

2017

Abstracts and Program for the Annual Meeting of the Georgia Academy of Science, 2017

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GEORGIA ACADEMY OF SCIENCE

ANNUAL MEETING
March 24th–25th, 2017
Young Harris College
Program



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Top right image by Yolanda Evans



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NORTH GEORGIA™

GAS President's Welcome and Report of the Academy Council

Greetings Academy Members and Guests,

Welcome to the 2017 Annual Meeting of the Georgia Academy of Science!

The Academy is most grateful to President Cox for inviting our organization to Young Harris College. We are also thankful to Jennifer Schroeder, members of the local arrangements committee, and the faculty, staff and students of Young Harris College for their hard work and hospitality. We are lucky to have 70 oral presentations and 41 posters at this year's meeting.

The Academy has had another productive year. The Council has overseen the continuation of poster awards and student travel awards (more than twice as many applicants this year as last). We have now transitioned the meeting issue, like the rest of the GA J. of Science, to an open, electronic format that is indexed and globally available. We have also accepted invitations from the University of West Georgia to host the 2018 annual meeting and from the University of North Georgia-Gainesville to host the 2019 annual meeting. Additional work of the Council can be found on our web page.

With the conclusion of this year's meeting I step down as your President and leave you in the very capable hands of Paul Arnold. It has been a pleasure to serve the Academy, and I look forward to many more years as a member of this great community.

I hope you enjoy the meeting and your time in Young Harris.

Sincerely yours,

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

Cumming Dahlonega Gainesville Oconee

The University of North Georgia is designated as The Military College of Georgia and as a State Leadership Institution.



GREETINGS, GAS!

Welcome, members of the Georgia Academy of Science, to Young Harris College for your 2017 annual meeting!

We have been looking forward to hosting your conference and have been busy making preparations for some time now, and I would specifically like to thank the local arrangements committee and our faculty and staff for making this meeting possible.

Science is a vitally important component of the liberal arts environment, and Young Harris College is committed to nurture its development in any way that it can. The Georgia Academy of Science is not only an important organization that fosters scientific research, exchange and collegiality in this great State of ours, but it is also an important part of the learning experience for many undergraduate and graduate students as they go down the road to becoming top-notch practitioners in the art of Science. In addition, GAS is a strong advocate for championing the sciences to the public and political sector of the state of Georgia. Thank you for upholding scientific literacy in a political and media climate where facts and research sometimes take a backseat to more sensationalized, but unfounded conclusions.

Founded in 1886 by a circuit-riding Methodist minister, Young Harris College has a long history of training students, including scientists, in the context of a liberal arts environment. In 2009, YHC made the transition from a 2-year to a 4-year college, with the hopes of having even a greater impact on the academic culture of the state of Georgia. Since that transition, the College has nearly doubled its enrollment and more than doubled the size of its faculty.

The sciences have been a big part of that growth, and our graduates can now be found in a multitude of quality graduate programs and careers. The emphasis of undergraduate research has been a large part of YHCs increasing success, and the faculty of Young Harris College work tirelessly with students in order to make sure that they have the necessary skills to navigate the rigors of the scientific world. In addition to their superb teaching, our faculty also are actively engaged in their disciplines through their own professional endeavors and scientific contributions.

It is my wish that you have a rewarding and productive conference here in the "Enchanted Valley," and that you enjoy the majestic scenery surrounding our campus while you are here. Best wishes from all of us at YHC!

Sincerely,

Cathy Cox, JD
President, Young Harris College

OFFICE OF THE PRESIDENT

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phone 706.379.5137 • 800.241.3754 • **fax** 706.379.4319 • www.yhc.edu

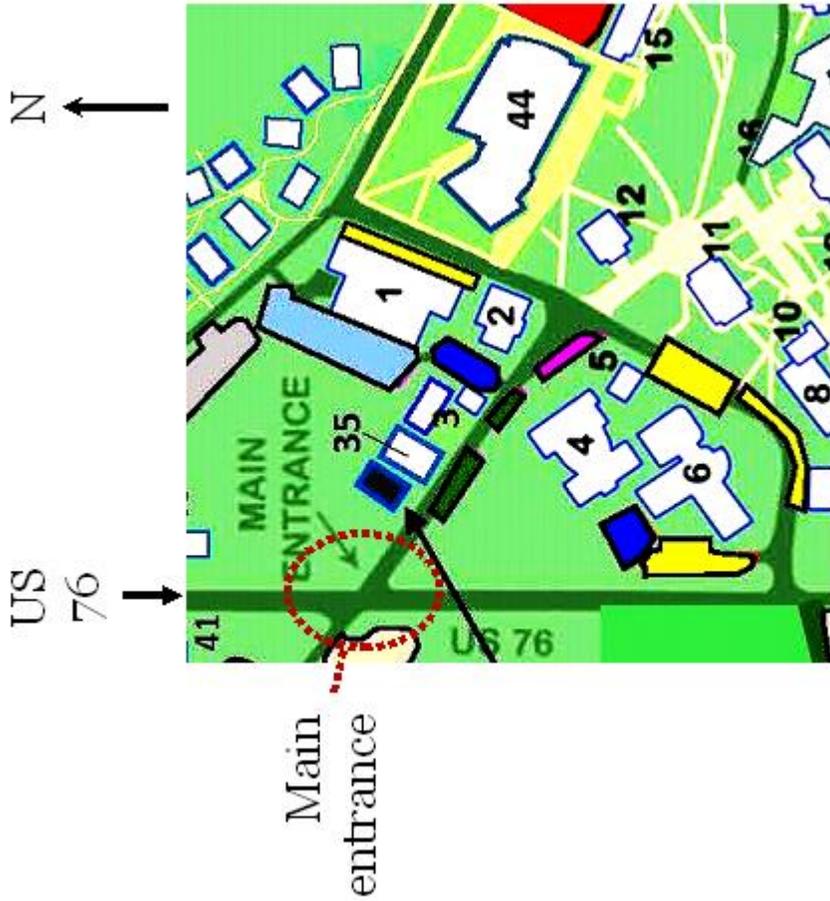


Image courtesy of Young Harris College

- 1. Maxwell Center
- 44. Rollins Campus Center

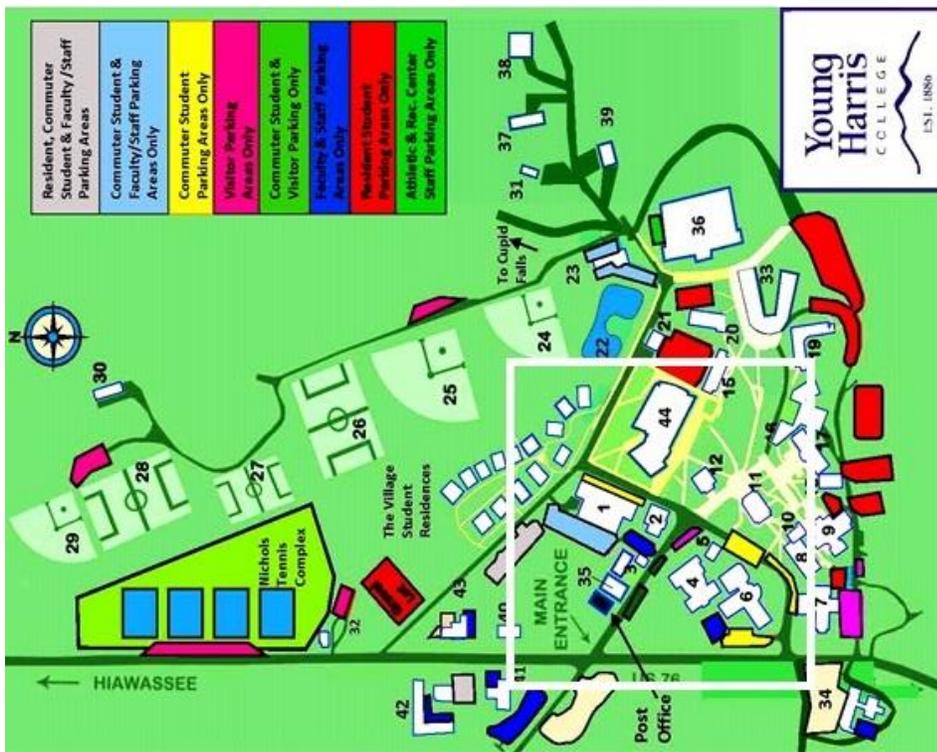


Image courtesy of Young Harris College

- 1. Maxwell Center
- 44. Rollins Campus Center

GAS 2017 PROGRAM

Friday, March 24, 2017

- 11:30 am to 1:00 pm: Georgia Academy of Science Board of Directors business meeting closed to the publicRoom 258, 2nd Floor RCC
- 12:00 pm to 6:00 pm: On-site Registration.....Main Lobby,
Rollins Conference Center (RCC)
- 1:30 pm to 5:00 pm: Section IV: PHYSICS, MATHEMATICS,
COMPUTER SCIENCE, ENGINEERING AND
TECHNOLOGY.....Room 107 Maxwell
- 2:00 pm to 5:00 pm: Section I: BIOLOGICAL SCIENCES.....Hatcher Room
(1st Floor RCC)
- 5:00 pm to 6:00 pm: Poster presentations, refreshments served.....Suber Banquet Hall,
Rollins Conference Center
- 5:45 pm to 6:00 pm: Opening remarks, Dr. Shane Webb and YHC President Cathy Cox
Suber Banquet Hall,
Rollins Conference Center
- 6:00 pm to 6:15 pm: Break
- 6:15 pm to 7:15 pm: Keynote lecture by Dr. William T. Newsome.....Suber Banquet Hall,
Rollins Conference Center

Understanding the Brain: The Path Forward

How can a brain understand itself? Get the low-down from the frontiers of neuroscience research from Bill Newsome, Director of the Stanford Neurosciences Institute and Co-Chair of the United States BRAIN Initiative planning group.

Bill Newsome is an Investigator of the Howard Hughes Medical Institute and Professor of Neurobiology at the Stanford University School of Medicine. He received a B.S. degree in physics from Stetson University and a Ph.D. in biology from the California Institute of Technology. Dr. Newsome is a leading investigator in systems and cognitive neuroscience. He has made fundamental contributions to our understanding of the neural mechanisms underlying visual perception and simple forms of decision making. He has received numerous awards of distinction and was elected to membership in both the National Academy of Sciences (2000) and the American Philosophical Society (2011). Dr. Newsome recently cochaired the NIH BRAIN working group, charged with forming a national plan for the coming decade of neuroscience research in the United States.

7:30 pm and 8:15 pm: Planetarium Showings.....Rollins Planetarium, Maxwell
(Tickets required, one per attendee provided with registration.)

Saturday, March 25, 2017

7:30 am to 8:30 am: Light breakfast.....Maxwell Lobby
7:30 am to 9:30 am: On-site Registration.....Main Lobby,
Rollins Conference Center (RCC)
8:00 am to 12:00 pm: Oral presentations/Section Business Meetings
Section I: BIOLOGICAL SCIENCES.....Hatcher Room (1st Floor RCC)
Section II: CHEMISTRY.....Room 106 Maxwell
Section III: EARTH AND ATMOSPHERIC SCIENCES.....Room 116 Maxwell
Section IV: PHYSICS, MATHEMATICS, COMPUTER SCIENCE,
ENGINEERING AND TECHNOLOGY.....Room 107 Maxwell
Section V: BIOMEDICAL SCIENCES.....Room 257 RCC
Section VI: PHILOSOPHY AND HISTORY OF SCIENCE.....Room 117 Maxwell
Section VII: SCIENCE EDUCATION.....Room 258 RCC
Section VIII: ANTHROPOLOGY.....Room 113 Maxwell
12:00 pm to 1:00 pm: Lunch.....Suber Banquet Hall,
Rollins Conference Center
1:15 pm to 1:45 pm: Student awards and Academy Business
Meeting.....Suber Banquet Hall,
Rollins Conference Center
2:00 pm: Hike at Track Rock led by Dr. Paul ArnoldMeet at Maxwell Lobby
(Carpool or caravan to the trail head.)

FRIDAY PAPER PRESENTATIONS

***Denotes student presenter**

****Denotes student research in progress**

Section I: Biological Sciences

Rollins Conference Center, Hatcher Room, 1st Floor RCC

Johnathan G. Davis, Presiding

- 2:00 EFFECTS OF RESVERATROL ON AHR ACTIVITY IN CELLS TREATED WITH BENZO[A]PYRENE OR INDIGO, Abigail L. Griffiths*, and Jennifer C. Schroeder
- 2:15 A PRELIMINARY ASSESSMENT OF THE MACROINVERTEBRATE BIODIVERSITY OF CORN CREEK**, J.B. Rowe*, B.H. Donaldson*, J. Schrader*, and K.P. Miller
- 2:30 FACTORS AFFECTING MORTALITY OF LARGEMOUTH BASS *MICROPTERUS SALMOIDES* IN COMPETITIVE TOURNAMENTS, Parker Moon*, Zoelle Reinke* and Johnathan G. Davis
- 2:45 AN EXAMINATION OF SELECTIVE FEEDING AND MOLECULAR RECOGNITION IN THE CILIATE, *TETRAHYMENA PYRIFORMIS* EHRENBERG, 1830, Blaise W. Menta*, Ashley E. Kirby, and Frank S. Corotto
- 3:00 EVALUATION OF FACTORS INFLUENCING SPOTTED BASS *MICROPTERUS PUNCTATUS* USE OF INTRODUCED STRUCTURES IN A GEORGIA HIGHLAND RESERVOIR, Ethan Barrett* and Johnathan G. Davis
- 3:15 **Break**
- 3:30 ASSESSMENT OF HABITAT PREFERENCES OF THE HIWASSEE CRAYFISH *CAMBARUS HIWASSEENSIS***, Samuel Flagg*, William Moon and Johnathan G. Davis
- 3:45 ECOSYSTEM ASSESSMENT OF AN AQUATIC RESOURCE FOR K12 EDUCATION AND RECREATION**, Joleishia N. Cooper*, B. Bellflower, C. Calhoun, A. Thompson, K. Warren and B. L. Simmons
- 4:00 EVALUATION OF AGE AND GROWTH OF REDHORSES IN BRASSTOWN CREEK, GEORGIA, Joshua Goeltz*, Kaylyn Crossley* and Johnathan G. Davis
- 4:15 DETERMINATION OF THE BINDING SITE OF ADENOVIRUS E4 11K ON THE CELLULAR PROTEIN DDX6**, Clint Edmunds, Michael Hammond and Kasey Karen
- 4:30 A DRIFT FENCE SURVEY OF THE SMALL VERTEBRATES IN A MIXED HARDWOOD HABITAT IN LAMAR COUNTY, GEORGIA, ** Kori Ogletree* and M.J. Bender
- 4:45 IDENTIFICATION OF NEW MICRORNAS IN *DUNALIELLA SALINA***, Alicia Winfrey, Glen Borchert and David Chevalier

