentage concentration of anti-freeze. Car manufacturers typically recommend that a 50% concentration of anti-freeze to water be used in car engines for coolant purposes. Our range included this value, as well as some concentrations on either side, leaning towards higher percentage water volume mixtures. Through mixture concentrations 10%-70%, the speed of sound increased in a generally linear fashion from 1,536 m/s ± 0.082 m/s to 1,720 m/s ± 0.085 m/s. Future work will look at levels above 70% concentrations.

Section V: Biomedical Sciences

Location: Instructional Complex Room 209

Seyed H. Hosseini and Godwin Ananaba, Presiding

8:00 COMPARING LEVELS OF CYP1A1 EXPRESSION IN MOUSE HEPATOCYTES FOLLOWING EXPOSURE TO INDIGO IN THE PRESENCE OR ABSENCE OF BIOFLAVONOIDS**, Kallie J. Epperson* and Jennifer C. Schroeder, Young Harris College, Young Harris, GA 30582. The aryl hydrocarbon receptor (AhR) is a transcription factor that can be activated by ligand-binding, subsequently regulating transcription of genes such as cyp1a1. Known ligands of the AhR include: benzo[a]pyrene (B[a]P), polycyclic aromatic hydrocarbons, halogenated aromatic hydrocarbons, indigo, and certain bioflavonoids and stilbenoids. In these experiments, we will examine cyp1a1 expression levels using a luciferase reporter assay following exposure of mouse hepatocytes to varying concentrations of indigo and compare these with B[a]P-induced activation. We will also determine if combination treatments with indigo and B[a]P are competitive, additive, or synergistic in their activation of cyp1a1. Further experiments will also explore cyp1a1 expression levels when combining indigo with either the bioflavonoid, quercetin, or the stilbenoid, resveratrol. Funded by the Young Harris College Science Research Initiative.

8:15 EXAMINING CYP1A1 EXPRESSION IN MOUSE HEPATOCYTES FOLLOWING EXPOSURE TO HICKORY SMOKE CONCENTRATE IN THE PRESENCE OR ABSENCE OF BIOFLAVONOIDS**, Christian D. Hambrick* and Jennifer C. Schroeder, Young Harris College, Young Harris, GA 30582. The aryl hydrocarbon receptor (AhR) is a cytosolic receptor that has the ability to translocate into the nucleus upon being activated by the binding of agonists, such as benzo[a]pyrene, polycyclic aromatic hydrocarbons (PAHs), halogenated aromatic hydrocarbons (HAHs), or other combustion products. This translocation leads to the expression of specific target genes, including cyp1a1. Many AHR agonists, such as PAHs and HAHs are known human carcinogens. Exposure to these compounds is common and frequent due their presence in charred meat products, air pollution, cigarette smoke, and wood smoke. Some bioflavonoids have been shown to exhibit chemopreventative effects, perhaps by serving as antagonists or partial agonists of the AHR pathway. In these experiments, we aim to examine whether hickory smoke concentrate (which is used in cooking) can activate cyp1a1 expression in mouse hepatocytes. To measure this activation, a luciferase reporter assay will be utilized. Further studies will determine if cyp1a1 expression induced by the smoke can be reduced...
by cotreatment with the bioflavonoids, kaempferol and quercetin. Funded by the Young Harris College Science Research Initiative.

**8:30 INVESTIGATION OF ANTIFUNGAL PROPERTIES OF SANGUINARIA CANADENSIS EXTRACT AGAINST CANDIDA ALBICANS**, Jordana C. Freitas*, and Andrea L. Kwiatkowski, Young Harris College, Young Harris, GA 30582. The human fungal pathogen *Candida albicans* causes opportunistic infections such as thrush and genital infections in immunocompromised hosts. As strains become antibiotic resistant, it is of medicinal worth to explore naturally occurring compounds such as the ones produced by *Sanguinaria canadensis* for their antimicrobial properties. *S. canadensis* produces benzylisoquinoline alkaloid toxin as a powerful primary defense that is predicted to have medicinal properties. Historically, *S. canadensis* was used by Native Americans to inhibit tumors and bacterial growth. In this study, a disc diffusion assay was used to determine the susceptibility of *C. albicans* to *S. canadensis* extract. Discs containing a 20% ethanol tincture or aqueous solution were placed on Sabouraud agar that had been inoculated with a standardized concentration of *C. albicans*. Cells were grown at 30˚C overnight. Zones of inhibition then were measured. A serial dilution of a 0.15% ethanol tincture or aqueous solution was applied to *C. albicans* in Sabouraud broth, which was then grown overnight at 30˚C. The minimum inhibitory concentration (MIC) of the plant extract was determined by measuring the turbidity of the broths at a wavelength of 600 nm. There were zones of inhibition for both tincture and aqueous solution in the disc diffusion assay, but not for ethanol-only or water controls. The MIC of *Sanguinaria* extract was 0.15 %. These results show that *S. canadensis* extract has inhibitory properties against *C. albicans* and should be investigated as an antifungal treatment. This project was funded by the Young Harris College research grant.