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

Section IV: Physics, Mathematics, Computer Science and Technology

Maxwell Center, Room 107

L. Ajith DeSilva, Presiding

- 1:30 ELEMENTAL ABUNDANCES IN 16 PLANETARY NEBULAE FROM DEEP, HIGH-RESOLUTION OPTICAL SPECTROSCOPY**, Cameroun G. Sherrard*, N. C. Sterling, Simone Madonna, Courtney L. Spencer and A. L. Mashburn
- 1:45 INVESTIGATING THE EFFECTS OF MAGNETIC INTERACTION ON THE INDIRECT RIXS PEAK LOCATION, Kenny Stiwinter* and Trinanjan Datta
- 2:00 R-MATRIX PHOTOIONIZATION CROSS-SECTION CALCULATIONS FOR BROMINE AND RUBIDIUM IONS**, John E. Harrison*, N. C. Sterling, Manuel A. Bautista, Austin B. Kerlin and A. L. Mashburn
- 2:15 DEVELOPMENT OF AN INEXPENSIVE LOW-POWER SONDE USING THE TEENSYTM MICROCONTROLLER**, C. Morrison*, J. A. Hauger, J. Reichmuth and M. Roeber
- 2:30
- 2:45 **Break**
- 3:00 THERMODYNAMIC PROPERTIES OF PROTEIN FOLDING PROCESS**, Vattika Sivised* and Theja De Silva
- 3:15 AN INVESTIGATION OF TITANIUM DIOXIDE NANOPARTICLES FOR PHOTOCATALYTIC PROPERTIES**, Christian A. Ozburn* and L. Ajith DeSilva
- 3:30 AN INVESTIGATION ON TRANSPARENT CONDUCTIVE P-TYPE COPPER (I) IODIDE THIN FILMS, J. Harwell*, L. Ajith DeSilva, T. M.W.J. Bandara, G.R.A. Kumara, A.G.U. Perera, K. Tennekone and Neal Chesnut
- 3:45 STUDENT LED SUPPLEMENTAL INSTRUCTION TO IMPROVE STUDENT SUCCESS IN CLASSICAL MECHANICS, Joshua S. Buth* and Javier E. Hasbun
- 4:00 NUMERICAL MODELING OF BROMINE, RUBIDIUM, AND XENON IN ASTROPHYSICAL NEBULAE**, Courtney L. Spencer*, N. C. Sterling, R. L. Porter, and Cameroun G. Sherrard
- 4:15 OBSERVATION OF RESONANCE REPULSION IN A COUPLED TORSION OSCILLATOR SYSTEM, William Reeves* and Tom Colbert
- 4:30 THE EFFECT OF TEMPERATURE ON THE ELECTRICAL RESISTANCE OF CARBON NANOTUBES**, Hannah Watkins* and Ben deMayo,
- 4:45 THE MICROCONTROLLER MEETS WATER SCIENCE: DEVELOPMENT OF INEXPENSIVE ENVIRONMENTAL SENSORS USING ARDUINOTM**, M. Roeber*, J. A. Hauger, J. Reichmuth, W. Byne and O. Flite

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

SATURDAY PAPER PRESENTATIONS

***Denotes student presenter**

****Denotes student research in progress**

Section I: Biological Sciences

Hatcher Room, 1st Floor RCC

Johnathan G. Davis, Presiding

- 9:15 TRILLED SONG TYPES ARE MORE SALIENT THAN NON-TRILLED SONG TYPES IN AGONISTIC INTERACTIONS BETWEEN MALE SONG SPARROWS (*MELOSPIZA MELODIA*)**, Cameron B. Duke* and Barbara B. Ballentine
- 9:30 ANALYSIS OF SEQUENCE CHARACTERISTICS OF TYPE I CD PROTEINS USING MULTIVARIATE STATISTICS IN ORDER TO DETERMINE THEIR FUNCTIONAL CLASS**, K.C. Pramir* and Janghoon Kang
- 9:45 EFFECTS OF NEST BUILDING BEHAVIOR ON INCUBATION AND REPRODUCTIVE SUCCESS IN CAROLINA CHICKADEES *POECILE CAROLINENSIS***, Traci E. Ballance* and Barbara B. Ballentine
- 10:00 **Break and Section Business Meeting**
- 10:30 ARE HERP ENCLOSURES HOT SPOTS OF SALMONELLA COLONIZATION?**, Sarah E. Rosario, C.R. Phipps and Amanda L.J. Duffus
- 10:45 LANDSCAPE FEATURES ASSOCIATED WITH BEHAVIORAL CHANGES ALONG AN URBAN-RURAL GRADIENT IN SONG SPARROWS, Kaley Wisher and Jeremy Hyman
- 11:00 GENETIC CHARACTERIZATION OF MUTANTS OF *SACCHAROMYCES CEREVISIAE* THAT GROW BROWN IN THE PRESENCE OF COPPER, Brian W. Schwartz, Michael E. Rohly, Nathaniel J. Moore, Christopher L. Resch, and Joshua D. May
- 11:15 INVESTIGATING BEHAVIORAL VARIATION IN URBAN AND RURAL POPULATIONS OF EASTERN BLUEBIRDS (*Sialia sialis*), Barbara Ballentine and Meghan Graham

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

POSTERS

- ASSESSMENT OF DIATOM MOVEMENT AND SPECIES COMPOSITION IN RELATION TO VARIOUS TIDE LEVELS ON ST. SIMONS ISLAND, GA**, Merry Zohn* and K.M. Manoylov
- BINDING OF ADENOVIRUS EARLY PROTEIN E411K TO RNA HELICASE DDX6**, Emilee Friedman and Kasey Karen
- THE ROLE OF LEPTIN IN TRIPLE NEGATIVE BREAST CANCER TREATED WITH CHEMOTHERAPEUTICS, Ann A. Kurian* and Ruben Rene Gonzalez-Perez
- QUANTITATIVE PCR VALIDATION OF COPPER-REGULATED GENE EXPRESSION IN *SACCHAROMYCES CEREVISIAE*, Brooks E. Arnold* and Brian W. Schwartz

FACTORS CONTRIBUTING TO REINTRODUCTION SUCCESS OF NATIVE FRESHWATER FISHES IN SOUTHERN APPALACHIA**, Rachel Benson*, Harrison Barton* and Johnathan G. Davis

AN ANALYSIS OF ANTERIOR HOX GENE EXPRESSION PATTERNS IN THE PHARYNGEAL ARCHES OF ZEBRAFISH (*DANIO RERIO*)**, Jeremy M. Brown* and A. Davis

FIELD SURVEYS FOR DETECTION OF *BATRACHOCHYTRIUM DENDROBATIDIS* IN NORTH GEORGIA AMPHIBIAN POPULATIONS, Spencer L. Cruz*, Jason Nations*, J.M. Morgan and N.L. Hyslop

POTENT LETHAL EFFECT OF SALICYLALDEHYDE AND CINNAMALDEHYDE ON THE ARGENTINE ANT (HYMENOPTERA: FORMICIDAE)** Benjamin Curry*, Amy Droegmiller*, Emiliano Sanchez, Chul Hee Kang, and Cathy Lee

DNA BARCODING, NCBI DATA TOOL AND MEGA AS A TEACHING AND RESEARCH TOOL FOR UNDERGRADUATE BIOLOGY LABORATORY ACTIVITIES**, Charlsey D. Dodgen*, Lucas Newman, and Cathy Lee

EFFECTS OF TEMPERATURE AND HUMIDITY ON CAPTURE RATES OF BATS IN FLAT CREEK NATURE AREA, FAYETTE COUNTY, GEORGIA, Raquel I. Gonzalez* and M.J. Bender

EXPLORING ALTERNATE GENES FOR *RANAVIRUS* PHYLOGENETICS.** Abigail Heiney*, Mason Patten*, and Amanda L.J. Duffus

IDENTIFICATION OF NEW MICRORNAS IN *CHLAMYDOMONAS REINHARDTII*, Lindsey Howell*, Glen Borchert, David Chevalier

PARTIAL CHARACTERIZATION OF THE *PITX1* GENE OF EMPETRICHTHYINE FISHES (GOODEIDAE). A.L. Lacey*, J.L. Tolbert* and S.A. Webb

BIONFORMATICS ANALYSIS OF THE STRIPED (*MORONE SAXATILIS*) BASS *HOXA2A* AND *HOXA2B* GENOMIC DNA SUGGESTS EVOLUTIONARY CONSERVATION OF GENE REGULATION**, Amanda D. Mileham*, J. Scemama, A.L.J. Duffus, and A. Davis

AN ASSESSMENT OF ALGAL COMMUNITIES IN WETLANDS LOCATED ABOVE AND BELOW THE GEORGIA FALL LINE, Sofia E. Sifnaios* and Kalina Manoylov

SURVEY OF UNMANAGED PINE FOREST FOR THREATENED REPTILE SPECIES**, Derick R. Thompson*, R. Phillips, K. Warren and B. L. Simmons

IMPACTS OF COLD STRATIFICATION AND MOISTURE PRETREATMENT ON SEED GERMINATION OF THREE MILKWEED SPECIES NATIVE TO GEORGIA, Andrew M. Wright*, Zachary W. Izen*, Gretchen M. Ionta and Kalina M. Manoylov

WHOLE GENOME RANAVIRUS PHYLOGENIES: AN IN-DEPTH LOOK**, Cori M. Harding*, Bridget Piatt*, W. Culpepper*, C. D. Dodgen*, S. E. Rosario, and Amanda L. J. Duffus

THE OCCURRENCE OF ATHLETE'S FOOT (TINEA PEDIS), CAUSED BY THE DERMATOPHYTIC FUNGUS, *TRICHOPHYTON RUBRUM* MALMSTEN 1845, AMONGST ATHLETES AT BREWTON-PARKER COLLEGE. Natalia Adams and Helene Peters

AN INVESTIGATION INTO THE EFFECT OF THE ENERGY DRINK, MONSTER ENERGY® BRAND ON ATHLETE PERFORMANCE AMONGST BASKETBALL ATHLETES AT BREWTON-PARKER COLLEGE. Tajamian Foster and Helene Peters

A COMPARISON OF THE LEAF-LITTER INVERTEBRATE COMMUNITY ASSOCIATED WITH GOLDEN BAMBOO STANDS VERSUS ADJACENT AREAS, Katherine Odegard, Lara Jones and M.J. Bender

Section II: Chemistry

Maxwell Center, Room 106

Daniel W. Holley Presiding

8:30 DISSOLUTION TESTING AND ANALYSIS OF VITAMIN C TABLETS**, Dorcas Ugbo*, M.C. Koether

8:45 COMPARISON OF HEMATITE NANOCRYSTALLINE FILMS FOR USE IN PHOTOELECTROCHEMICAL CELLS**, Allison B. Taylor* and Linda de la Garza

9:00 A PRELIMINARY ANALYSIS OF WASTE OIL AND GREASE FROM THE CAMPUS CHICK-FIL-A FOR USE AS BIOFUEL**, Syed A. Hyder*, Blake Lindner*, Ahla Ko*, Uchechi Egejuru*, Neelam Khan, Sang H. Park, Kathryn Zimmermann, and David P. Pursell

9:15 EVALUATING TWO MODELS FOR THE EFFECTS OF OSMOLYTES ON PROTEIN STABILITY AND FUNCTION: MEASURING THE INTERACTIONS OF GLYCINE BETAINE WITH CARBOXYLIC ACIDS, Grace Terry*, Fergus King, Casey Wiltsek*, Red Chu*, Jonathan G. Cannon

9:30 GREEN SYNTHESIS OF SOAPS: UNDERGRADUATE CHEMISTRY LAB PROJECT, Jillian Mary V. Amurao*, Tyler S. Brack, Sara G. Peacock and Renat. R. Khatmullin

9:45 INTERLOCKING TOY BUILDING BLOCKS AS HANDS-ON LEARNING MODULES FOR BLIND AND VISUALLY IMPAIRED CHEMISTRY STUDENTS, Samuel Melaku, James O. Schreck, Kameron Griffin, and Rajeev B. Dabke

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

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

POSTERS

SYNTHESIS OF CHIRAL IMINES and AMINES ON SILICA SURFACES**, Alexander J. Burch* and John T. Barbas

NANO-BIOMATERIALS FOR THERAPEUTIC APPLICATIONS: SYNTHESIS OF AN ENCAPSULATED SULFANILAMIDE ANTIBIOTIC**, ZeAndra D. Whitfield* and Ghislain Mandouma

TOWARD METAL-ORGANIC FRAMEWORKS CONTAINING NONBENZENOID ISOCYANOARENES AND HALF-SANDWICH IRIIDIUM (III)-BASED BUILDING BLOCKS**, Farrah M. Bakr*, John J. Meyers

DETERMINATION OF TOXIC HEAVY METALS IN PEANUTS, Sydney Brown* and Samuel M. Abegaz

IMPROVED MEASUREMENTS OF THE EFFECTS OF GLYCINE BETAINE AND PH ON GLUTAMIC ACID SOLUBILITY** Red Chu*, Casey Wiltsek*, Grace Terry, Fergus King, Jonathan G. Cannon

INVESTIGATION OF TOXIC HEAVY METALS IN PERSONAL CARE PRODUCTS **, Brittney N. Menefee* and Samuel M. Abegaz

ICING BEHAVIORS OF SUPERHYDROPHOBIC ZINC OXIDATE**, Kelly English* and Liqiu Zheng

EFFECT OF ACID STRENGTH AND TEMPERATURE ON ACTIVATION ENERGY FOR MUTAROTATION OF SUCROSE USING POLARIMETRY**, Andrew Duitsman*, Sean Carrigan*

SYNTHESIS OF CONJUGATED STYRENE-ALT-MALEIC ANHYDRIDE**, N.M Sikes, D.W. Holley

Section III: Earth and Atmospheric Sciences

Maxwell Center, Room 116

Mark Groszos, Presiding

9:00 THE ABILITY OF WATER TREATMENT RESIDUALS TO FILTER RHODAMINE-COATED MICROPARTICLES AS PATHOGEN PROXIES AT DIFFERENT IONIC STRENGTH AND PH LEVELS**, C. Lever, A. VandeVoort, and S. Mutiti

9:15 AN ASSESSMENT OF CARBON DIOXIDE EMISSIONS AMONG CONTRASTING URBAN DEVELOPMENT PATTERNS IN POPULATED AREAS**, Evan M. Rentz and Weimin Feng

9:30 A PETROLOGIC AND PETROGRAPHIC ANALYSIS OF SANDSTONES FROM THE BROXTON ROCKS EXPOSURE, BROXTON, GA**, Eric L. Parrish

9:45 HISTORIC DEMISE OF SELECTED GLACIERS IN THE BEARTOOTH MOUNTAINS OF MONTANA: AN UPDATE UTILIZING OVER 120 YEARS OF PHOTGRAPHIC AND CLIMATIC DATA, Edward E. Chatelain

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

Section IV: Physics, Mathematics, Computer Science and Technology

Maxwell Center, Room 107

L. Ajith DeSilva, Presiding

- 8:00 EXPERIENTIAL LEARNING IN ENGINEERING: BUILDING A ROBOT AND ELECTRONIC CONTROL SYSTEM, S.M. Remington, R.T. Atnip*, T.H. Zeigler*, T.G. Lebsekal*, G. Mellors and B. Hojjatie
- 8:15 A MODIFIED HUBBERT MODEL FOR RESOURCE RECOVERY, Ronald E. Mickens
- 8:30 A MATHEMATICAL MODEL OF THE WAY MICROORGANISMS REPRODUCE AT THE EXPENSE OF NUTRIENT CONSUMPTION IN THE CHEMOSTAT, 'Kale Oyedeji
- 8:45 THE NORTH POLAR REGION OF MARS DURING 2016, Richard W. Schmude, Jr.
- 9:00 THE NORTH POLAR HOOD DURING NORTHERN AUTUMN, Richard W. Schmude, Jr.
- 9:15 THREADED DISCUSSION OPTIONS BEYOND THE TEXT FOR COLLEGE ALGEBRA COURSES, Debra M. Kean
- 9:30 SOLAR ECLIPSE ON AUGUST 21, 2017, Bob Powell and Ben Jenkins
- 9:45 EFFECT OF GAMMA IRRADIATION ON CdTe/ZnTe BILAYER THIN FILMS, Madhavi Thakurdesai and L. Ajith DeSilva
- 10:00 **Break and Section Business Meeting**
- 10:30 UMBRELLA PHYSICS — NEW WINE IN AN OLD BOTTLE, K. C. Chan and Arun Saha
- 10:45 DYNAMICS OF A SQUARE MECHANICAL METAMATERIAL SYSTEM, K. C. Chan
- 11:00 ON CALCULATING THE OPTICAL PATH LENGTH IN SIMPLE SYSTEMS PART II, Javier E. Hasbun
- 11:15 A CONTINUUM MODEL OF PHONONS IN TWO-DIMENSIONAL MATERIALS, L. C. Lew Yan Voon and M. Willatzen
- 11:30 DESIGN AND TESTING OF MICROSTRIP RESONATOR-BASED BAND PASS FILTER, Arun K Saha and Ervin Mccarroll III
- 11:45 EMISSION MODES IN ELECTRO CO-FLOW, J. Guerrero, A. J. Hijano, M. A. Lobato, I. G. Loscertales and A. Fernandez-Nieves

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

POSTERS

USING MODELING AND SIMULATION FOR A DEEPER UNDERSTANDING OF INTRODUCTORY PHYSICS CONCEPTS**, M Puerta*, J.H. Lawson*, B. Ray, and A. Roy

A STUDY OF OPTICAL BAND GAP ON TITANIUM DIOXIDE NANOPARTICLES LAYERS**, J. Preston*, W. Johnson* and L. Ajith DeSilva

HOMEMADE DIODE FOR PHYSICS AND ELECTRONICS LABS**, T. King*, L. Ajith DeSilva and J. E. Hasbun