**8:45 DISRUPTION OF MIXED SPECIES BIOFILMS BY NATURALLY SOURCED CHEMICALS AS AN ALTERNATIVE IRRIGANT FOR ROOT CANAL TREATMENTS**, Matthew T. Heard* and Andrea L. Kwiatkowski, Young Harris College, Young Harris, GA 30582. Chemicals such as sodium hypochlorite and chlorhexidine are used to treat apical periodontitis, a disease within the root canal, along with other conditions within the mouth. However, these chemicals have side effects such as toxicity to human cells. For example, sodium hypochlorite is toxic to cells and produces a foul smell. Natural chemicals such as xylitol, lactoferrin, and farnesol can be used instead, without side effects to the patient. Apical periodontitis lesions often contain *Enterococcus faecalis* and *Fusobacterium nucleatum*. This research will test these natural chemicals against biofilms containing mixtures of *E. faecalis*, *F. nucleatum*, and *Streptococcus sanguinis* (a known co-aggregate with *F. nucleatum*). Past research in our lab has experienced difficulty growing *F. nucleatum* biofilms in tissue culture plates. This research will initially focus on the attempt to produce an adequate biofilm from *F. nucleatum* paired with the other bacteria to assist with growth. Bacteria will be added into each well of a 96-well tissue culture plate at a concentration of 1 x 10^6 colony forming units per mL of Schudeler broth. Cells will be grown for 72 hours in an anaerobic jar. Once the biofilm is formed, xylitol, lactoferrin, farnesol, chlorohexidine, and sodium hypochlorite (control) will be applied for 5 minutes in order to disrupt the biofilms. The
remaining biofilm will be stained with safranin dye and solubilized with ethanol. A microplate reader will determine the amount of biofilm remaining. Supported by Young Harris College Undergraduate Research Initiative.

9:00 Break

9:15 ANTIMICROBIC EFFECTS OF XANTHORHIZA SIMPLICISSIMA RHIZOME EXTRACTS ON SELECTED BACTERIA OF THE DIGESTIVE SYSTEM**, Irene Payne*, P. T. Arnold, and A. L. Kwiatkowski, Department of Biology, Young Harris College, Young Harris, GA 30582. Xanthorrhiza simplicissima (yellowroot), has been used in Appalachian folk traditions as a treatment for digestive ailments. It contains the isoquinoline alkaloid berberine within its roots, which is reported to have antimicrobial properties, analgesic effects, and the ability to lower cholesterol and blood glucose levels in humans. In this experiment, 6.25 g of dehydrated X. simplicissima rhizomes were mixed with 50 mL of 75% ethanol, creating a tincture, which was tested against a 75% ethanol control group. Sterile filter paper discs were soaked in the tincture and other discs were soaked in the alcohol and placed in petri dishes containing Brain-Heart Infusion agar inoculated with a lawn of one of the following bacterial species: Streptococcus salivarius, Salmonella enteritidis, Escherichia coli, and Enterococcus faecalis. Each plate was incubated for 24 h at 37°C. The following zones of inhibition for the tincture were measured (in mm) and compared to controls (n=20 for each treatment and control): S. salivarius 14.8±2.9 compared to the control 1.5±2.0; S. enteritidis 1.9±1.6 compared to the control 1.1±0.7; E. coli 5.0±2.1 compared to the control 0.0±0.0; and E. faecalis 3.4±2.3 compared to the control 0.0±0.0. Results indicated that the tincture treatments created significantly greater zones of inhibition than the ethanol controls in each bacterial species tested (p ≤ 0.001, t-test). Following up on these results, Minimum Inhibitory Concentration (MIC) studies are currently in progress.

10:00 Section Business Meeting

Posters (will be displayed Friday 5:00 to 6:00 pm)

POSTERS

FUSOBACTERIUM NUCLEATUM MUTANT CONSTRUCTION USING TRADITIONAL CLONING AND CRISPR BASED SYSTEMS**, Kyle R. Dennis*, and Andrea L. Kwiatkowski, Young Harris College, Young Harris, GA 30582. Xylitol is found in common oral care products such as mouth wash and toothpaste and inhibits the growth of a variety of bacteria including Fusobacterium nucleatum. F. nucleatum can contribute to tooth decay, most often by its ability to act as a coaggregate with other oral bacteria like Streptococcus mutans. Xylitol impedes the growth of F. nucleatum. It is expected that the five-carbon sugar alcohol is transported via the phosphotransferase system (PTSs) into the bacteria and is transformed into xylitol phosphate which F. nucleatum is unable to metabolize. This restriction on the bacteria’s metabolism essentially “starves” the bacteria and also prevents the creation and excretion of lactic acid which degrades tooth enamel. This research aims to compliment the results of previous research which showed that in the presence of a high-sucrose diet, the deletion of the fruI gene in S. mutans resulted in diminished colonization of the teeth. The fruI gene codes for a
phosphotransferase system protein which helps to transport xylitol in \textit{S. mutans}. This research aims to disrupt the \textit{frul} gene in \textit{F. nucleatum}. This will be accomplished by using either a traditional or a CRISPR type II cloning system. In both methods \textit{frul} will be disrupted by an insertion, of either an antibiotic resistance gene or a modified part of the \textit{frul} gene. In the CRISPR method, Cas9 will be expressed in \textit{F. nucleatum} and will create the mutation using a guide RNA. Mutant \textit{F. nucleatum} should grow in the presence of xylitol because xylitol transport in the cell will no longer occur. This project was funded by the Young Harris College research grant.