PREPARATION OF TITANIUM DIOXIDE NANOPARTICLE LAYERS FOR DYE-SENSITIZED SOLAR CELLS**, W. Johnson*, J. Preston* and L. Ajith DeSilva

Section V: Biomedical Sciences

Rollins Conference Center, Room 257

Seyed H. Hosseini, Presiding

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

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

POSTERS

THE ROLE OF LEPTIN IN TRIPLE NEGATIVE BREAST CANCER TREATED WITH CHEMOTHERAPEUTICS, Ann A Kurian* and Ruben Rene Gonzalez-Perez

EFFECTS OF NICOTINE USE IN CIGARETTES AND VAPORIZERS ON THE ORAL MICROBIOTA, Sazma Al-Rashid*, and A. L. Kwiatkowski

EXPRESSION OF MITOCHONDRIAL GENOME ALTERATION AS A POTENTIAL BIOMARKER FOR COLORECTAL ADENOPOLYPS IN RELATIVE TO AGE AND RACE, Anju Mary Cherian, L. Wallace, and F.O. Aikhionbare

THE ROLE OF RBP-JK IN LEPTIN-INDUCTION OF BREAST CANCER PROGRESSION AND CHEMORESISTANCE**, Sha'Kayla Nunez*, Ruben R Gonzalez-Perez*

THE ROLE OF BODY HABITUS ON AEROBIC FITNESS IN NCAA BASKETBALL PLAYERS **, Sarah N. Garner* and Linda G. Jones

Section VI: Philosophy and History of Science

Maxwell Center, Room 117

Charmayne E. Patterson, Presiding

9:00 RACIAL HISTORIES, PAST AND PRESENT, Tom McMullen

9:30 COUNTERFACTUAL HISTORIES OCCUR IN CLASSICAL PHYSICS, Ronald E. Mickens and Charmayne Patterson

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

- 10:30 OUT OF HIDING: HOW THE BOOK AND FILM 'HIDDEN FIGURES' HAVE RAISED THE VISIBILITY OF AFRICAN AMERICAN WOMEN IN THE SCIENCES, Charmayne E. Patterson and Ronald Mickens
- 11:00 DEVELOPMENTS IN SCIENCE EDUCATION: PAST, PRESENT, AND FUTURE**, Ozden Sengul

Section VII: Science Education
Rollins Conference Center, Room 258
Peter Roessle, Presiding

- 9:30 A REVIEW OF THE BENEFITS OF ARGUMENTATION IN THE SCIENCE CLASSROOM, Amy F. Salter*¹, Maggie D. Renken
- 10:00 **Break and Section Business Meeting**

Section VIII: Anthropology
Maxwell Center, Room 113
Teresa P. Raczek, Presiding

- 8:45 HOW ONE SKELETON OPENS THE WINDOW INTO THE DAILY LIVES OF ROMANIZED CRETANS**, Eden J. C. Ryan* and Susan Kirkpatrick Smith
- 9:00 THE ANALYSIS OF INTEROBSERVER ERROR TO TEST THE LIMITATIONS OF AVAILABLE METHODS IN ANCESTRY AND SEX ESTIMATION OF TEACHING SKULLS**, Vivien N. Kibble
- 9:15 LINEAR ENAMEL HYPOPLASIA IN ROMAN IERAPETRA, Morgan E. McKenna* and Susan K. Smith
- 9:30 PERIOSTEAL REACTION AND SIGNS OF STRESS FOUND IN SKELETAL REMAINS FROM IERAPETRA, CRETE, Logan Howard and Susan Kirkpatrick Smith Kennesaw State University, Kennesaw, GA 30144
- 9:45 TESTING THE MANIFESTATION OF THE MEDICAL GAZE IN THE USE OF HUMAN SKELETAL REMAINS IN A UNIVERSITY SETTING, Caitlin N Olsen
- 10:00 **Break and Section Business Meeting**
- 10:30 ARCHAEOLOGICAL INVESTIGATIONS OF ANTEBELLUM SLAVE QUARTERS AT A PLANTATION SITE IN NORTH GEORGIA**, Ethan M. Williams
- 10:45 FIVE THOUSAND IN THE PINES: BLACKSHEAR'S CONFEDERATE PRISON CAMP, M. Jared Wood, Lance Greene, and Inger Wood
- 11:00 AN ANALYSIS OF MIDDLE WOODLAND PERIOD POTTERY FROM THE LOWER DABBS SITE IN NORTH GEORGIA**, Briana K. Johnston, Savana Deems
- 11:15 A PRELIMINARY COMPOSITIONAL ASSESSMENT OF MUD BRICK AND CLAYS FROM THE PHOENICIAN *EMPORIUM* OF MOZIA, SICILY, William M. Balco

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

POSTERS

THE GOOD, THE BAD, THE DEVIANT: NON-NORMATIVE GRAVES AT TUMILACA LA CHIMBA (AD 950-1300), MOQUEGUA, PERU,** Danielle E. Carmody,* and Nicola Sharratt

History and Description of the Georgia Academy of Science

Organized in 1922 and incorporated as a nonprofit organization in 1953, the Georgia Academy of Science continues to grow in size and academic strength. The interests of Academy members encompass all aspects of science and that interest is expressed through participation in one or more of eight sections: I Biological Sciences, II Chemistry, III Earth & Atmospheric Sciences, IV Physics, Math, Computer Science, Engineering & Technology, V Biomedical Sciences, VI Philosophy & History of Science, VII Science Education, VIII Anthropology.

The Academy is dedicated to the promotion of science education and the fostering of scientific research in the state of Georgia. To that end we publish the Georgia Journal of Science and hold annual scientific meetings that emphasize the presentation of undergraduate and graduate research.

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FRIDAY PAPER PRESENTATIONS

***Denotes student presenter**

****Denotes student research in progress**

Section I: Biological Sciences

Rollins Conference Center, Hatcher Room, 1st Floor RCC

Johnathan G. Davis, Presiding

2:00 EFFECTS OF RESVERATROL ON AHR ACTIVITY IN CELLS TREATED WITH BENZO[A]PYRENE OR INDIGO, Abigail L. Griffiths* and Jennifer C. Schroeder, Young Harris College, Young Harris, GA 30582. The aryl hydrocarbon receptor (AHR) is a ligand-activated transcription factor. AHR regulates many cellular pathways, including expression of the CYP1A1 gene, which is responsible for metabolizing compounds such as B[a]P. While limited research has been done with indigo and its effects on the AHR, B[a]P is a known inducer of CYP1A1 via the AHR. Resveratrol, a stilbenoid found in grapes and other food items, has been shown to inhibit tumor growth and modulates other cellular pathways that involve the AHR. We here examined the effects of resveratrol on AHR activity in mouse hepatocytes, specifically looking at its effects on B[a]P- and indigo-mediated activity of the receptor. Previous findings have indicated that using different concentrations of resveratrol to treat cells can illicit varying responses. In this study we report that low concentrations of resveratrol in combination with either B[a]P or indigo results in increased AHR activity compared to B[a]P or indigo alone, with maximal activity observed with 50nM of resveratrol. However, at higher concentrations (~200nM), resveratrol can act as an inhibitor of the receptor activity in the presence of B[a]P or indigo. Based on these findings, we suggest that high concentrations of resveratrol are required to inhibit AHR activity, which could cause the metabolic activation of B[a]P into a carcinogen. It is fortunate that resveratrol is well-tolerated and easily absorbed; however, it is rapidly metabolized, which could make it difficult to obtain the required intercellular concentrations in vivo. Keywords: aryl hydrocarbon receptor, AHR, CYP1A1, benzo[a]pyrene, indigo, resveratrol

2:15 A PRELIMINARY ASSESSMENT OF THE MACROINVERTEBRATE BIODIVERSITY OF CORN CREEK**, J.B. Rowe*, B.H. Donaldson*, J. Schrader*, and K.P. Miller, Young Harris College, Young Harris Georgia 30582. In order to provide baseline data for future research of Corn Creek in Young Harris Georgia, a survey of the macroinvertebrate community was performed in fall 2016 from October 3rd to November 3rd, to determine if diversity decreases downstream in relation to human impact. Human activity and development generally increases as distance from the headwaters increase. Four sites on Corn Creek were sampled for macroinvertebrates using Georgia Adopt-A-Stream protocols, and organisms were identified to family level when possible. The four sampled sites were located at the creek headwaters at an underground spring, upstream of an ~15 m falls, downstream of the falls and where the creek feeds into Brasstown Creek. Shannon and Simpson's diversity indices were calculated from the data collected. The sampled site upstream of the falls was in proximity to an area used by vehicular traffic to cross the creek, and this may have had a negative impact on the diversity at that site. The samples themselves yielded a large number of Ephemeroptera and Plecoptera especially the families Heptageniidae (flathead mayflies) and Peltoperlidae (roach-like stoneflies). However,

preliminary analysis of the data does not appear to support the hypothesis that diversity decreases downstream in relation to human impact. Keywords: biodiversity, macroinvertebrate, Corn Creek

2:30 FACTORS AFFECTING MORTALITY OF LARGEMOUTH BASS *MICROPTERUS SALMOIDES* IN COMPETITIVE TOURNAMENTS, Parker Moon*, Zoelle Reinke* and Johnathan G. Davis, Young Harris College, Young Harris, GA 30582. Competitive bass fishing through tournaments provides a recreational opportunity for anglers and an economic opportunity to local communities surrounding productive bass fisheries. However, these activities may negatively impact fisheries due to mortality of bass during and after tournaments. This study determined significant factors influencing total mortality of black bass during competitive tournaments. In searching through numerous databases and journals, we identified 63 tournaments reporting mortality rates and collected 27 variables potentially related to initial, delayed, or total mortality. We constructed univariate regression models to evaluate the effect of significant variables on mortality. Water temperature was the most significant ($P < 0.001$; $R^2 = 0.45$) variable affecting mortality although tournament length ($P = 0.014$; $R^2 = 0.32$), state where the tournament was conducted ($P < 0.001$) and elevation ($P = 0.003$; $R^2 = 0.25$) were also significant. Based upon our results, expected mortality from tournaments conducted when water temperatures exceeded 30°C may be $>30\%$. In southern U.S. reservoirs that experience warm temperatures during summer months, competitive tournaments may adversely impact bass welfare and the ability to maintain healthy, productive fisheries. It is recommended that agencies and anglers implement appropriate strategies to decrease mortality under warm water conditions. Keywords: largemouth bass, mortality, tournaments, *Micropterus*

2:45 AN EXAMINATION OF SELECTIVE FEEDING AND MOLECULAR RECOGNITION IN THE CILIATE, *TETRAHYMENA PYRIFORMIS* EHRENBERG, 1830, Blaise W. Menta*, Ashley E. Kirby, and Frank S. Corotto, University of North Georgia, Dahlonega, GA, 30597. In amoeboid cells, food particles are engulfed only after receptors on the phagocytic cell's membrane bind to ligands on a particle's surface. Ciliates also feed via phagocytosis, but instead of enveloping particles the way amoebae do, ciliates take up particles through a complex, permanent, funnel-shaped feeding apparatus. It is unclear whether receptor-ligand interactions are needed to trigger the process. If ciliates were shown to prefer certain particles over others, based on the particles' surface properties, then receptor-ligand interactions would likely play a role in phagocytosis. The literature includes few reports of such selectivity in ciliates. To further investigate this issue, we chose to study feeding selectivity in the ciliate *Tetrahymena pyriformis* Ehrenberg, 1830. We fed *Tetrahymena* mixtures of orange and green fluorescent, $3\ \mu\text{m}$, latex beads at two concentrations in which one type of bead was coated with bovine serum albumin through passive adsorption (BSA; $8\text{--}13\ \mu\text{g}$ protein/mg beads). Authors were unaware of which beads were coated while collecting data. Treatment groups included the results of 12–16 trials. We found no evidence of a preference for either coated or uncoated beads at either concentration (coated vs. not coated, $P = 0.131$; bead concentration, $P = 0.866$; interaction, $P = 0.294$). In contrast, others have reported that *T. pyriformis* feeds more rapidly on BSA-coated beads than uncoated ones. We also found no trend toward the development of a preference as cells acquired more beads over time. The literature indicates that two species of nanoflagellates develop such a preference. Although we cannot rule out the possibility that *Tetrahymena* feeds selectively, we did not find convincing evidence of such selectivity when *T. pyriformis* is given a choice between uncoated beads and

those coated with BSA. Our results failed to demonstrate a role for molecular recognition when *Tetrahymena* engages in phagocytosis. Keywords: filter-feeding, Alveolata, alveolate, Ciliophora

3:00 EVALUATION OF FACTORS INFLUENCING SPOTTED BASS *MICROPTERUS PUNCTATUS* USE OF INTRODUCED STRUCTURES IN A GEORGIA HIGHLAND RESERVOIR, Ethan Barrett* and Johnathan G. Davis, Young Harris College, Young Harris, GA 30582. As reservoirs age, habitat degradation occurs, resulting in reduced habitat to support reservoir fisheries. Chatuge Reservoir in western North Carolina and northern Georgia is 74 years old and experiencing significant degradation. However, anglers purposely introduce various structures to improve available habitat and attract fish. We tested the utility of various installed structures present in Chatuge Reservoir as suitable habitat for spotted bass and identified specific factors of these structures that best attract spotted bass. Using an underwater camera system, abundance of spotted bass from video recordings (SBAV) was quantified from 40 installed structures in Lake Chatuge from July – August 2016. We observed higher spotted bass abundance at structures with vegetation present, young of year present, increasing height, horizontal structural orientation and forage species absent. Structure orientation (P=0.075) and presence of vegetation (P=0.094) were significantly related (P <0.1) to spotted bass abundance. Horizontal structures and structures with vegetation present contained approximately two more bass per structure on average than other structural variables. As surface water temperature increased (P=0.079) and distance to nearest bank increased (P= 0.049) spotted bass counts were predicted to increase as well. These findings provide guidance for biologists and anglers seeking to increase available habitat to support productive spotted bass fisheries in clear highland reservoirs similar to Lake Chatuge. Keywords: spotted bass, Chatuge, reservoir, structure, *Micropterus*

3:15 Break

3:30 ASSESSMENT OF HABITAT PREFERENCES OF THE HIWASSEE CRAYFISH *CAMBARUS HIWASSEENSIS* HOBBS, 1981**, Samuel Flagg*, William Moon* and Johnathan G. Davis, Young Harris College, Young Harris, GA 30582. The Hiwassee crayfish is a relatively rare species endemic to the Hiwassee River watershed in north Georgia and western North Carolina. A lack of information exists on this species, and no studies have been conducted on the habitat preferences or life history of this species. This study defined the specific habitat preferences of *Cambarus hiwasseeensis* Hobbs, 1981 in a small second order stream. From August to November 2016, 146 1-m² quadrants were randomly sampled from an 800-m stream reach. Twenty-one habitat parameters were defined for each 1-m² quadrat. Logistic regression models will be used to define the probability of presence of *C. hiwasseeensis* for various habitat parameters and a multivariate model selection procedure will be used to identify important habitat parameters. Principle components analysis will be used to compare habitat preferences of *C. hiwasseeensis* to sympatric species such as the common crayfish *Cambarus bartoni*. Keywords: *Cambarus*, *hiwasseeensis*, crayfish, habitat preference