THE ROLE OF DIFFERENT FORMS OF EXERCISE ON AEROBIC FITNESS IN NCAA FEMALE LACROSSE PLAYERS **, Jaclyn Kernohan* and Linda G. Jones, Young Harris College, Young Harris, GA 30582. Lacrosse is a sport that requires endurance as well as strong, quick responses. This study was designed to determine the effectiveness of different exercise regimens on aerobic fitness by measuring such parameters as lung capacity and heart rate recovery. Twenty-two female lacrosse players were divided into two groups with approximately equal numbers of the different player positions in each group. In addition to the regular workout regime of the Young Harris College Women's Lacrosse team, the two groups participated in different conditioning exercises for the final ten minutes of the regular practice period. One group participated in stretching exercises while the other group added plyometric exercises to the regular workout with the hypothesis that the plyometric group would improve their aerobic fitness to a greater degree than the stretching group regardless of their position on the field. The initial fitness levels of all participants were measured during the fall pre-season conditioning period using the iWORX data acquisition unit that recorded VO$_2$, VCO$_2$ and heart rate during a modified stress test. The second set of measurements will be obtained during the active lacrosse season in the spring. The data collected will then be used to compare fitness levels before and after the different exercise protocols by examining differences in heart rate recovery, VO$_2$max and the Respiratory Exchange Ratio (RER). 


data collected will then be used to compare fitness levels before and after the different exercise protocols by examining differences in heart rate recovery, VO$_2$max and the Respiratory Exchange Ratio (RER). 

Funding for this project was from the Young Harris College Undergraduate Research Initiative.

ALTERATIONS IN BEHAVIORAL RESPONSES FOLLOWING ACUTE EXPOSURE TO ALCOHOL IN ADULT ZEBRAFISH **, Kristina Kauffman* and Linda G. Jones, Young Harris College, Young Harris, GA 30582. Zebrafish (\textit{Danio rerio}), used in developmental studies for many years, are increasingly being used to model human pathophysiology and behavior. In that alcohol has been shown to inhibit the reaction time of some vertebrate organisms, this study was designed to determine the effects of acute alcohol exposure on the behavioral response to a predatory stimulus in adult zebrafish. Fifteen zebrafish were tagged using the Visual Implant Elastomer (Northwest Marine Technology) and individually monitored by video-tracking during three successive trials using a net to initiate a stress/avoidance response. The following week, the fish were exposed for 20 minutes to 1% ethyl alcohol (v/v) and the same test was again video-recorded individually for each fish. Qualitative changes in behavior following alcohol exposure compared to the initial trials were apparent, though the data have yet to be quantified. This project is ongoing and we anticipate collecting more data in
repeat trials with different levels of alcohol exposure. **Funding for this project was from the Young Harris College Undergraduate Research Initiative.**

**IMMUNOHISTOCHEMICAL ANALYSES REVEAL CHANGES IN ASTROCYTIC DENSITY IN THE DORSAL RAPHE NUCLEUS AFTER STRESS,** India Nichols*1, Chuma Okere1, Ketema Paul2, 1 Department of Biological Science, Clark Atlanta University, Atlanta Georgia, 2 Neuroscience Institute, Morehouse School of Medicine, Atlanta, Georgia. The dorsal raphe nucleus (DRN) is an important component of the stress response circuit. In rats, acute stress alters nitric oxide synthase (NOS) activation in the DRN. Specifically, active NOS expression is enhanced in the caudal region. Astrocytic organization in the DRN is important because it may help reveal the regulatory role of NOS on stress responses. Glial fibrillary acidic protein (GFAP), a marker for astrocytes, increases in other stress-sensitive brain areas during chronic stress. Our hypothesis is that there will be an increase in GFAP staining as a result of stress, revealing a unique organization among astrocytes. Following stress coronal sections (20 µm-thick) of the DRN from rat brains were stained with GFAP antibody and then visualized with avidin biotin complex and peroxidase (n=3-4). Mean gray value for the rostral and caudal subregions were analyzed. This analysis revealed differences in astrocytic density between acute and chronic stress for both rostral and caudal subregions. Astrocytic organization in the rostral DRN was different from the caudal region; the rostral staining was ubiquitous while the caudal staining was localized mostly to the midline and lateral wing regions. Although acute and chronic stress increased astrocytic density throughout the DRN, it did not change the organizational relationship between rostral and caudal regions. To conclude, this unique pattern of astrocyte distribution may suggest functional specialization for astrocytes in the DRN especially as a response to stress.

**Section VI: Philosophy and History of Science**

**Location:** Instructional Complex Room 220

**Charmayne E. Patterson, Presiding**

9:00  **AN HISTORICAL SKETCH OF NINETEENTH CENTURY GEOLOGY — A FEW DISCOVERIES AND CONTRIBUTIONS OF EARLY NATURAL PHILOSOPHERS AND THEIR JOURNALS.** Elliott O. Edwards Jr., Bartram Trail Conference, Savannah, Georgia 31410. Many nineteenth century philosophers have been almost forgotten since their contributions to geology. Almost 200 years ago, in July 1818, the “American Journal of Science and Arts” produced its first journal and provided it to the public. The journal which lasted over a hundred years was one of only a few scientific periodicals that continued to be published without any interruption since that historic day in July. We credit the Greeks with taking the lead in the beginning of science, but a century before Aristotle (384 – 322) saw the building of the Parthenon. This study shows those hundred years of combined industrial and science progress should be recognized for the period of science it endured. This was the period that encompassed some of the most important and early developments of science and industry. The nineteenth century will always occupy a position in world history as the epoch, where a combination of the greatest achievements in all divisions of science occurred which led to the most exceptional industrial progress of this generation. It was
also during the nineteenth century that investigations in the scientific world where generated methods of observation carried out under controlled conditions that lead to experimentation. This paper will review some of the journals that introduced the scientists, their theories, and the sub geological sciences that were individually being discovered in the interest of science.