3:45 ECOSYSTEM ASSESSMENT OF AN AQUATIC RESOURCE FOR K12 EDUCATION AND RECREATION**, Joleishia N. Cooper*¹, B.A. Bellflower¹, C.V. Calhoun¹, G.B. Stracher¹, A. Thompson², K.E. Warren¹ and B. L. Simmons¹, ¹East Georgia State College, Swainsboro, GA 30401 and ²University of Georgia, Athens, GA 30602. Natural and anthropogenic factors, such as

plant diversity and surface runoff, can influence inputs to ponds and lakes in suburban areas, affecting their suitability for research or recreation. Shallow, stagnant suburban ponds can become eutrophic due to fertilizer runoff and may include automotive pollutants from pavement runoff and household trash. Recreational ponds must be carefully managed to maintain water quality standards and fish health. Ponds used by educational institutions must also be safe for small children. Seeking recommendations to maximize the educational benefits of an outdoor classroom, local teachers requested an evaluation of their school pond and adjacent wetland. This pond is utilized for PK-5 educational programs and is part of a stream network that includes a municipal wastewater treatment facility and is annually stocked for children's fishing events. Physical, chemical and biological characteristics of this system were measured to assess water quality and ecological integrity. With a maximum depth of only 85 cm, the study site harbors small populations of grass carp (*Ctenopharyngodon idella*) and catfish (*Ictalurus punctatus*) and warms up to 32°C in the summer. Benthic invertebrate diversity and abundance was low (<5 individuals per sample), and species recovered during dip net sampling were pollution tolerant. Isolated bacteria included lactose and nonlactose-fermenting fecal coliforms and nitrogen reducing gram negative bacteria. It is unknown at this time if the isolated species are pathogenic; bacterial community analysis is ongoing. Dissolved oxygen content ranged between 5.0 and 6.2 mg/L, pH was low (5-7) and conductivity was high (80-110 µS), indicating potentially unsuitable habitat for sensitive animal species. Nitrogen and potassium content of benthic sediment was poor while potassium levels were high. Chemical analysis of water samples for heavy metals and pesticides is forthcoming. Initial recommendations were made to the local school board to remove the fish, break the dam and allow the area to transition from pond to bog habitat. The school can use the standing infrastructure to maintain a bog garden, and there is the potential for cultivation of locally rare bog species, such as *Sarracenia leucophylla*. It would be less expensive to maintain than a fish pond and eliminates any concerns associated with water safety. Keywords: fish pond, k12 education, ecological integrity, water quality

4:00 EVALUATION OF AGE AND GROWTH OF REDHORSES IN BRASSTOWN CREEK, GEORGIA**, Joshua Goeltz*, Kaylyn Crossley* and Johnathan G. Davis, Young Harris College, Young Harris, GA 30582. Redhorses (Genus: *Moxostoma*) are migratory, benthic fishes inhabiting the lotic waters of the United States. High endemism of redhorses exists in the southeastern U.S., and many species are of conservation concern due to their susceptibility to water quality and habitat degradation. Brasstown Creek in north Georgia contains 5 sympatric species of redhorses, including the silver (*M. anisurum*), golden (*M. erythrum*), black (*M. dusquenii*), river (*M. carinatum*) and sicklefin (*Moxostoma sp.*) redhorses. This study estimated age and growth rates of redhorses from a non-lethal technique utilizing pectoral fin rays. Von Bertalanffy growth (VBG) models were developed for each species using nonlinear model fitting methods and compared to each other by fitting eight models of which each model represented a difference between species for at least one VBG parameter. Models were compared sequentially using the likelihood ratio and extra sum-of-squares tests. Sicklefin redhorse, a state-endangered species, exhibited the slowest rate of growth and was the longest-lived species whereas silver redhorses grew the fastest but were shorter-lived. In comparison to other redhorse age and growth studies conducted across a latitudinal gradient from Canada to Georgia, Brasstown Creek redhorses are among the faster growing populations, presumably due to warmer temperatures and a longer growing season. Keywords: *Moxostoma*, redhorse, Brasstown Creek, growth

4:15 DETERMINATION OF THE BINDING SITE OF ADENOVIRUS E4 11K ON THE CELLULAR PROTEIN DDX6**, Clint Edmunds, Michael Hammond, and Kasey Karen, Georgia College & State University, Milledgeville, GA 31061. Adenovirus is a double stranded DNA virus responsible for localized infections, such as upper respiratory tract infections. The virus takes over the cell by taking control of host cell replication mechanisms as well as controlling host cell protein synthesis machinery. One of the functions of adenovirus E4 11k protein is in turning off host cell protein synthesis and regulating late viral gene expression. E4 11k is known to disrupt cellular RNA processing bodies (P-bodies) through an interaction with a P-body protein, Ddx6. Our research goal is the identification of the binding site of Ddx6 on the E4 11k protein. Once this site is narrowed down to a single amino acid or sequence of amino acids, we aim to ascertain if the binding of E4 11k with Ddx6 and subsequent disruption of P-bodies during an adenovirus infection is involved in the control of host cell and late viral protein synthesis.

4:30 A DRIFT FENCE SURVEY OF THE SMALL VERTEBRATES IN A MIXED HARDWOOD HABITAT IN LAMAR COUNTY, GEORGIA,** Kori Ogletree* and M.J. Bender, Gordon State College, Barnesville, GA 30204. Accurate range and distribution data are critical to detecting species and community responses to a variety of potential threats and ever-changing environmental and landscape conditions. However, the known distribution of many species in Georgia can only be inferred from a small number of widely dispersed capture records. This paucity of records may limit the ability of wildlife professionals to effectively manage Georgia's wildlife resources and detect threats or changing ranges early. Lamar County, located in the west-central area of the state in the Piedmont province, has experienced minimal sampling effort and the status of many small vertebrates that could be considered as possible residents of the region is unknown. To improve upon our understanding of the small vertebrates within the county and contribute to the regional data, we conducted a drift fence survey in a small mixed- hardwood habitat in Lamar County, Georgia. Pitfall traps were opened for four consecutive days every other week between May and November 2016. Amphibians and reptiles accounted for approximately 80% of our 61 total captures and, although our capture rates were low (< 0.2 animals/trap night), we documented the presence of thirteen species in this small habitat patch. Our small survey, which produced three new county records, indicates a lack of sampling effort rather than a lack of suitable habitat within the county. Additional sampling efforts on a larger scale, of a longer duration, and in non-drought periods are likely to have higher capture rates and produce additional county records. Keywords: Lamar County, Drift fence survey, *Hemidactylum scutatum*, *Tantilla coronata*, *Virginia valeriae*

4:45 IDENTIFICATION OF NEW MICRORNAS IN *DUNALIELLA SALINA*** , Alicia Winfrey*¹, Glen Borchert² and David Chevalier¹, ¹Department of Biology, Division of Math & Science, East Georgia State College, Swainsboro, Ga. ²Department of Biology, College of Art and Science, and Department of Pharmacology, College of Medicine, University of South Alabama, Mobile, Al. MicroRNAs are small single strand noncoding RNAs. Their main function is to regulate the expression of genes. MicroRNAs bind to their target mRNAs resulting in either the degradation of these mRNAs or the inhibition of their translation. MicroRNAs are involved in several biological processes including cell cycle control, apoptosis, stem cell differentiation, and skeletal muscle development. Some studies even show that miRNAs have been used to differentiate and maintain tissue identity. They have been identified in animals, bacteria, fungi,

plants, and protists, which include algae. *Dunaliella salina* is a phototrophic alga that is very resistant to salt due to the production and accumulation of high concentration of beta-carotene. This accumulation protects the algae against high light intensity, glycerol, and osmotic pressure. This alga is used to produce beta-carotene for cosmetics and dietary supplements. The main goal of our research is to identify new MicroRNAs in *Dunaliella salina*. We are conducting this research using a bioinformatics approach. Our project involves analyzing the small RNAs that we sequenced from *Dunaliella salina* and then comparing these sequences to all the known miRNAs and stem loops. Being able to identify new miRNAs from *Dunaliella Salina* can help in our understanding of the miRNA in this species. If the same miRNA is identified in another species, then we can infer that the miRNA is present in important functions in plants and animals. Keywords: MicroRNA, Bioinformatics, Algae, *Dunaliella salina*

Section IV: Physics, Mathematics, Computer Science and Technology

Maxwell Center, Room 107

L. Ajith DeSilva, Presiding

1:30 ELEMENTAL ABUNDANCES IN 16 PLANETARY NEBULAE FROM DEEP, HIGH-RESOLUTION OPTICAL SPECTROSCOPY**, Cameroun G. Sherrard*¹, N. C. Sterling¹, Simone Madonna², Courtney L. Spencer¹ and A. L. Mashburn¹,¹University of West Georgia, Carrollton, GA 30118 and ²Instituto de Astrofísica de Canarias, Tenerife, Spain. We present elemental abundances of 16 planetary nebulae (PN) derived from deep, high-resolution ($\lambda/\Delta\lambda = 36,700$) optical spectra. A PN is the ionized ejected envelope of a low-mass star (1-8 solar masses) at the end of its nuclear fusion lifetime. The spectra cover the wavelength range 3600—10,400 Å, and were obtained with the 2D-coudé spectrograph on the 2.7-m Harlan J. Smith Telescope at McDonald Observatory (TX). Between 100 and 600 distinct emission lines were detected in the observed PN, making these the deepest spectra ever obtained for most objects in our sample. Using the PyNeb package, as well as newly-developed Python and IDL routines that partially automate the data analysis, we have determined electron temperatures and densities, as well as ionic and elemental abundances in each PN. Specifically, we utilize both permitted (recombination) and forbidden (collisionally-excited) emission lines to compute abundances. Our abundances agree well with previous studies of these PN. The deep spectra have allowed us to study the abundances of many elements (including P, K, Ca, Fe, and “neutron-capture” elements heavier than Zn) for the first time in these PN, as well as abundances from permitted C, N, O, and Ne lines. These results will provide new details of nucleosynthesis in the progenitor stars of PN, the composition of nebular dust grains, and the “abundance discrepancy problem,” in which abundances from permitted lines are systematically higher than those from forbidden lines. Numerical simulations of these PN, conducted with the widely-used Cloudy photoionization modeling code, are underway to study the ionization equilibria of the detected elements and to apply corrections for unobserved ionization states. Keywords: Planetary nebulae: general, Nuclear reactions, nucleosynthesis, abundances, Stars: evolution

1:45 INVESTIGATING THE EFFECTS OF MAGNETIC INTERACTION ON THE INDIRECT RIXS PEAK LOCATION, Kenny Stiwinter* and Trinanjan Datta, Augusta University, Augusta, GA, 30912. Resonant Inelastic X-ray scattering (RIXS) is a novel

experimental technique to characterize the properties of magnetic materials. The goal of this research is to theoretically investigate the effect of spatial anisotropy and next-nearest neighbor interaction on the multiple peak location of the bimagnon RIXS spectrum. Utilizing a Green function approach within the Bethe-Salpeter scheme we wrote a python code to simulate the indirect RIXS spectrum. Using a spin wave theory magnetization phase diagram and the associated spatial anisotropy parameter (ζ) and next nearest neighbor interaction parameter (η) we notice that the RIXS spectrum can develop multiple peaks. By fitting the location of the peaks we observe that a pattern emerges in how these peaks are affected by interaction. In the vast majority of the parameter space the peak of a fixed ζ with increasing η combination shifts downward in frequency with each consecutive increase in η . However, there are a couple of parameters where an upshift was observed. Based on our fits of the peak location we conclude that the pattern follows a non-linear (quadratic, cubic, or exponential) dependence on η for a fixed ζ . Keywords: Resonant Inelastic X-ray Scattering (RIXS), spin wave theory, magnetism

2:00 R-MATRIX PHOTOIONIZATION CROSS-SECTION CALCULATIONS FOR BROMINE AND RUBIDIUM IONS**, John E. Harrison*¹, N. C. Sterling¹, Manuel A. Bautista², Austin B. Kerlin¹ and A. L. Mashburn¹. ¹University of West Georgia, Carrollton, GA 30118. ²Western Michigan University, Kalamazoo, MI 49008. We present photoionization cross sections for bromine and rubidium ions (including Br²⁺, Rb²⁺, Rb⁴⁺, Rb⁵⁺, and Rb⁶⁺) calculated with the R-matrix method. These calculations are part of a larger program to determine atomic data for low-charge Br and Rb ions in order to accurately derive the abundances of these elements in astrophysical nebulae. The orbital wavefunctions are an important ingredient to photoionization calculations. To determine these, we utilized the AUTOSTRUCTURE atomic structure code, which uses the configuration interaction approximation. The scaling parameters to the radial wavefunctions were optimized on the first ~10 term energies in LS coupling, in order to best reproduce experimental energies and ionization potentials from NIST. The R-matrix calculations were first carried out in LS coupling using a suite of FORTRAN routines from the UK-APAP group. To test the veracity of these results, we compared them against experimental photoionization cross section measurements conducted at the Advanced Light Source synchrotron radiation facility at Lawrence Berkeley National Laboratory in California. Once good agreement between the LS and experimental cross sections was found, the fully relativistic level-resolved cross section was calculated with the Breit-Pauli R-Matrix code. Overall, we find good agreement between our theoretical and experimental photoionization cross sections, typically to within 25-30% for direct photoionization. The experimental resonance structures are also reproduced well by our calculations. Our results provide key ingredients for modeling the ionization equilibrium of Br and Rb in astrophysical nebulae, which will enable accurate nebular abundance determinations of these elements for the first time. The atomic data will be applied to modeling planetary nebulae (ionized ejecta marking the death of 1-8 solar mass stars), which may be enriched in Br and Rb by neutron-capture nucleosynthesis in their progenitor stars. We gratefully acknowledge support from NSF award AST-1412928. Keywords: Atomic data, atomic processes Stars: evolution Nuclear reactions, nucleosynthesis, abundances

2:15 DEVELOPMENT OF AN INEXPENSIVE LOW-POWER SONDE USING THE TEENSYTM MICROCONTROLLER**, C. Morrison*, J. A. Hauger, J. Reichmuth and M. Roeber, Augusta University, Augusta, GA 30912. Hydrologic flow in and out of coastal zones,

such as estuaries, may be responsible for sediment transport, altered salinity gradients, and variations in nutrient availability. In order to measure such flow, we have developed and tested a Lagrangian style surface drifting sonde capable of recording position and time for deployments lasting several days. A Teensy™ microcontroller is interfaced to a Global Positioning System (GPS) sensor with real-time cell network communications capability. The electronics is housed in a floating, waterproof enclosure and periodically transmits location and time data via short message service (SMS) to a website where information is stored for further analysis. Because the location is transmitted in near real-time, the device can be retrieved at the end of the sampling period. Design parameters including electronics, battery capacity, and power-saving software techniques will be presented. Keywords: Microcontroller, Sonde, Hydrologic flow

2:45 **Break**

3:00 THERMODYNAMIC PROPERTIES OF PROTEIN FOLDING PROCESS**, Vattika Sivised* and Theja De Silva, Department of Chemistry and Physics, Augusta University, Augusta, GA 30912. Proteins are one of the fundamental building blocks of life and they are present in almost all biological and cellular processes. Proteins consist of amino acids held together in a long chain by peptide bonds. When proteins function in biological processes, they fold in to three-dimensional structures by curling the chain. The folding of a peptide chain into a three dimensional structure is a thermodynamically driven process such that the chain naturally evolves to form domains of similar amino acids. The formation of this domain occurs by curling the one dimensional amino acid sequence by moving similar amino acids proximity to each other. We model this formation of domains or “ordering of amino acids” using q-state Potts model and

study the thermodynamic Properties using a statistical mechanics approach. Converting the interacting amino acids into an effectively non-interacting model using a mean-field theory, we calculate the Helmholtz free energy (HFE). Then by investigating the HFE, we qualitatively study the properties of protein folding transition. We find that the protein folding phase transition is strongly first order and the specific heat shows the experimental signatures of this phase transition. Keywords: Protein Folding, Potts Model, Phase Transition

3:15 AN INVESTIGATION OF TITANIUM DIOXIDE NANOPARTICLES FOR PHOTOCATALYTIC PROPERTIES**, Christian A. Ozburn* and L. Ajith DeSilva, Department of Physics, University of West Georgia, Carrollton, GA 30118. Titanium oxide (TiO_2) is one of the materials most extensively investigated for its photocatalytic properties, primarily because of its ability to degrade a wide variety of organic pollutants. Photocatalytic degradation of Congo-red on a (~ 300 nm) thin layer of anatase TiO_2 nanoparticles is investigated under Mercury light-source. The thin layer was prepared by spin coating techniques using commercially available TiO_2 nanoparticles of average size 10 – 15 nm. The samples are characterized by UV–visible spectroscopy and scanning electron microscopy (SEM). Estimated rate constant was found to be $3.1 \times 10^{-2} \text{ min}^{-1}$. Further, the degradation properties of thin layer samples were compared with that obtained with as-received TiO_2 nanoparticles under similar conditions. Financial support from UWG SEEP and SRAP programs are acknowledged. Keywords: Nanocomposite, Photocatalysis, Pollution

3:30 AN INVESTIGATION ON TRANSPARENT CONDUCTIVE P-TYPE COPPER (I) IODIDE THIN FILMS, J. Harwell*¹, L. Ajith DeSilva¹, T. M.W.J. Bandara², G.R.A. Kumara³, A.G.U. Perera⁴, K. Tennekone⁴ and Neal Chesnut¹, ¹Department of Physics, University of West Georgia, Carrollton, GA 30118, ²Department of Physics, Rajarata University of Sri Lanka, ³Postgraduate Institute of Science, University of Peradeniya, Sri Lanka, ⁴Department of Physics, Georgia State University, Atlanta, GA 30303. Copper (I) iodide (CuI), a p-type wide band gap (~ 3.1 eV) transparent semiconductor is a potential candidate for a range of applications in optoelectronics. Polycrystalline p-CuI thin films were prepared on glass substrate by solution processing at low temperature. The CuI films were doped with iodine vapor and with KSCN to achieve a high conductivity. Their electrical and optical properties were characterized by current-voltage measurements and UV–visible spectroscopy. The surface morphology of the films was also characterized by scanning electron microscopy. Financial support from UWG SEEP and SRAP programs are acknowledged. Keywords: Transparent conducting films, Copper Iodide, p-type semiconductor

3:45 STUDENT LED SUPPLEMENTAL INSTRUCTION TO IMPROVE STUDENT SUCCESS IN CLASSICAL MECHANICS, Joshua S. Buth* and Javier E. Hasbun, Department of Physics, University of West Georgia, Carrollton, GA 30118. The goal of this research is to explore the effectiveness of supplemental instruction in a classical physics class. The class involves physics projects associated with real classical physics problems which were based on writing the equations of motion for analytically solvable conditions. The projects are based on extensions of the analytical solutions to include terms in the equations that made the problems unsolvable analytically. Numerical solutions were to be obtained and compared with the analytically examined solutions and study the effects of the modifications. To accomplish this, the

students would write or modify MATLAB programs in order to compare the numeric and analytic solutions. My task was to lead my peers in supplemental instruction (SI) sessions to help with the physics of the various projects and with their MATLAB coding while answering questions in the form of hints. I would finish my coding projects early to get it checked over by the professor and then hold SI sessions to give feedback to my peers. Personally, I have seen a greater understanding in the students in regards to the MATLAB coding projects and the classical physics problems. The SI sessions seemed to improve student understanding in classical physics. Financial support from UWG SEEP program is acknowledged. Keywords: Supplemental instruction, Classical mechanics, MATLAB, Peer instruction

4:00 NUMERICAL MODELING OF BROMINE, RUBIDIUM, AND XENON IN ASTROPHYSICAL NEBULAE**, Courteney L. Spencer*, N. C. Sterling, R. L. Porter, and Cameroun G. Sherrard, University of West Georgia, Carrollton, GA 30118. We present numerical simulations of 10 planetary nebulae (PN) computed with Cloudy, a state-of-the-art code for modeling photoionized astrophysical nebulae. The primary goal of this endeavor is to study abundance enhancements of bromine, rubidium, and xenon, each of which can be produced by neutron-capture nucleosynthesis in low-mass (1-8 solar mass) giant stars that are the progenitors of PN. However, since only one or two ions of these elements are typically detected in individual PN, it is necessary to correct for the abundances of unobserved ionization states. The most accurate method for determining these corrections are with numerical models that simulate the ionization equilibrium of various elements. To this end, we have added Br, Rb, and Xe to the atomic database of Cloudy, making use of newly-determined photoionization, recombination, and collisional excitation atomic data for these elements. The modified version of Cloudy has been fully tested for stability, and reproduces standard test simulations to high accuracy. We have modeled PN in which one or more ionization states of Br, Rb, and Xe have been detected, to assess the accuracy of the new atomic data and to derive elemental abundances. The input model parameters, including central star temperature and luminosity, hydrogen density, and elemental abundances were determined via a subplex optimization routine that produced the best fit to observed emission line strengths. To derive analytic corrections to unobserved Br, Rb, and Xe ions we have initiated large grids of models (over 10,000 individual simulations per grid) that span the parameter range of densities, central star temperatures and luminosities, dust compositions, and metallicities (abundances of elements heavier than helium) encountered in PN. Our results will enable Br, Rb, and Xe abundances to be determined with unprecedented accuracy in PN, revealing new details of neutron-capture nucleosynthesis, the interior structure and mixing in low-mass giant stars, and the chemical evolution of the Universe. We gratefully acknowledge support from NSF grant AST-1412928. Keywords: Atomic data, atomic processes, Planetary nebulae: general Nuclear reactions, nucleosynthesis, abundances, Stars: evolution

4:15 OBSERVATION OF RESONANCE REPULSION IN A COUPLED TORSION OSCILLATOR SYSTEM, William Reeves* and Tom Colbert, Augusta University, Augusta GA 30912. A mass clamped to a stretched vertical wire acts as a driven damped torsional oscillator system. The angular amplitude of oscillations is measured using an optical lever composed of a laser pen and a mirror attached to the oscillating mass. We have observed decay of the system, and have measured the resonance response of the driven system. The system is driven using a simple coil powered by an audio amplifier and a small magnet fixed to the mass. The driving

frequency is controlled by the output reference signal from a lockin amplifier with precision to 0.001Hz. A second mass clamped to the same stretched wire allows for two oscillators with slightly different resonant frequencies and damping factors to interact. In one setup configuration, the resonance of one mass (the other is held fixed) is observed at 6.594 Hz and the other at 7.805 Hz. When the oscillators are coupled, resonances are observed at 6.565Hz and 7.823Hz respectively. This demonstrates the effect of resonance repulsion due to coupling in a simple mechanical system. Such repulsion effects can be observed in coupled electrical, optical, or atomic oscillator systems (spin-orbit coupling for example). Present results indicate a 3.88% repulsion effect. Investigation continues in order to enhance the repulsion effect and to give a detailed characterization of the forced coupled damped torsional oscillator system. Keywords: Resonance, Torsion oscillator, Oscillator

4:30 THE EFFECT OF TEMPERATURE ON THE ELECTRICAL RESISTANCE OF CARBON NANOTUBES**, Hannah Watkins* and Ben deMayo, University of West Georgia, Carrollton, GA 30118. Temperatures from 20 C (room) down to -196 C (liquid nitrogen) were applied to a commercially supplied multi-wall carbon nanotube sample—from Helix Material Solutions, Inc. A plastic PLA 3-D printed sample holder was used in a 4-wire resistance configuration, along with a platinum resistance temperature detector from Omega Engineering. A custom made LabView virtual instrument collected data at a rate of 2 sets of readings per second. After analyzing the data with Excel software, the resistance of the sample generally increased from around 95 Ω , at room temperature, to around 180 Ω , at -196 C. Upon warming, the resistance varied slightly, but ultimately decreased down to around 140 Ω , at room temperature. Hysteresis was observed. The voltage versus current dependence—at room temperature—was fit to a quadratic function; the resistance at $I = 0$ was found to be $(133.20 \pm 0.01) \Omega$. Work supported by the Georgia Space Grant Consortium-NASA. Keywords: Carbon Nanotubes, Electrical resistance, Temperature

4:45 THE MICROCONTROLLER MEETS WATER SCIENCE: DEVELOPMENT OF INEXPENSIVE ENVIRONMENTAL SENSORS USING ARDUINO™**, M. Roeber*¹, J. A. Hauger¹, J. Reichmuth¹, W. Byne² and O. Flite³, ¹Augusta University, Augusta, GA 30912, ²City of Augusta Engineering Department, Augusta, GA 30901, ³Phinizy Center for Water Sciences, Augusta, GA 30906. The Arduino™ microcontroller system provides a high quality platform for constructing custom environmental sensor packages. These packages can be comparable in quality to commercial devices at a fraction of the cost. We have recently designed, constructed, tested and deployed two specialized environmental monitoring devices. The first is a rain gauge that measures rainfall in a remote location and reports the data via Short Message Service (SMS) text to a computer server. Data from a recently deployed network of such sensors is then posted to the internet and can be examined alongside other environmentally relevant quantities. The second package is a Global Positioning System (GPS) sensor interfaced to an Arduino microcontroller equipped with SMS capability. The device is housed in a floating waterproof enclosure and records position and time data in order to monitor current flow in an open body of water. The device location and time data are periodically transmitted via SMS, allowing retrieval of the sensor at the end of the sampling period. Design parameters, device performance, and current status of these projects will be presented. Keywords: Environmental sensors, Arduino, Global positioning system, Water science

SATURDAY PAPER PRESENTATIONS

***Denotes student presenter**

****Denotes student research in progress**

Section I: Biological Sciences

Hatcher Room, 1st Floor RCC

Johnathan G. Davis, Presiding

9:15 TRILLED SONG TYPES ARE MORE SALIENT THAN NON-TRILLED SONG TYPES IN AGONISTIC INTERACTIONS BETWEEN MALE SONG SPARROWS (*MELOSPIZA MELODIA*)**, Cameron B. Duke* and B. Ballentine, Western Carolina University, Cullowhee, NC 28723. In song sparrows, previous research has shown that full repertoire song indicates male quality. However, there has been little research devoted to understanding the functional significance of the various songs in a song sparrow's repertoire. This study focused on trills to explore the possibility that repertoires evolved due to functional differences between songs based on structure. Trills have been the subject of much song research and are key message-carrying components likely to signal quality or aggressive intent of the singer. While most Song sparrow songs contain a trill, a small portion of songs do not. We conducted an experiment with 26 individuals on the campus of Western Carolina University. Trials featured six minutes of playback of either a trilled song type or nontrilled song type. Our response variable was average distance to the speaker as a measure of response intensity as per Searcy et al. (2006), with a lower average approach distance to the speaker characterizing the response as being more aggressive than a higher average approach distance. Our focal males approached more closely for the trilled songs (Paired T-test, $P=0.04$), supporting our hypothesis that song sparrows respond more intensively to trilled song types over nontrilled song types. This consistent difference in response intensity suggests that the song repertoire evolved not only as a signal of overall cognitive capacity, but to contain songs that can be used in various types of interactions. High trill performance is a correlate of mating success, so songs that lack trills may lack valuable cues for the receiver. This is indicated by not only higher average approach distances for the nontrilled songs, but larger standard deviations from those means as well. While trilled songs might be honest signals of quality and/or aggression, nontrilled songs may be attempts at novel, unmatchable songs, thus driving the evolution of repertoires. Keywords: Song sparrow, Song, repertoire, evolution, behavior, trill

9:30 ANALYSIS OF SEQUENCE CHARACTERISTICS OF TYPE I CD PROTEINS USING MULTIVARIATE STATISTICS IN ORDER TO DETERMINE THEIR FUNCTIONAL CLASS**, Pramir KC* and Janghoon Kang, Valdosta State University, Valdosta, GA 31698. Membrane proteins are important macromolecules that play pivotal roles as transporters, receptors, enzymes, and anchoring molecules in living organisms. Cluster of Differentiation (CD) proteins are membrane proteins found in the cell membranes of leucocytes. They are cell markers for many immune cells and function as diagnostic and therapeutic targets. The knowledge of structure is essential in determining the function of a protein. However, it is extremely difficult to determine protein structure by X-ray crystallography or NMR. We used multivariate statistics to analyze the sequence characteristics of type I CD proteins in order to classify them into two different classes: enzymes or binding proteins. We selected 126 different protein parameters and used

bioinformatics tools to extract them for each of the 263 type I CD proteins. We analyzed our data using principal component analysis (PCA) and K-means clustering. One initial analysis showed a clear cluster of type I CD proteins with enzymatic activity in the score plot. Statistical significance of the clustering will be assessed in the future. This is the first time this method of determining type I CD protein functional classes completely based on sequence characteristics has been employed and appears quite promising. In the future, this bioinformatics approach could be useful in determining the functional class of newly discovered type I membrane proteins. Keywords: CD proteins; Bioinformatics; PCA; K-means Clustering; CD Proteins functions.

9:45 EFFECTS OF NEST BUILDING BEHAVIOR ON INCUBATION AND REPRODUCTIVE SUCCESS IN CAROLINA CHICKADEES *POECILE CAROLINENSIS****, Traci Erin Ballance* and Barbara Ballentine, Western Carolina University, Cullowhee, NC 28723. Nest building is a vital part of parental care, but the impacts of the variation in nest building behavior on reproductive success in birds is not well understood. We address the effects of nest quality on incubation behavior and reproductive success in Carolina chickadee (*Poecile carolinensis*) females. In Carolina chickadees, only females build nests, incubate eggs, and brood young nestlings. Well-constructed nests can reduce the negative effects of cooling on eggs and nestlings. Extensive cooling can result in delayed embryonic development, hatching asynchrony, or hatching failure. Very young nestlings also depend on brooding for proper thermoregulation. However, females face tradeoffs between self-maintenance and incubation. We test the hypothesis that investment in high quality nests will result in higher reproductive success. Throughout spring and summer 2016, we monitored nest boxes in Jackson and Macon counties, N.C. for reproductive activity. For completed nests, we recorded nest dimensions and installed two iButtons (thermal data logger) inside each nest box to record nest and ambient temperatures. Comparisons between changes in nest temperature relative to ambient temperature allow us to estimate the time females spent incubating. Nestlings were weighed every-other-day between days 2- 12 and monitored for evidence of fledging. We will use growth rates of nestlings and fledging success as estimates of reproductive success. Faster growth rates indicate higher probability of post fledging success. Upon fledging, all nests were collected and air dried. Nest quality is estimated by dry mass and dimensions. We predict that higher quality nests require shorter periods of incubation but yield higher reproductive success. Keywords: Reproductive Success, Incubation Behavior, Nest Quality

10:30 ARE HERP ENCLOSURES HOT SPOTS OF SALMONELLA COLONIZATION?**, Sarah E. Rosario, C.R. Phipps* and Amanda L.J. Duffus, Gordon State College, Barnesville, GA 30204. *Salmonella* is estimated to cause more than 1 million cases of foodborne illness in the United States annually. Recently there have been four independent outbreaks of human *Salmonella* infection associated with pet aquatic turtles. Both reptiles and amphibians are known carriers of *Salmonella* and can shed the bacteria into their local environment through their feces. The aim of this study was to perform surveillance for *Salmonella* in captive reptile and amphibian enclosures using a combined traditional culture method and molecular approach. Samples were obtained from aquatic environments within the enclosures. Enrichment culture in tetrathionate broth media, followed by PCR amplification of the genes *invA* and *spvC* were used to determine the presence of *Salmonella*. *invA* is located on the *Salmonella* chromosome and encodes a protein associated with invasion of intestinal epithelium, while *spvC* is found on the virulence plasmid. Initial results indicate that more than 80% of surveyed enclosures harbor *Salmonella*. This high prevalence is

not surprising given the known association between herps and *Salmonella*. These results suggest that extreme caution should be taken when handling these animals and cleaning the enclosures to prevent human infection. Keywords: *Salmonella*, PCR detection, reptiles, amphibians, surveillance

10:45 LANDSCAPE FEATURES ASSOCIATED WITH BEHAVIORAL CHANGES ALONG AN URBAN-RURAL GRADIENT IN SONG SPARROWS, Kaley Wisher¹ and Jeremy Hyman¹, ¹Western Carolina University, Cullowhee, NC 28779. Organisms in urban habitats often display traits that differ from rural counterparts. Studies of song sparrows (*Melospiza melodia*) have found differences in behavior between urban and rural populations, with urban males showing higher territorial aggression and higher boldness than rural males. However, previous studies have simply categorized landscapes as either urban or rural, rather than quantifying landscape differences for each song sparrow territory, and thus, it is unclear what changes to the landscape influence behavior and result in urban animals being more aggressive and bold. In this study, we used playbacks of heterospecific Carolina wren (*Thryothorus ludovicianus*) alarm calls to measure boldness in song sparrows. For each territory, we also measured several landscape variables that correlate with urban disturbance, such as human population density, amount of built space, and distance to buildings. We performed regression analyses in order to determine which landscape variables best correlate with variation in behavior. Our results indicate that distance to the nearest building is the best predictor of behavior, with bolder birds living closer to buildings. These results suggest that the boldness typical of urban birds can arise in birds in close proximity to human activity, even when their territories are found in an otherwise non-developed, rural landscape. Keywords: behavior, bird, boldness, urbanization, song sparrow

11:00 GENETIC CHARACTERIZATION OF MUTANTS OF *SACCHAROMYCES CEREVISIAE* THAT GROW BROWN IN THE PRESENCE OF COPPER, Brian W. Schwartz*, Michael E. Rohly, Nathaniel J. Moore, Christopher L. Resch, and Joshua D. May, Columbus State University, Columbus, GA 31907. Certain mutants of *Saccharomyces cerevisiae* produce a brown pigment when grown in the presence of 1 mM CuSO₄. Genetic complementation tests indicate that at least three different genes (*BRN1*, *BRN2*, and *BRN3*) can mutate to the brown on copper phenotype. Results from whole genome sequencing studies suggest that *BRN1* corresponds to *SAM2* and that *BRN2* corresponds to *CYS3*. The failure of *BRN3* mutants to complement a deletion of *CYS4* indicates that *BRN3* corresponds to *CYS4*. DNA sequencing of additional mutant alleles and segregation analyses support the identities of the three genes. These three genes in yeast encode enzymes that are involved in synthesis of sulfur amino acids and S-adenosylmethionine. Mutations in the human homologs of these genes are associated with genetic diseases. Therefore, we anticipate that these mutants will allow for detailed functional analyses of these genes in yeast and will serve as models of human genetic diseases. Keywords: Yeast, *Saccharomyces cerevisiae*, copper, mutants, sulfur amino acid biosynthesis

11:15 INVESTIGATING BEHAVIORAL VARIATION IN URBAN AND RURAL POPULATIONS OF EASTERN BLUEBIRDS (*Sialia sialis*), Barbara Ballentine^{1, 2} and Meghan Graham¹, ¹University of West Georgia, Carrollton, GA 30118 and ²Western Carolina University, Cullowhee, NC 28723. Urbanization presents animals with unique challenges associated with the effects of human disturbances such as increased noise, light, pollution and proximity to humans.