9:30 ARE COUNTERFACTUAL HISTORIES REALIZABLE? Ronald E. Mickens and Charmayne Patterson, Clark Atlanta University, Atlanta, GA 30314. For many historians the subject of “counterfactual history” is a topic of disdain and gives rise to various arguments concerning the scholarly validity of its subject matter. However, when viewed within the context of current modern physics, the major, previously thought negative features of counterfactual history (CFH) may prove to be irrelevant. We present arguments to affirm the actual existence of CFH’s, provided one or more of the recent formulations of “multiverse physics” are physically valid. References are (1) Robert Cowley, editor, “What If?” Putnam, New York, 2001, (2) Bernard Carr, editor, “Universe or Multiverse” (Cambridge University Press, New York, 2007.

10:00 Section Business Meeting

10:30 THE ROLE OF HISTORY IN SCIENCE: THE REVIEW ARTICLE, Charmayne E. Patterson and Ronald E. Mickens, Clark Atlanta University, Atlanta, GA 30314. We extend our previous discussion on the role history plays in the genesis, analysis, and understanding of scientific research. The earlier work concluded that science is associated with progress, this progress can be measured and calculated, and for progress to occur “some things” must be discarded. The current work illustrates these issues within the context of the scientific review article. Background information is given in the two references: (1) C. E. Patterson, R.E. Mickens, “The Role of History in Science”, Georgia Journal of Science (2015) 73 (#1): 66; (2) R. Creath, “The Role of History in Science, “Journal of the History of Biology (2010) 43: 207-214.

11:00 GEORGE WASHINGTON CARVER AND HIS (POSSIBLE) CURE FOR POLIO, Breighlynn Polk*, Ronald E. Mickens, and Charmayne Patterson, Clark Atlanta University, Atlanta, GA 30314. After World War I, America was faced with the ravages of annual (mainly during the summer) polio outbreaks, which occurred primarily in children under the age of ten. In the absence of a medical cure, many forms of treatment were advanced, tried, and found grossly inadequate. George Washington Carver was led to believe, by his actions and the opinion of others, that he might have a treatment, if not a cure, for polio. This presentation discusses the following issues: 1) What was Carver’s cure? 2) Who (individuals, organizations, etc.) gave credence to Carver’s work on a possible treatment for polio? 3) What was the final outcome? 4) And, who were the individuals involved in making the definitive decision as to whether Carver actually achieved a cure? In addition to examining the lessons learned, we also consider why this aspect of Carver’s scientific production is not generally known today.
Section VII: Science Education
Location: Instructional Complex Room 222
Mike Sakuta, Presiding

9:00 BETTER OR WORSE? A LONGITUDINAL ASSESSMENT OF VARIATION IN STUDENT PERFORMANCE IN FRESHMAN BIOLOGY COURSES, Charlotte Christy, Augusta University, Augusta, GA 30904. A trend of decreased academic performance by American students is a common topic of conversation and concern in both academic and non-academic circles. This, in part, has led to increased emphasis on pedagogical innovation and on assessment of teaching and learning. Valid assessment is a task easily as complex as the activities it measures. As part of a personal assessment process, I have retained the keys to most exams I’ve administered over the preceding 15+ years. These record the number of students taking the exam, the grade distribution, and the number who missed each of the machine-scored, constrained answer questions. Some of these questions appear in identical or very similar form on multiple exams and can be used to address the question: Is student performance getting better or worse? This analysis uses exams from freshman-level Biology courses. The common questions were coded by category of intellectual activity, such as: simple factual recall; recall of the sequence of steps in a process; concept application; problem solving; logical inference; and, biology-specific math problems. Arranging the percent of students missing the question by date of exam makes any trends in performance immediately obvious. While there is some variation, no clearly defined trends of increased or decreased performance were found. This suggests that student abilities have also remained unchanged. Alternate explanations include a coordinated shift, in opposite directions, of the relative abilities of these students and their instructor.

9:30 USING STUDENTS’ REFLECTIONS TO IMPROVE INSTRUCTION: ACTION RESEARCH, Ozden Sengul* and Renee S. Schwartz, Georgia State University, Atlanta, GA, 30303. This action research study examines implementation of an alternative approach to teaching and learning practices in an undergraduate physics laboratory in an urban university. Instructor-as-researcher plans, observes, acts, and reflects on teaching and learning processes by incorporating the 5E instructional model. The main purpose of this study is to explore how the 5E model can be incorporated into lesson planning for three-hour laboratory instruction as a way to enhance the effectiveness of teaching practices and improve student understanding. This study demonstrates how the instructor takes action based on students’ reflections on the instructional strategies. Data includes lesson plans, pre- and post-reflective journal of the instructor and students’ reflective journals. The results provide the insight of students’ learning experience, their challenges and successes of the lesson. Through this action research, the instructor will present how students’ reflections help the instructor receive information from students on their learning process and how students’ reflections were helpful in the re-planning process.

10:00 Section Business Meeting
TRAUMA PATTERNING ON RIBS AS AN INDICATOR OF BLAST FORCE TRAUMA, Michael McClung, Kennesaw State University, Kennesaw, GA 30144. There is a small body of literature focusing on blast force trauma from an anthropological perspective. An experiment was designed simulating a homemade explosive placed in a public area. The experiment was conducted in September 2015 with the assistance of law enforcement who constructed non-military grade explosives. Pigs (sus scrofa) (n = 6) were used as proxy victims for the experiment to test the biomechanical response of bones to a blast event. To control for various trauma patterning, three specimens were placed close to walls and three were exposed to shrapnel away from walls. It was hypothesized there would be a high frequency of fracture types to ribs indicative of ventrally applied force on all specimens, and the specimens positioned near the walls would exhibit a greater number of fractures than those not near a wall. Results demonstrated a mixed presentation of fracture types, frequencies, and locations. As hypothesized, a high frequency of bone failure indicative of ventrally applied force to the ribs was observed, especially in wall specimens. However, the type and location of the fractures was different than anticipated. The bones exhibited failure from both hyperflexion and hyperextension. It is concluded that this particular presentation of trauma was the result of a ventrally applied force that compressed the front of the rib while extending the curvature of the neck of the rib. These findings vary from the conclusions of previous published research. This is significant because it expands the current understanding of skeletal trauma with regards to blast events and corroborates the variability of trauma presentation.