However, increased tolerance of human disturbance can allow individuals to take advantage of beneficial aspects of urban landscapes such as access to resources, less interspecific competition and lower predation. Clumped resources associated with human disturbances characterize urban landscapes and may favor more aggressive males that can defend high quality resources and bolder males that are tolerant of human disturbance. In this study, we investigate how aggression and boldness differs in populations of eastern bluebirds (*Sialia sialis*) inhabiting urban and rural landscapes. We measured differences in male aggression using a conspecific playback, where closer approach toward the speaker indicates higher aggression. We measured boldness of males in the presence of humans and natural predators by their willingness to approach. We found that males in urban habitats are more aggressive than males in rural habitats and that urban males approached humans and natural predators equally. However, rural birds were less willing to approach a human than to approach a natural predator. Our results suggest that boldness in the presence of humans is not the result of habituation and that anthropogenic disturbance favors aggressive males that are tolerant of humans. Keywords: Aggression, Boldness, Urbanization, Eastern Bluebird, Anthropogenic disturbance, Behavior

POSTERS

BINDING OF ADENOVIRUS EARLY PROTEIN E411K TO RNA HELICASE DDX6**, Emilee Friedman* and Kasey Karen, Georgia College & State University, Milledgeville, GA 31061. Adenovirus is a non-enveloped, icosahedral DNA virus with a linear, double-stranded genome. Over 50 serotypes of human adenovirus have been identified and cause a variety of illnesses, including: conjunctivitis, gastroenteritis, and respiratory infections. Largely due to the efficacy with which adenovirus is able to infect host cells and replicate, it has been demonstrated to be an indispensable tool for a variety of therapeutic purposes including gene therapies, immunization delivery, and oncolytic therapies. Consequently, ongoing research largely focuses on adenovirus' improvement as a vector and a deepening understanding of host responses to infection. The life cycle of adenovirus is divided into early and late phases, with early proteins being largely regulatory, and late proteins being of a structural nature. Previous research has indicated that among the many roles of early proteins, arguably some of the most vital exist solely to evade the numerous antiviral responses mounted by infected host cells and establish a favorable environment for viral replication. Such proteins have been demonstrated to re-localize key cellular proteins, most notably proteins found within mRNA processing bodies (p-bodies). Among the re-localized p-body proteins are the scaffolding protein, Pat1b, and RNA helicase, DDX6. Pat1b and DDX6 are known to work together to post-transcriptionally control the expression of genes. Additionally, research has indicated that the interaction between DDX6 and the 11-kDa protein E411K reliably enhances viral replication. Further research is needed to understand the nature of this interaction, and could provide valuable insight to the mechanisms through which adenovirus modulates antiviral responses. Specifically, our project aims to identify, via immunofluorescence, (1) the intracellular locations of wild-type Pat1b following adenovirus infection and (2) the location of Pat1b and DDX6 following infection with mutant adenovirus that fails to express E411K. Keywords: Adenovirus, DDX6, Pat1b, immunocytochemistry

THE ROLE OF LEPTIN IN TRIPLE NEGATIVE BREAST CANCER TREATED WITH CHEMOTHERAPEUTICS, Ann A Kurian* and Ruben Rene Gonzalez-Perez, Morehouse School

of Medicine, Atlanta, Georgia 30310. Triple negative breast cancer (TNBC) tumors lack estrogen, progesterone and HER2 receptor expression, and its occurrence has been linked to obesity. Chemotherapy remains as the key therapy for TNBC, as there is no targeted treatment. Leptin is a hormone secreted mainly by the adipose tissue that is elevated in obese people. Leptin signaling could affect TNBC survival during chemotherapy, which may open a new way to combat the disease and reduce chemoresistance. We hypothesize that Leptin is a proliferative and survival factor for TNBC that could reduce the effectiveness of the commonly used drugs Doxorubicin (DOX) and 5-fluorouracil (5-FU). TNBC cell lines MDA-MB-231 and MDA-MB 468 were treated, as follows: 1) basal medium; 2) 2.5nM leptin; 3) 2.5nM leptin plus 2.5nM PEG-LPrA2 (pegylated leptin antagonist developed by us); 4) DOX at ED50; 5) 5-FU at ED50; 6) 2.5nM leptin plus DOX; 7) leptin plus 5-FU; 8) 2.5nM leptin, 2.5nM PEG-LPrA2 plus DOX ED50; or 9) 2.5nM leptin, 2.5nM PEG-LPrA2 plus 5-FU ED50. Apoptosis and cell cycle progression were determined after 6 day treatments using Nexcelom Cellometer technology to complete Annexin V assays for apoptosis and PI staining for cell cycle assays. Results indicate that leptin increased cell cycle progression by inducing progression of S phase. DOX and 5-FU induced apoptosis, which was attenuated by leptin. PEG-LPrA2 abrogated leptin effects on cell cycle and survival with chemotherapeutics. These data indicate that high levels of leptin in obese TNBC patient can decrease chemotherapeutic effectiveness and induce drug resistance. Thus, inhibiting leptin signaling using antagonist could serve as a new strategy to improve chemotherapeutic effectiveness, decrease drug resistance and reduce dosage of chemotherapeutics. Keywords: MDA-MB 231, MDA-MB-468, Triple negative breast cancer, obesity, leptin, PEG-LPrA2, Chemotherapeutics, DOX, 5-FU

ASSESSMENT OF DIATOM MOVEMENT AND SPECIES COMPOSITION IN RELATION TO VARIOUS TIDE LEVELS ON ST. SIMONS ISLAND, GA**, Merry Zohn* and K.M. Manoylov, Georgia College & State University, Milledgeville, GA 31061. As primary producers, the function of algae is determined by their shapes and sizes. The ability to travel up and down in mud and sand in coastal areas heavily affected the survival of algae within the aquatic habitats. This ability allows algae to live in diverse habitats with tidal cycles and escape periods of desiccation. Epipellic (growing on the mud surface) and epipsammic (growing attached to the sand particles) diatoms are the primary inhabitants of sand samples and are found within a thin horizontal and time dependent region at the sediment-water interface. While epipsammic algae might be exposed to desiccation at faster rate, motile epipellic diatoms can move to the surface during favorable conditions for maximum light exposure but then away from the surface to escape desiccation. Those movements are driven to maximize photosynthetic efficiency and increase the production of both ATP and storage material under favorable condition. The capacity to travel into the moist sand allows for some algae to survive longer periods of time than others that stay afloat on the sand surface. In this experiment, the movement distance of algae was documented from the northern region of St. Simons Island, GA using three different petri dishes of 0.5cm, 1.0cm, and 2.0cm. Live algal communities were assessed in every sample and live to dead diatom proportions in the communities were calculated. Cleaned diatoms were analyzed following standard protocols and used for species level identification. Community indices were compared through time and along the vertical gradient. Four algal groups were present including diatoms (Bacillariophyceae), Cryptophyta, Cyanobacteria, and green algae (Chlorophyta). Thirteen genera were physiologically active in the surface community. Algal communities in the sampling site were dominated by

epipelagic representatives of the genus *Nitzschia* (Bacillariophyceae). Diatom motility depended upon external temperature and time of sampling, other groups were less motile. The trophic system dependent on this community is at risk from increases in temperature and faster rates of post tidal desiccation. Keywords: Diatom, movement, tide changes, desiccation, sediment-water

QUANTITATIVE PCR VALIDATION OF COPPER-REGULATED GENE EXPRESSION IN *SACCHAROMYCES CEREVISIAE*, Brooks E. Arnold* and Brian W. Schwartz, Columbus State University, Columbus, GA 31907. Cells must tightly regulate copper levels because it serves as an essential micronutrient and is toxic when present in excess. Abnormal copper levels are a factor in several human disorders such as Menkes disease and Wilson's disease. Due to the similarity of pathways between yeast and other eukaryotes, budding yeast is a useful model for studying eukaryotic cell functions. Yeast cells regulate copper levels by differential expression of genes related to uptake (e.g., *CTR1*) and sequestration (*CUP1*). Previously, RNA sequence analysis (RNA-Seq) provided a list of genes that are significantly regulated by copper. RNA-Seq uses next-generation sequencing to quantify expression levels across the entire genome. However, RNA-Seq data must be verified and validated using other means of quantifying expression levels. The goal of this research was to verify regulation of *CTR1* and *CUP1* using quantitative PCR. RNA was isolated from yeast grown in triplicate under standard conditions with and without 1 mM copper sulfate. Target RNA expression levels were measured by quantitative PCR after conversion of RNA to cDNA and then normalized to the geometric mean of expression levels of three stably expressed reference genes. ANOVA indicated that *CTR1* is modestly down-regulated by copper ($P=0.101$), and *CUP1* is significantly up-regulated ($P=0.0003$). Repression of *CTR1* expression by copper is consistent with RNA-Seq results and other studies. Up-regulation of *CUP1* was not detected by RNA-Seq but had been observed in other studies. We conclude that RNA-Seq reliably detected regulation of *CTR1* but failed to detect regulation of *CUP1*. Keywords: Yeast, *Saccharomyces cerevisiae*, copper, gene regulation

FACTORS CONTRIBUTING TO REINTRODUCTION SUCCESS OF NATIVE FRESHWATER FISHES IN SOUTHERN APPALACHIA**, Rachel Benson*, Harrison Barton* and Johnathan G. Davis, Young Harris College, Young Harris, GA 30582. The Southern Appalachia region has high endemic fish diversity, but many native fish populations are being extirpated by various causes. Efforts to reintroduce and recover fish populations to their historical ranges have been conducted, but specific factors contributing to reproductive success or failure is not well known. We performed a meta-analysis of 30 published, peer-reviewed studies and constructed univariate and multivariate generalized linear models based upon eight factors to predict the probability of reintroduction success. Results suggest that the probability of reintroduction success is mostly strongly affected by the original cause of extirpation ($P=0.0233$). Multivariate models indicated that stream substrate, habitat, and stream order are also strong predictors of success. Fishes preferring gravel substrates had a much lower predicted probability of success (0.38) than all other substrates (>0.80). Larger streams (>6 orders) had low predicted probability of success (0.09 – 0.19) than smaller streams (0.60 – 0.78). Thus, our models suggest that reintroduction failure is likely for fishes that utilize gravel substrates inhabiting larger streams. Our results can be used in prioritizing extant fishes that are currently threatened with extirpation and focus conservation efforts on those fishes that are not likely to be reintroduced successfully. Keywords: reintroduction, native fish, Appalachia

AN ANALYSIS OF ANTERIOR HOX GENE EXPRESSION PATTERNS IN THE PHARYNGEAL ARCHES OF ZEBRAFISH (*DANIO RERIO*)**, Jeremy M. Brown*¹ and A. Davis¹, ¹Gordon State College, Barnesville, GA 30204. The pharyngeal arches (PAs) are a group of embryonic tissue primordia that give rise to craniofacial tissues, including bones, in vertebrate animals. Several developmental studies have shown that the *Hox* paralog group (PG) 3-6 genes in mouse (*Mus musculus*), dogfish shark (*Scyliorhinus canicula*), and several teleost fishes, including the Japanese medaka (*Oryzias latipes*) and Nile tilapia (*Oreochromis niloticus*), are expressed in the posterior PAs. While it is known where most of zebrafish (*Danio rerio*) *Hox* PG3-6 genes are expressed within the hindbrain, little is known of where these genes are expressed in the posterior PAs. We are currently uncovering the PA expression patterns of the zebrafish *Hox* PG3-6 genes. We have developed sense and antisense RNA probes for zebrafish *hoxa3a*, *a4a*, *a5a*, *b5a*, *b6a*, *b6b*, *c3a*, *c5a*, *c6a*, *d3a*, and *d4a*. To date, by performing whole-mount *in situ* hybridization, we have found that *hoxb5a* is expressed in the posterior PAs. We expect many of the other aforementioned genes to be expressed also in the posterior PAs, especially since their expression domains appear to be conserved across evolutionarily divergent lineages, including mouse, shark, medaka and tilapia. Keywords: Zebrafish, Gene Expression, Pharyngeal Arches, *Hox*

FIELD SURVEYS FOR DETECTION OF *BATRACHOCHYTRIUM DENDROBATIDIS* IN NORTH GEORGIA AMPHIBIAN POPULATIONS**, Spencer L. Cruz*, Jason Nations*, J. M. Morgan and N. L. Hyslop, University Of North Georgia. Chytridiomycosis is a fungal disease caused by the pathogen *Batrachochytrium dendrobatidis* (*Bd*), and is a contributing factor to global amphibian population declines. Although *Bd* is distributed globally, little research has been conducted on Georgia's amphibian populations. We surveyed for the presence of *Bd* in amphibian populations in the northeast Georgia Piedmont region at 3 different locations using active night searches, and passive sampling techniques at one of the 3 locations from spring 2013 through fall 2016. During night searches, we located amphibians in wetlands and captured them by hand. We used poly-vinyl chloride (PVC) pipes for passive sampling during both day and night. Following captures, we collected environmental and physical data from each individual, swabbed the skin for *Bd* detection using sterile polyester tipped swabs, and released individuals at their capture site. We changed gloves and disinfected equipment between each capture. Collected skin swabs were analyzed using polymerase chain reaction (PCR) testing to detect for presence of *Bd*. To date, we have collected 450 individual samples from 9 different species at 3 study sites using active surveys and 90 individual samples from passive sampling. PCR techniques have detected a positive *Bd* sample at one of the sites after testing 106 samples. Analysis of sampling, along with capture-mark-recapture data will continue throughout 2017. Keywords: Chytridiomycosis, *Batrachochytrium dendrobatidis*, Amphibian, disease, north Georgia

POTENT LETHAL EFFECT OF SALICYLALDEHYDE AND CINNAMALDEHYDE ON THE ARGENTINE ANT (HYMENOPTERA: FORMICIDAE)**, Benjamin Curry*¹, Amy Droegmiller*¹, Emiliano Sanchez², ChulHee Kang², and Cathy Lee¹, ¹Gordon State College, Barnesville, GA 30204 and ² Washington State University, Pullman, WA 99164. The Argentine ant, *Linepithema humile* (Mayr), is a serious pest in the southern United States. Current strategies for ant control are limited to applying long-term residual insecticides, which should be harmful to both human and the environment. Previously, we showed potent lethal effects of plant salicylic acid and its metabolites, benzoic acid and cinnamic acid, on Argentine ants. Salicylic acid is one

of the plant secondary metabolites, synthesized from phenylalanine via cinnamic acid and *o*-coumaric acid or via benzoic acid. In this report, the lethal effect of their redox partner molecules, namely cinnamaldehyde and salicylaldehyde, was tested by adopting an identical protocol. Cumulative mortality of Argentine ants was estimated initially after 3-day exposure to either salicylaldehyde or cinnamaldehyde in 10% sucrose food solution under the vented and unvented condition. Due to the potency of the lethal effect, we also tested the effect with much shorter exposures to salicylaldehyde and cinnamaldehyde in 30 min intervals. Similar trends of the lethal effects were observed in the exposure of cinnamaldehyde to the cultured Sf9 (*Spodoptera frugiperda*) cells. Our preliminary results strongly indicated a lethal effect of those aldehydic compounds which were much more potent than their acidic counterpart. Keywords: plant secondary metabolites, phenolic compounds, Argentine ant, sf9 cells

DNA BARCODING, NCBI DATA TOOL AND MEGA AS A TEACHING AND RESEARCH TOOL FOR UNDERGRADUATE BIOLOGY LABORATORY ACTIVITIES**, Charlseay D. Dodgen¹, Lucus Newman², and Cathy Lee¹, ¹Gordon State College, Barnesville, GA 30204, ²School of Medicine, Oregon Health and Science University, Portland, OR 97239. In 2012, a project involving plant DNA barcoding was started at Gordon State College to improve student engagement in upper division and senior level research courses. DNA barcoding involves the collection of specimens for identification and the laboratory analysis of DNA barcode sequences. The data is then placed in a database for subsequent analysis. The National Center for Biotechnology (NCBI) houses a series of DNA sequence databases in GenBank. Additionally, Molecular Evolutionary Genetics Analysis (MEGA) is a freely available computer program that conducts statistical analysis of molecular evolution and aids in the construction of phylogenetic trees. This provides an excellent molecular tool to train students to collect, manage/analyze DNA barcode data, and compare it with GenBank DNA databases to construct phylogenetic trees. In fall 2012, 2014, 2016, and spring 2013 the Biotechnology and special research topics classes isolated genomic DNA from 30 vegetables and 30 fruit species taken from local grocery stores and nine plant species from the Gordon State College walking trail. Genomic DNA preparation was done using PureLink™ plant DNA Total DNA Purification Kits (Invitrogen, Carlsbad, Ca). The students amplified chloroplast RuBisCO large subunit (rbcL) sequences by using a polymerase chain reaction (PCR). The isolated genomic DNA templates and DNA sequencing was created by using MEGA software to understand the evolutionary relationship of the chosen species and to further analyze the DNA barcoding data. This provides an excellent educational research project within the undergraduate upper division biology lab classes and special research topics course. Keywords: DNA barcoding, MEGA, NCBI, GenBank, biotechnology, educational tool, phylogenetic trees, RuBisCO

EFFECTS OF TEMPERATURE, HUMIDITY, AND PRESSURE ON CAPTURE RATES OF BATS IN FLAT CREEK NATURE AREA, FAYETTE COUNTY, GEORGIA, Raquel I. Gonzalez* and M.J. Bender, Gordon State College, Barnesville, GA 30204. Bats are increasingly recognized as critical members of almost every ecosystem they inhabit and, because of their volant nature and the abundance of prey, bats are virtually ubiquitous in their distribution. However, there is still much to be learned about the ecology, physiology, and activity patterns of many bat species. For instance, ambient temperature and relative humidity have the potential to influence not only the activity of their insect prey but also the thermoregulatory challenges that bats face while

foraging and commuting, but the effect of humidity, temperature, and other weather-related factors on flight activity has not been well documented. To better understand the influence of weather conditions on bat activity in Fayette County, GA, we surveyed bats and used linear regression and correlation to examine the relationships between nightly weather variables and captures. We used mist nets to sample bats in Flat Creek Nature Area between June 16 and September 15, 2016 and archived weather data from a nearby airport weather station for each sample night. We captured 75 bats and confirmed the presence of five species in the nature area. Average temperatures during our sample periods ranged from 72°F - 80°F, relative humidity ranged from 53% - 100%, and barometric pressure from 29.87 to 30.22 in Hg. Temperature and humidity were strongly correlated ($r^2 = 0.69$), but were not correlated with barometric pressure ($r^2 < 0.003$). Assuming higher bat activity corresponds with higher captures, regression analyses did not indicate any influence of temperature or humidity on bat activity, but regression results suggest that barometric pressure is a significant predictor variable and that bat captures decline on nights with higher average barometric pressure. Previous researchers have observed that higher barometric pressure correlates with lower insect activity and influences bat activity so our results have a biological basis and empirical support. However, additional research is required to determine if the barometric pressure differences we observed are related to actual differences in insect abundance in Flat Creek Nature Area. Keywords: bats, Fayette County, Flat Creek Nature Area, barometric pressure, bat activity

WHOLE GENOME RANAVIRUS PHYLOGENIES: AN IN-DEPTH LOOK**; Cori M. Harding*, Bridget Piatt*, W. Culpepper*, C. D. Dodgen*, S. E. Rosario, and A. L. J. Duffus, Gordon State College, Barnesville, GA, 30204. Ranaviruses are a group of globally emerging pathogens in amphibians, fish, and reptiles. They have been associated with the declines of several species and are known to affect several endangered species. Forty-two full *Ranavirus* genomes were obtained from GenBank and will be aligned using the MAFFT multiple sequence alignment program. Sequences will then be imported into the Molecular Evolutionary Genetic Analysis (MEGA) software program to analyze the sequences and determine the best nucleotide substitution model that will be used in the tree building algorithm. We will create maximum likelihood and neighbor joining trees and compare them to the published trees, most of which have only been made with small portions of the genome. Additionally, we will compare the complete genome trees to one made using only the major capsid protein (MCP) from the genomes from GenBank. The MCP trees will be built in the afore-mentioned manner. We anticipate that since the MCP is a highly conserved gene, the tree made with the whole genome will have similar branching patterns. Keywords: *Ranavirus*, whole genomes, phylogenetic analysis, MAFFT, MEGA, MCP

EXPLORING ALTERNATE GENES FOR RANAVIRUS PHYLOGENETICS**, Abigail Heiney*, Mason Patten*, and A.L.J. Duffus, Gordon State College, Barnesville, GA 30204. Ranaviruses, from the family *Iridoviridae*, are a group of viruses that are infectious in amphibians, reptiles, and fish. Outbreaks of ranaviral disease have caused economic losses in aquaculture. In amphibians, they have been associated with local population extinctions and declines. Traditionally, the sequence of the major capsid protein (MCP) has been used to examine the phylogenetic relationships between different isolates and species of ranaviruses. However, the MCP is highly conserved and, when used for phylogenetic inferences, may not be representative of the evolutionary history of the specific isolate/strain being examined. Here we take two different genes from GenBank whole genome sequences, an ATPase-like protein and a

myristilated membrane protein, and use them to build phylogenetic trees, which we will then compare to a tree that we have built using the MCP of the same ranavirus isolates and species. We will first align the sequences using MAFFT, then they will be imported into MEGA for further analysis. The aligned sequences will be analyzed for the best fit nucleotide substitution model and the best fit model will be used to build neighbor joining and maximum likelihood phylogenetic trees. The trees will be compared to previously published work and the constructed MCP tree. We anticipate that the trees will be similar to those that have previously been published using whole genomes, but we believe that the tree constructed with the myristilated membrane protein sequence will be the most divergent. Keywords: *Ranavirus*, emerging infection, phylogenetics

IDENTIFICATION OF NEW MICRORNAS IN CHLAMYDOMONAS REINHARDTII, Lindsey Howell*¹, Glen Borchert², David Chevalier¹, ¹Department of Biology, East Georgia State College, Swainsboro, Ga., ²Department of Biology and Department of Pharmacology, University 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 processes 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 to 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 miss-expression of miRNAs have been linked to several 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. The same miRNA can then be identified in other species, giving hope that some of these miRNA are present in many vital functions of plants and animals. Keywords: MicroRNA, Bioinformatics, Algae, *Chlamydomonas reinhardtii*

PARTIAL CHARACTERIZATION OF THE *PITX1* GENE OF EMPETRICHTHYINE FISHES (GOODEIDAE). A.L. Lacey*, J.L. Tolbert* and S.A. Webb, University of North Georgia, Dahlonega, GA 30597. Vertebrate pelvic appendages are complex structures comprising many different tissues. Nevertheless, taxa including sticklebacks (Gasterosteidae, Teleostei) and manatees (Sirenia, Mammalia) have independently lost these structures as a result of defects in a common, cis-acting, upstream regulatory element (pel) of the *Pituitary homeobox transcription factor 1* (*PITX1*) gene. Here we began investigating whether independent pelvic loss in the Empetrichthyinae (Goodeidae, Teleostei) was caused by similar *PITX1* regulatory defects. Toward this end we desired to sequence *PITX1* from *Crenichthys baileyi* and the goodeine *Goodea atripinnis* (a related clade with pelvic fins) using standard molecular protocols. Multiple, overlapping sets of primers were developed within the four exons of this nuclear gene using comparative bioinformatics approaches with publicly available sequence data for *Oryzias latipes* and *Fundulus heteroclitus*. Most primer combinations did not successfully amplify products of the

predicted size. Partial sequences were successfully determined for exon 2, intron 2 and exon 3. Comparisons of exons 2 (89 bp) and 3 (148 bp) of *Crenichthys* and *Goodea* revealed 96 and 97% sequence identity, respectively. These same exons shared 84 and 92% identity with *Oryzias*, and 96 and 96% identity with *Fundulus*. These coding regions yielded no significant hits on other genes. We have successfully sequenced part of the *PITX1* gene of goodeids with and lacking pelvic fins. Keywords: Pelvic fin loss; complex traits; developmental genetics; regulatory mutations, *PITX1* gene

BIOINFORMATICS ANALYSIS OF THE STRIPED (*MORONE SAXATILIS*) BASS *HOXA2A* AND *HOXA2B* GENOMIC DNA SUGGESTS EVOLUTIONARY CONSERVATION OF GENE REGULATION**, Amanda D. Mileham*¹, J. Scemama², A.L.J. Duffus¹, and A. Davis¹, ¹Gordon State College, Barnesville, GA 30204 and ²East Carolina University, Greenville, NC 27858. *Hoxa2* is an evolutionarily conserved developmental regulatory gene that functions to pattern the rhombomeres and pharyngeal arches, or tissue primordia that give rise to many cranial nerves and craniofacial skeletal elements, respectively, in vertebrates. Bioinformatics and reporter gene assays in the mouse (*Mus musculus*) and chick (*Gallus gallus*) embryos have shown the presence of several genomic DNA regulatory sequences within and around the *Hoxa2* gene. These sequences were shown to direct *Hoxa2* gene expression in the rhombomeres and pharyngeal arches. Several teleost fishes contain two *Hoxa2* genes, *hoxa2a* and *hoxa2b*, due to a whole genome duplication at the incipient stage of teleost evolution. Recent bioinformatics and reporter gene assays have shown that many of the regulatory sequences identified for *Hoxa2* of mouse and chick are also present for *hoxa2a* and *a2b* of several teleost fishes, including zebrafish (*Danio rerio*), Japanese medaka (*Oryzias latipes*), pufferfish (*Takifugu rubripes*), and Nile tilapia (*Oreochromis niloticus*). The current study attempts to expand our understanding of the *Hoxa2* regulatory elements in teleost fishes by analyzing unpublished genomic *hoxa2a* and *a2b* sequences of striped bass (*Morone saxatilis*). We used the software program Geneious® to perform comparative genomic sequence analyses of the Striped bass *hoxa2a* and *a2b* sequences with orthologous sequences from mouse, chick, zebrafish, medaka, pufferfish, and tilapia. Preliminary results suggest that the regulatory sequences that direct mouse and chick *Hoxa2* gene expression in the rhombomeres and pharyngeal arches are conserved for striped bass *hoxa2a* and *a2b*. These results support the expression patterns of striped bass *hoxa2a* and *a2b*, which are also expressed in the same domains. Keywords: Striped bass, *Hoxa2*, Gene Expression, Bioinformatics

A COMPARISON OF THE LEAF LITTER INVERTEBRATE COMMUNITY ASSOCIATED WITH GOLDEN BAMBOO STANDS VERSUS ADJACENT AREAS, Katherine Odegaard*, Lara Jones*, and M.J. Bender, Gordon State College, Barnesville, GA 30204. Golden Bamboo (*Phyllostachys aurea*) is an invasive species that forms dense monocultural stands that exclude all other plants. The invertebrate leaf litter community associated with these stands likely varies from native or more heterogeneous stands because reducing heterogeneity generally reduces available niches. The potential reduction in complexity and abundance of the leaf-litter community may influence multiple trophic levels because litter invertebrates are influential in nutrient cycling and also serve as predators of soil and litter fauna. Our objective for this project was to test our hypothesis that the community of leaf-litter invertebrates would be depauperate when compared to the litter invertebrates associated with adjacent but more heterogeneous habitat. We collected litter samples from three locations in Lamar County, GA, that contained dense areas of golden

bamboo. Berlese funnels were used to extract the invertebrates and we identified all invertebrates to Order level. We used t-tests ($\alpha = 0.05$) to determine if the community associated with Golden Bamboo litter differed from that of adjacent litter in regards to total abundance, order richness, Shannon's diversity, and Shannon's equitability. A total of 5026 macroinvertebrates representing 21 Orders were identified, with 2276 in bamboo and 2750 in hardwood. Average richness in bamboo habitats was slightly lower than in adjacent areas (13/sample vs. 13.7), average Shannon's diversity in bamboo was slightly higher (1.5 vs. 1.0), and average Shannon's equitability was 0.58 in bamboo versus 0.38 in adjacent areas. However, the only difference that was significantly different was Shannon's equitability ($P = 0.04$). Based on the results from our small study, we reject our hypothesis that the macroinvertebrate community in Golden bamboo differs substantially from the community found in more heterogeneous areas nearby. Keywords: leaf-litter, Golden Bamboo, Lamar County, *Phyllostachys aurea*

AN ASSESSMENT OF ALGAL COMMUNITIES IN WETLANDS LOCATED ABOVE AND BELOW THE GEORGIA FALL LINE, Sofia E. Sifnaios*, and Kalina Manoylov. Georgia College & State University, Milledgeville, GA 31061. Wetlands are important aquatic habitats that provide a variety of ecosystem services beneficial to all organisms. These services include improving water quality, storing excess water during floods, and maintaining global climate conditions through several nutrient cycles. Algae are an integral part of aquatic habitats as essential primary producers and important bioindicators of water quality alterations. This study was conducted as an assessment of water quality based on algal biomass in wetlands north (the Piedmont Plateau) and south (Coastal Plain) of the Fall Line. One wetland from each region was selected and compared based on mineral contents, nutrient availability, organic material, primary production, and hydrologic properties based on its soils physical and chemical makeup. YSI and BenthosTorch measurements were taken in the field, and algal samples were collected and analyzed in the lab for Chlorophyll α concentrations using bbe AlgaeGuard. Comparisons between wetlands and between measurements of primary production in the field and in the lab were evaluated with two-sample Hotelling's T-square tests. Based on the physical parameters tested, the wetlands were significantly different only in dissolved oxygen ($p < 0.001$, but were not different in pH ($p = 0.297$), conductivity ($p = 0.097$) and temperature ($p = 0.882$). Total chlorophyll a measured in the lab was not significantly different ($p = 0.171$), but due to significant difference in Si ($p = 0.027$), K ($p = 0.004$) and hardness ($p = 0.008$) there were different algal compositions in each wetland. Green algae dominated algal community in the Babe and Sage farm wetland (south of the Fall line), due to higher nutrient content exposure. The Bartram forest wetland, north of the Fall line had lower sunlight exposure, was further from human activities, and primary production was dominated by diatoms.

SURVEY OF UNMANAGED PINE FOREST FOR THREATENED REPTILE SPECIES**, Derick R. Thompson*¹, R. Phillips², K. Warren¹ and B. L. Simmons¹, ¹East Georgia State College, Swainsboro, GA 30401 and ²Georgia Department of Natural Resources Swainsboro, GA 30401. *Gopherus polyphemus* (Dauden 1802), the gopher tortoise, is a burrowing reptile found in sandy coastal regions of the southeastern United States. Since the uninhabited burrows provide shelter to other organisms, the gopher tortoise is a keystone species. Populations are steadily decreasing, primarily because of habitat loss. The natural habitat of gopher tortoise are sandy soils of the longleaf pine (*Pinus palustris* Miller), a habitat that has been critically reduced in the last century.