UNDERSTANDING THE PAST: ANALYZING HOW RESIDENTS OF PANCHMATA, INDIA RELATE TO ARCHAEOLOGICAL FINDINGS**, Irina Paymer*, Kennesaw State University, Kennesaw, GA 30144. Across the globe, many contemporary settlements are built on top of archaeological remains. The relationship between the people living in those contemporary villages to the archaeological remains located underneath them is not well studied. Specifically, the relationship between the residents of Panchmata Village in Rajasthan India to the five thousand year old archaeological site beneath their homes has yet to be thoroughly examined. In this paper, a comparison is made between narrative descriptions and archaeological findings in order to discover how the understanding of the past is reflected empirically versus through folklore. Special focus is given to economic and social structures in the area and comparison is drawn to data collected from ongoing excavations at Panchmata and other local sites and that of the Indus Civilization, which surrounds the region. Data collection methods are discussed with special emphasis on the communication barriers encountered and how they were managed.

LIFE IN THE MEWAR PLAIN: ARTIFACT ANALYSIS AT THE SITE OF PANCHMATA**, Katelyn M. Anderson*, Kennesaw State University, Kennesaw, GA 30144. When conducting archaeological research, studying the material culture of a site has the potential to provide insight about the way people lived in the past. This anthropological insight is used to help gain a better perspective
about these ancient communities and how the people were able to thrive within them. This paper will analyze the material culture found during excavations at the site of Panchmata in northwest India. The site of Panchmata is located in the Mewar Plain region of Rajasthan, and was occupied in the 2nd and 3rd millennia BC. The material culture and data gathered from the 2016 excavation season will help determine the sequence of occupation at the site, the activities that occurred there, and how the site’s economy shifted over time. Specifically, analysis of small finds from Panchmata (e.g., beads, decorative objects, small tools, and figurines) will help provide an understanding of the site as a whole its relationship to other sites within the region.

AN ETHNOGRAPHIC AND ARCHAEOLOGICAL COMPARISON OF FLOOR COMPACTNESS USING THE POCKET PENETROMETER, Charles K. Brummeler, Kennesaw State University, Kennesaw, GA 30144. When identifying the floors and other living surfaces of an archaeological site, archaeologists tend to rely on subjective observations, thus creating problems related to standard identification protocols and replicability. To address this issue, recent studies have employed the pocket penetrometer, a small diagnostic tool that measures the resistance of the soil in kg/cm², and therefore provides an objective measure towards the identification of floors and other living surfaces. However, previous studies were conducted in archaeological contexts, thus replicating the problem of subjectivity in confirming that surfaces with high readings were, in fact, house floors. That is, none of these measurements were tested with data from comparable contemporary living surfaces including modern houses that have mud floors. In this study, we sample data points from currently occupied houses, courtyards, walkways, stables, and other ethnographically identifiable soil surfaces in Panchmata, a rural village in northwestern India. This data set provides a control sample from confirmed mud floors, which we then compare to readings gathered from the Second and Third millennium BCE archaeological site located in the village. The data collected give insight into the advantages of using the pocket penetrometer as a diagnostic tool in the field, as well as insight into how to identify floors within the archaeological context.

ARCHAEOLOGICAL EXCAVATIONS AT THE DABBS SITE: AN INVESTIGATION OF MISSISSIPPIAN PERIOD LIFE IN THE ETOWAH RIVER VALLEY, Terry G. Powis¹, Jason Whatley¹, Jamison Jewitt¹, Lindsey Goff*¹, and Katherine Lane¹. ¹Kennesaw State University, Kennesaw, GA 30144. The Dabbs Site, located in the periphery of the Etowah Indian Mounds, dates from the Middle Woodland to the Middle Mississippian period. The site’s main occupation dates to the Middle Mississippian period, a time when Etowah had its greatest political influence over the region. Research has been ongoing at Dabbs for the past four years, which has served primarily as a site for training Kennesaw State University students in field archaeology. Our investigations have centered on remote sensing (metal detecting, ground penetrating radar, magnetometry, and photogrammetry), Phase I shovel testing, Phase II testing, and Phase III data recovery. Based on preliminary results we have identified the center of this small village or hamlet and recorded about 75 cultural features. These features range in size, shape, and function, and combined inform on what the inhabitants of the site were engaged in during the 12th-14th centuries. We have uncovered postholes, refuse pits,
storage pits, and a burial. Of particular interest is the high frequency of storage pits in relation to other features. To date, no dwellings have been identified. Therefore, given the presence and absence of certain feature types, we are focused on defining the nature, structure, and extent of the occupation. Does the site represent a short or long term occupation? If short term which season(s) was it occupied? What were the storage pits being used for? What is the relationship between the inhabitants at Dabbs with those at Etowah? Preliminary ceramic, lithic, and botanical data from several years of research helps to clarify the site’s function and its connection, if any, to Etowah. No funding sources were utilized.

PALEOETHNOBOTANY OF THE DABBS SITE**, Amber Avery*1, Leslie Raymer2, Terry G. Powis1, 1Kennesaw State University, Kennesaw, GA 30144 and 2Paloeobot Consulting, Decatur, GA, 30030. This study examines Woodland through Middle Mississippian plant use at the Dabbs Site, a small village located in the periphery of the Etowah Indian Mounds. It assesses relative contributions of indigenous cultigens and gathered plants, changes in subsistence over time, and wood use patterns. The macroplant assemblage offers evidence of possible spring through fall occupations whose inhabitants engaged in the large-scale collection and processing of nuts, practiced maize gardening, grew indigenous cultigens, and gathered naturally occurring plants. The identified wood charcoal assemblage is indicative of cultural use of locally available pines and hardwoods from hardwood-dominated mixed hardwood and evergreen forests surrounding the site locality. No funding sources were utilized.

UNDER CONSTRUCTION: LANGUAGE AND ASSEMBLAGES OF IDENTITY**, Daniel S. Garner*, University of West Georgia, Carrollton, GA 30118. This study is an ethnosemantics evaluation of identity focusing on how people act to construct their identities through the words they use to describe themselves. Data collection included asking participants to generate a list of terms they identify with and to rank the top five responses they identify with most. Unstructured interviews were also conducted to obtain demographic data and to clarify participant responses. Early results suggest that variables such as gender, sexual orientation, and ethnicity affect participant responses. First, participants who are members of socially marginalized groups tended to construct their identities in terms of their markedness, while members of unmarked groups tended to omit responses that would indicate their membership in unmarked groups. Second, participants who identified as women tended to use more terms that reveal a sense of collectivism and a relational dimension of the self. These results indicate a relationship between social power dynamics and how people construct their identities. Members of socially marginalized groups identify more with the variables affecting their status than those in groups with higher levels of social power. Ethnosemantics serves as a valuable methodological approach that can help reveal how language is used to structure worldview. Although no funding has as of yet been provided for this study, funding will be sought from the University of West Georgia Anthropology Department.

A CROSS CULTURAL ANALYSIS OF CUSS WORDS, AUSTIN CROSS*, University of West Georgia, Carrollton, GA 30117. Ethnosemantics allows researchers to study how people categorize different parts of their world, and by using
ethnosemantics, one can do a cross-cultural comparison of how people categorize cuss words. This study examines the domain of cuss words and cussing across multiple cultures of unilingual and multilingual speakers of various languages. Cuss words tell us about varying levels of appropriateness in certain contexts, and personal knowledge and use of cuss words shows individual differences among the language acquisition and socialization processes. Methods included free listing, pile sorting, and structured pile sorting within a semi-structured interview format. Interviews were conducted with responses coming from the participant’s native language first, then each interview was redone using any secondary languages the participant knew. Analysis of the data revealed that there was considerable overlap among the words provided by the differing levels of English speakers, which shows that there are words that are marked with a higher cultural prominence. When analyzing the results from the various methods utilized, the noticeable theme was that the language acquisition and socialization processes of cuss words differ greatly for first and second language speakers of English. These trends show that culture is a product of the environment in which different factors, such as language acquisition and socialization processes, are influenced by the interaction of different networks of language speakers in a specific area or country.

CONTROLLING CURSING: A STUDENT’S CONFORMITY TO NEW IDENTITY CONSTRUCTS**, Tanner Martin*, University of West Georgia, Carrollton, GA 30118. Across American culture groups, the words viewed as too inappropriate, profane, vile, obscene, offensive, and/or crude for daily conversation could potentially be placed into a semantic domain known as “curse words”. This paper attempts to accomplish three tasks. First, it will analyze the meaning of “cursing” in college students, then it will ask how “cursing” works to establish one’s social identity. For this study, I used ethnosemantic methods, including free-listing and ranking of curse words with seven male and seven female college students between eighteen and twenty-six years of age. Data will be analyzed from a quantitative, as well as qualitative, approach. In this study, I find words that are exclusively derogatory towards females to be utilized more often than any other word choice, reflecting the uneven ratio of female derogatory terms to male derogatory terms that are actively utilized in this particular environment of college students. Moreover, this is significant because the gender exclusive terms listed are codes that males use in order to assert their power over women.

AN ETHNOLINGUISTIC ANALYSIS OF ‘HEALTHY’ EATING IN YOUNG ADULTS**, Sydney T. O’Brien*, University of West Georgia, Carrollton, GA, 30118. This study is an ethnolinguistic analysis of how young adults conceptualize healthy eating. During my ethnosemantic research, I focused on determining what foods were important to my participants, how they organized them, which they considered healthy, and which were their favorites. The five methods employed in the study include pile sorting, two exercises of rank ordering, and two exercises of free listing. The results from these methods were analyzed on the basis of gender, activity level, and ethnicity. I found that different aspects of culture influence how people identify foods as healthy or unhealthy. Within my small-scale study, I had many major findings. First, almost all participants had different ideas of what foods were ‘healthy’ depending on their activity and exercise level, and they
categorized these foods differently. Second, when studying differences between ethnicities and gender, I found that between my group of 12 participants, there was not much variation on the basis of race or ethnicity, and there was a slight variation between genders in relation to toughness and texture of foods. Lastly, I found that when asked to rank and identify their favorite foods, only one person selected and ranked items that they had also identified as ‘healthy.’ This suggests that public health efforts should be made for more focused nutrition education to bring favorite foods in alignment with healthy foods. In sum, ethnolinguistic methods are valuable because they allow us to understand how people categorize their world, and in this case, it allows us to focus on what public health efforts could be made in the future.

CHILDHOOD OBESITY IS MORE THAN OBESITY: A STUDY OF HEALTH DISPARITIES AND INEQUALITIES IN COMMUNITY BASED PROGRAMS**, Symantha N. Dawson*, University of West Georgia, Carrollton, GA 30117. The United States has become notorious for the “obesity epidemic” that has started taking place. There has been a strong push to try and combat this from the public health and medical sectors and this “push” has resulted in several nationwide programs promoting health and wellbeing via exercise, nutrition, and education. Some of these programs have been specifically designed to try and combat childhood obesity rates, specifically through means of sustainability (walking or biking instead of driving and other “green” methods). The overall goals of the programs are positive and beneficial, but they are only helpful to those that use them. Inherent stigmas are associated with free programs as anyone who needs it may use it; a privilege of time is also associated with these programs, which creates inequalities/disparities for those who do and do not use these programs. My research will be to study both those who do and do not use a particular national program called “Safe Routes to School” via in-person interviews and participant observation to assess the extent to which these disparities are happening, and to present possible solutions for this. I expect that there is a trifecta of disparities that occur between gender/race, class, and overall health/fitness which impede the overall goal of the program. This study potentially contributes to the Critical Medical Anthropological approach, understanding the duality of health and culture, and potential overall wellness of the community. Funding for this study was provided by the University of West Georgia and Tanner Medical System.

WE ARE OUR OWN BODYGUARDS, Alexandra Illidge*, University of West Georgia, Carrollton, GA 30118. Womankind faces a constant stream of hazards and perils strictly due to their gender. Because of this, women have been taught to create security through their own means when none is provided for them. The Greenbelt, which will be a 16 mile long walking and biking trail, located in Carrollton, Georgia, has been created in an effort to counteract the negative health trends and is primarily used for recreational activities. A study of Greenbelt users was designed to learn about its usage patterns by using interviews, surveys, and checklists of participants collected from the users of the Greenbelt. This study suggests how women find their own ingenious and innovative ways of protecting themselves from potential harm. During interviews, we learned that some women wished that there were more precautionary safety
measures on the trail. In response to the lack of such measures, the women felt that to be able to enjoy the Greenbelt, they must create their own security by means of walking in groups, taking larger dogs with them, carrying car keys and small weapons, and only going out at certain times of the day. Our study provides valuable perspectives from its users that can shape future improvements in women’s health and safety. Funding for this study was provided by the University of West Georgia and Tanner Medical System.

SOCIAL STRATIFICATION AND ITS EFFECTS ON USAGE PATTERNS OF A TRAIL IN CARROLLTON, GA**, Jonathan W. Baugh*, University of West Georgia, Carrollton, GA 30118. The Greenbelt is a roughly 16-mile trail that allows members of the Carrollton community the opportunity to live a healthier lifestyle through activities such as jogging and cycling. During the Fall while gathering data from people on the Greenbelt through surveying, it came to my attention that the majority of people that chose to actively use the Greenbelt shared a common Caucasian ethnic background. To gain a better understanding of why racial diversity on the Greenbelt is low, I have begun doing research at a predominantly African American housing unit that is located near the Greenbelt. There, I will be conducting semi-structured interviews and collecting surveys recording usage patterns of the Greenbelt. By analyzing why other ethnic groups do not use the Greenbelt, it is possible that researchers can identify the reasons for lack of ethnic diversity and identify ways of encouraging use by minority groups that are currently under-represented on the Greenbelt. By utilizing mixed methods and approach this research with culturally relativistic principles I believe that a more diverse Carrollton community becomes a tangible goal. Not only will Carrollton become more welcoming and culturally varied, research from this study may be applied with other ethnically isolated communities and contribute in some way to the cultural unification of our world. Funding for this study was provided by the University of West Georgia and Tanner Medical System.

Posters (will be displayed Friday 5:00 to 6:00 pm)

POSTERS

PRELIMINARY ANALYSIS OF THE PALEOINDIAN AND ARCHAIC LITHIC ASSEMBLAGES FROM SITE 9RI381, RICHMOND COUNTY, GEORGIA, Janaka A. Greene1, Ashley M. Smallwood1, Thomas A. Jennings1, 1University of West Georgia, Carrollton, GA 30118. Site 9RI381 is located on an oxbow remnant of the Savannah River in Phinizy Swamp within Richmond County, Georgia. It was excavated during University of West Georgia field schools of 2013 and 2014 in cooperation with the Georgia Department of Transportation and the Georgia Department of Natural Resources. This poster presents the preliminary results of the analysis of the lithic materials. Points recovered span several occupation periods ranging from the Late Paleoindian to the Late Archaic. In addition to diagnostics, we present tool types and debitage associated with each cultural component.

PHOTOGRAMMETRY AND ITS APPLICATION TO ARCHAEOLOGY**, Lindsey A. Goff*, Kennesaw State University, Kennesaw, GA 30144. In the last fifteen years,
the evolution of technology and program development has allowed scientists to translate digital photographic measurements into lifelike 3D models. This process is identified in science as photogrammetry. This is a specialized field, requiring the specialist to train in the operations and techniques of digital photo equipment, programming, and modeling. Photogrammetry has made its way into archaeology, allowing archaeologists to document features, and artifacts in the field in order to analyze archaeological finds and data through photos and 3D models. A project was conducted to see the progression of learning photogrammetry as it applies to archaeological artifacts in the lab and field. Four test cases were conducted over a period of five months and included: a human skull, a Maya ceramic bowl, and two types of vehicles in an outdoor environment. Data from each of these were collected and analyzed. Results, through rigorous trial and error, show that a novice can learn to use this highly technical software and create 3D models for a variety of applications in archaeology. No funds were utilized in this project.

AN ASSESSMENT OF DIETARY TRENDS IN SOLDIERS FROM NAPOLEON’S GRAND ARMY USING STABLE CARBON AND NITROGEN ISOTOPE ANALYSIS, Sammantha Holder*,1, Laurie J. Reitsema*,1, Tosha Dupras2, and Rimantas Jankauskas3, 1University of Georgia, Athens, GA 30602, 2University of Central Florida, Orlando, FL 32816, and 3Vilnius University, Vilnius, Lithuania LT-01513. This study examines dietary trends in Napoleonic soldiers discovered in 2001 in a mass grave in Vilnius, Lithuania using stable isotope analysis. These skeletal remains represent soldiers from Napoleon’s Grand Army who died during their march from Moscow to France, following the Russian Campaign of 1812. Soldier diet provides information on military strategy: soldiers may be provisioned by rations, which reflects a significant organized effort on the part of the state to support its military, or soldiers may fend for themselves during campaigns, living off the land, as was the case with Napoleon’s army. Seventy-two individuals were selected for stable carbon and nitrogen isotope analysis of femoral collagen to investigate dietary trends. It was hypothesized that career soldiers would exhibit stable isotope values indicative of wider dietary breadth than young soldiers due to Napoleon’s policy of soldiers living off the local lands during their travels in war campaigns. The median δ¹³C value is -17.4‰, ranging from -19.2‰ to -11.8‰. The median δ¹⁵N value is 10.8‰, ranging from 10.6‰ to 11.1‰. These isotope values are typical of inland European populations, reflecting diets of predominantly C₃ plant protein with little to no marine resources, with some variation. Three age groups were established to examine differences in diet between young conscripts, junior soldiers with previous experience, and career soldiers. No statistically significant differences were found in stable carbon or nitrogen isotope values between groups (Kruskal Wallis: P=0.625 for δ¹³C, P=0.257 for δ¹⁵N). It appears that diet did not change significantly from childhood to career military service. This may be the result of individuals consuming isotopically similar resources throughout their life or due to the averaging effect of bone remodeling on stable isotope values.

BIOARCHAEOLOGICAL SEX ESTIMATION: UTILIZING TIBIA MEASUREMENT ANALYSIS ON ANCIENT CRETAN POPULATIONS, Princess A. Wilson*, Kennesaw State University, Kennesaw, GA 30144. Bioarchaeological techniques
provide methods for determining sex of skeletons. It is important to determine
the sex of individuals because this information provides greater insight into
ancient societies. Currently, bioarchaeologists use the pelvis, long bones, and
skull to determine the sex of individuals. The most accurate sexing results come
from the pelvis bone because of the differences females have due to childbirth
adaptations. Unfortunately, in bioarchaeological and archaeological excavation,
finding intact human remains is almost never the case. This research attempts to
create a standard of sex estimation for temporally similar populations that
subsisted on the island of Crete after Roman Conquest. Creating multiple sex
estimate standards benefits the world of bioarchaeology because complete intact
skeletons are not always available and because of commingled burials. The
research presented examines the circumference of recovered tibiae which were
measured at the foramen magnum and subjected to SAS 9.4 simple regression
and logistic regression tests. The logistic model showed 87.5% to 93.75% accuracy
of attempted sexing. For the female responses where the sex was already known,
the test yielded 100% accuracy for eight data entries. For males with sex already
known, the test yielded about 87.5% accuracy. These results are well within the
accuracy scores from other studies done utilizing tibiae measurement analysis.
THE GEORGIA ACADEMY OF SCIENCE
Affiliated with the American Association for the Advancement of Science, The Georgia Academy of Science is composed of “Residents and non-residents of Georgia who are engaged in scientific work, or who are interested in the development of science.” The purpose of the Academy of “the promotion of interests of science, particularly in Georgia.” The Georgia Academy of Science was organized in 1922 and incorporated as a non-profit organization in 1953. Originally, eligibility for membership in the Academy was “definite achievement in some branch of scientific activity,” and the number of members was set at fifty. This number gradually increased to ninety-five by 1934, and in 1937 the numerical limitation was removed. For several years the Academy affairs were administered by Fellows, but today this class of membership is honorary only, and all members who are residents of Georgia are equally eligible for Academy offices. Currently the membership of the Georgia Academy of Science is approximately 450, composed of men and women from all scientific disciplines and interest, located throughout the state of Georgia. In addition to direct membership in the Academy, affiliation of scientific societies with the Academy is also possible. At present the Georgia Junior Academy of Science and the Georgia Genetics Society are affiliated with the Academy, and have representatives on the Council, which is the governing body of the Academy. The primary activities of the Academy are centered around the Journal, the Annual Meeting and the Georgia Junior Academy of Science. The Georgia Journal of Science is a recognized scientific publication, and is to be found in libraries throughout the United States and in many foreign countries. The Journal is published four times each year, the April issue being devoted to the abstracts of papers presented at the Annual Meeting. The Annual Meeting of the Academy presents an opportunity for scientists and others interested in the development of science to meet, visit, and deliver scientific papers. Members of the Academy belong to Sections representing various fields of scientific endeavor the Annual Meeting is primarily oriented towards the programs of these Sections. In order to fulfill the growing requirement for interdisciplinary conferences one session of the Annual Meeting is devoted to a joint program in which the entire Academy participates. 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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