These systems are known for frequent fires, sparse canopy, and abundant herbaceous ground cover. Tortoises spend 90% of their lifetime in burrows but require an open canopy, which facilitates the growth of food resources such as grasses, the flowers, fruits and leaves of herbaceous plants and shrubs. Regulated burning of land is known to improve the habitat of the gopher tortoises; burning leads to wide spaced trees, diverse shrubs, and colonization of wiregrass. Fire suppression, dormant-season burning, and other forestry practices have detrimentally affected the natural cycles of the longleaf wiregrass system, making it less suitable for gopher tortoise. Habitat fragmentation and decreasing habitat quality makes gopher tortoise more susceptible to human encroachment, and predators. The study site is a 135.99 acre parcel of land in Emanuel County, GA (N 55°51'58"E, S 48°07'32"W to N 55°48'44"W, S 80°13'08"E), located adjacent to East Georgia State College. The burrow surveys were completed in late November 2016, using linear transects spaced 10 m apart. Standing biomass was estimated using a point-centered quarter method. Leaf litter and bare soil estimates were conducted visually using randomly placed 1 m sampling rings. Habitat quality across much of the study site is poor: standing biomass is dense, bare soil is scarce, and the area is heavily utilized by feral hogs and deer. Few burrows were determined to be active and must be investigated further using a camera field scope. Data from this survey will be used by the college in order to make decisions regarding land use and habitat management. Keywords: gopher tortoise, keystone species, conservation, longleaf pine wiregrass ecosystem, habitat fragmentation

IMPACTS OF COLD STRATIFICATION AND MOISTURE PRETREATMENT ON SEED GERMINATION OF THREE MILKWEED SPECIES NATIVE TO GEORGIA, Andrew M. Wright*, Zachary W. Izen*, Gretchen M. Ionta, and Kalina M. Manoylov, Georgia College & State University, Milledgeville, GA 31061. The North American population of the monarch butterfly (*Danaus plexippus*) has experienced a significant decline in the past two decades. This shrinkage follows a concurrent reduction in the availability of larval host plants such as milkweed (*Asclepias* species), due to recent agricultural practices. Accordingly, the reintroduction of milkweed into habitats accessible to monarch populations is a high priority for monarch restoration efforts. Milkweed seed, however, has an inherent dormancy, requiring exposure to a period of cold temperatures (e.g. winter conditions) before germination can take place. The ability to readily prepare seeds for planting independent of seasonal constraints would therefore provide a resource and timesaving shortcut to restoration efforts. We set out to determine optimal cold and moisture treatments for breaking seed dormancy in three milkweed species, *Asclepias syriaca*, *A. tuberosa*, and *A. incarnata*, by subjecting them to varying periods of cold stratification and moisture pretreatment prior to incubation, and recording subsequent germination rates. The seeds underwent stratification at 0°C for either 7, 14, 21 or 28 days, followed by incubation in a growth chamber at 16:8 hour temperature regimes of 27°C and 20°C, simulating natural ecological conditions. Half of the seeds were moistened before stratification, while the other half remained dry. Germination was determined by the appearance of a radical longer than 0.5mm in length, and time to germination and overall germination rates were recorded for each treatment. Unexpectedly, our results showed no statistically significant difference in germination rates as dependent on days stratified, but revealed a significant difference in germination rates based on moisture pretreatment, with a higher mean germination rate for non-moistened seeds at 0.80 +/- 0.068, compared to moistened seeds at 0.57 +/- 0.052. Keywords: *Asclepias*, Cold Stratification, Dormancy, Milkweed, Monarch

THE OCCURRENCE OF ATHLETE'S FOOT (TINEA PEDIS), CAUSED BY THE DERMATOPHYTIC FUNGUS, *TRICHOPHYTON RUBRUM* MALMSTEN 1845, AMONGST ATHLETES AT BREWTON-PARKER COLLEGE, Natalia Adams* and Helene Peters, Brewton-Parker College, Mount Vernon, GA 30445. Athlete's foot (tinea pedis) is a common fungal infection, caused by *Trichophyton rubrum* Malmsten 1845, an anthropophilic dermatophyte that invades and multiplies within the skin, nails, and hair and grows preferentially on humans. Athletes are at a much higher risk of infection due to their environment: they wear tight fitting shoes and sweaty socks often. Walking barefoot in swimming pool areas, saunas, locker rooms, whirlpools, and bathrooms can also increase risk of contracting tinea pedis. An infection can be cured by a variety of antifungal foot creams, gel, sprays, and powders. This study investigated the occurrence of tinea pedis with associated *T. rubrum* growth and the efficiency of Tinactin®, also referred to as tolnaftate 1%, as a treatment aerosol liquid spray. The women's and men's soccer team, women's softball team, and men's baseball team at Brewton-Parker College participated in the study. A survey of 84 athletes indicated that 18% had previous athlete's foot symptoms. Toenail clippings and skin scrapings were collected from 53 athletes. A KOH test was performed on the skin scrapings in order to identify the fungal hyphae microscopically. Toenails were inoculated on Sabouraud agar plates and incubated at 28 °C for four days to confirm *T. rubrum* growth. Of these, 59% were infected with *T. rubrum*. An experimental treatment group of 10 athletes was chosen based upon plate growth to study the effectiveness of Tinactin® spray. After 28 days of daily treatment, toenail clippings were collected from these 10 athletes, and inoculated to see if *T. rubrum* growth was cured. Upon completion of the treatment phase, only 10% of the fungal infections were cured and showed negative growth for *T. rubrum*. Keywords: Athlete's foot, tinea pedis, *Trichophyton rubrum*, dermatophyte, treatment

AN INVESTIGATION INTO THE EFFECT OF AN ENERGY DRINK ON ATHLETE PERFORMANCE AMONG BASKETBALL ATHLETES AT BREWTON-PARKER COLLEGE. Tajamian Foster* and Helene Peters, Brewton-Parker College, Mount Vernon, GA 30445. Popular energy drinks available today contain different amounts of caffeine, and these energy drinks are especially marketed to college and professional athletes. The chemical composition of energy drinks may increase athletic performance, which is known as an ergogenic effect, but these energy drinks may also produce adverse behavioral effects. The proposed study investigated whether a well-known energy drink had an effect on the athletic performance of the men's and women's basketball teams at Brewton-Parker College. The experimental groups (15 females and 18 males) ingested 8 fluid ounces of an energy drink, which contained 80mg of caffeine and 27g of carbohydrates, and were then tested using a Ruler Drop Test, a Running-based Anaerobic Sprint Test and a Squats Test. As a control, the groups also ingested a placebo drink with the same amount of carbohydrates, but no caffeine and were tested using the same three tests. Data were analyzed using a two-tailed t-test with the critical value at $p=0.05$ to determine whether ingestion of an energy drink significantly affected athletic performance. For the ladies, average Anaerobic Sprint Test times after placebo ingestion was 3.89 seconds over 35 meters and 3.87 seconds after energy drink with a t-value of $0.114423 > 0.05$. For the men, average sprint times after placebo was 3.78 seconds and 3.76 after energy drink with a t-value of $0.151049 > 0.05$. The Squats Test results showed averages of 38 (placebo) and 33 (energy drink) squats per minute and 35 (placebo) and 36 (energy drink) for the

ladies and men respectively with t-values of $0.061569 > 0.05$ and $0.4893688 > 0.05$. These two tests thus show no significant difference between placebo and energy drink for both genders. The Ruler Drop Test results for the men: an average of 0.063811 seconds before the ruler was caught for placebo and 0.062282 seconds for the energy drink, with t-value $0.0270467 < 0.05$, thus statistically significant. The results for the ladies were inconclusive. Keywords: Athletic performance, ergogenic, energy drink, caffeine

Section II: Chemistry
Maxwell Center, Room 106
Daniel W. Holley Presiding

8:30 DISSOLUTION TESTING AND ANALYSIS OF VITAMIN C TABLETS**, Dorcas Ugbo*, M.C. Koether, Kennesaw State University, Kennesaw, GA 30144. Dissolution testing is used to determine the release rate of vitamin C from over-the-counter tablets. The analytical method for the analysis of the vitamin C in the samples pulled from the dissolution tester at various time intervals was optimized. Figures of merit were obtained for the analysis. Keywords: Dissolution Testing, Vitamin C Analysis

8:45 COMPARISON OF HEMATITE NANOCRYSTALLINE FILMS FOR USE IN PHOTOELECTROCHEMICAL CELLS**, Allison B. Taylor* and Linda de la Garza, Valdosta State University, Valdosta, Ga 31698. Hematite, α -Fe₂O₃ nanocrystalline films have become a covetable material for use in photoelectrochemical cells because of efficient energy conversion in the visible electromagnetic spectrum and water splitting abilities to produce hydrogen gas. Nanoparticulate solutions of Fe₂O₃ were synthesized by a hydrolysis method with laboratory grade FeCl₃ and with FeCl₃ solution made from a sample of rust. The contaminated rust was collected from woven steel cable which was left exposed to harsh outdoor conditions. The solutions were deposited by a dip-coat method onto conductive glass and characterized by UV/ VIS, IR spectroscopy, and photoelectrochemistry. The efficiency of photocurrent production was evaluated. Keywords: Nanoparticles, Photoelectrochemical cells, nanocrystalline films, α -Fe₂O₃

9:00 A PRELIMINARY ANALYSIS OF WASTE OIL AND GREASE FROM THE CAMPUS CHICK-FIL-A FOR USE AS BIOFUEL**, Syed A. Hyder*, Blake Lindner*, Ahla Ko*, Uchechi Egejuru*, Neelam Khan, Sang H. Park, Kathryn Zimmermann, and David P. Pursell, Georgia Gwinnett College. Waste oil and grease (O&G) from GGC Dining Operation's Chick-fil-A restaurant was gravity separated and then chemically transformed from fatty acid into methyl ester (biodiesel) and glycerol, with the methyl ester subsequently extracted and dried from the product mixture. Characterization of the methyl ester (biodiesel) was accomplished using FT-IR, NMR, GC-MS, ICP-MS, thermodynamics via micro-bomb calorimetry, and density and viscosity measurements. Results indicate biodiesel methyl ester composition of approximately 54% methyl oleate [cis-9] and 33% methyl linoleate [cis-9,12], consistent with the Chick-fil-A's use of peanut oil as the primary cooking oil. Characterization results will be presented along with direction of future work, to include suitability of waste O&G for use as a biofuel. Keywords: waste oil and grease, biodiesel

9:15 EVALUATING TWO MODELS FOR THE EFFECTS OF OSMOLYTES ON PROTEIN STABILITY AND FUNCTION: MEASURING THE INTERACTIONS OF GLYCINE BETAINE WITH CARBOXYLIC ACIDS, Grace Terry*, Fergus King, Casey Wiltsek*, Red Chu*, Jonathan G. Cannon, Middle Georgia State University, Cochran, GA 31014. The osmophobic effect has been the dominant explanation for several decades for why osmolytes stabilize proteins under various stresses. Two competing models have been put forward to attempt to quantify the osmophobic effect. The group transfer free energy model (GTFE) predicts that the

primary effects of osmolytes are through interactions with the protein backbone, while interactions with side chains are a minimal, secondary effect. The local-bulk domain partitioning model (LBD) was developed to additionally quantify osmolyte effects on protein-nucleic acid interactions. This model predicts large effects from interactions of osmolytes with negatively charged atomic surfaces. We have been exploring the discrepancies between these models through examining the effects of glycine betaine on the solubility of glutamic acid. We have improved our methodology and begun collecting solubility data as a function of pH. A published comparison of the two models concluded that the LBD model is more accurate than the GTFE model. Our results continue to indicate that errors in the GTFE model may be due, in large part, to a small number of errors in published data, particularly the measurement of glutamic acid and aspartic acid solubility. Keywords: osmolytes, protein folding, solubility, density, amino acids, undergraduate research, empirical models

9:30 GREEN SYNTHESIS OF SOAPS: UNDERGRADUATE CHEMISTRY LAB PROJECT, Jillian Mary V. Amurao*, Tyler S. Brack, Sara G. Peacock and Renat. R. Khatmullin, Middle Georgia State University, Macon, GA 31206. Batches of soap are synthesized and wasted every year in Middle Georgia State University's chemistry labs. This is due to the high pH of the soap which made it caustic. It was theorized that adding weak acids extracted from various fruits during synthesis would neutralize this effect. So with this knowledge and the resources at hand, the synthesis of soap began in the lab using the hot process. Weak acids were added during synthesis, and a variety of soaps were produced. These soaps were tested for their pH and physical properties, and several of them met or exceeded standards set by a commercial antibacterial hand soap. In conclusion, green soap can be synthesized using the resources in the lab, and soap made by chemistry students yearly will no longer be wasted. Keywords: Soap, Synthesis

9:45 INTERLOCKING TOY BUILDING BLOCKS AS HANDS-ON LEARNING MODULES FOR BLIND AND VISUALLY IMPAIRED CHEMISTRY STUDENTS, Samuel Melaku, James O. Schreck, Kameron Griffin, and Rajeev B. Dabke, Department of Chemistry, Columbus State University, Columbus, GA 31907. In this study, interlocking toy building blocks as chemistry learning modules for blind and visually impaired (BVI) students in high school and undergraduate introductory or general chemistry courses are presented. Building blocks were assembled on a baseplate to depict the relative changes in the periodic properties of elements. Modules depicting the electron configuration of an element and molecular orbital theory were also constructed. Modules were presented as a hands-on learning experience for a group of BVI students followed by a survey. Modules were also presented as classroom demonstration for an undergraduate general chemistry class of sighted students. Keywords: General Public, High School/Introductory Chemistry, First-Year Undergraduate/General, Continuing Education, Hands-On Learning/Manipulatives, Testing/Assessment, Periodicity/Periodic Table

10:00 **Section Business Meeting**

POSTERS

SYNTHESIS OF CHIRAL IMINES and AMINES ON SILICA SURFACES**, Alexander J. Burch* and John T. Barbas, Valdosta State University, Valdosta, GA 31698. We have devised simple, facile, and greener methods in the synthesis of several new chiral amines on silica surfaces. Several of these amines have the pyridyl, furyl, and other moieties in their molecular structures, thus affording additional ligands for coordination with other chiral molecules. We have also synthesized amines with ortho substituents which afford steric hindrance to the reactions. In all cases the reactions proceeded smoothly to give quantitative yields of the products. Specific rotations were obtained of pure samples of all the imines and amines. In the synthetic procedure, typically 2.0 g of activated silica were added to 10 mL of an ethereal solution of equimolar quantities (2.0×10^{-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, while cooling the flask in an ice bath. The flask was briefly stirred upon each addition of water. The 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. Traces of the starting aldehyde or amine if present, were removed by column chromatography prior to analysis. Products were analyzed by IR, GC, GC-MS, and proton and C-13 NMR, and by polarimetry. Keywords: Imine, Amine, green chemistry

NANO-BIOMATERIALS FOR THERAPEUTIC APPLICATIONS: SYNTHESIS OF AN ENCAPSULATED SULFANILAMIDE ANTIBIOTIC**, ZeAndra D. Whitfield* and Ghislain Mandouma, Albany State University, Albany, GA 30096. Infectious diseases, and drug resistance to common antibiotic drugs continue to represent a major threat to human health. In developing countries, millions of children die each year due to infections that are otherwise treatable. Sulfa drugs or sulfanilamides are inexpensive, yet effective antibacterial drugs that have been known for more than a century. Several types of sulfa drugs are marketed for treatment of common bacterial infections (skin, bladder, respiratory or urinary track etc) in addition to being effective against malaria. Sulfanilamides control the growth of bacteria (bacteriostatic) by inhibiting folic acid synthesis needed for bacterial growth. Sulfanilamide is structurally similar to p-aminobenzoic acid (PABA) which is part of dihydrofolate. Bacterial growth is hindered by the progressive replacement of PABA by sulfanilamide during dihydrofolate biosynthesis in bacteria. Therefore, sulfanilamides are considered inhibitors of dihydropteroate synthetase. Several analogs of sulfanilamide have been synthesized, and this reaction is now described in textbooks. Metal complexes of sulfanilamides are water soluble but have also been linked to higher toxicity and increased resistance to sulfanilamides. Dendrimers are macromolecules which behave as monodispersed nanoreactors with ligand sites on both their surface and inside. Dendrimers host their guest-molecules with a molecular level of dispersion to the latter that increases the bioavailability of the nanocomposites thus formed. PAMAM-based dendrimers are also nontoxic, and therefore unable to interfere with the results of the proposed study. Keywords: sulfanilamides, sulfa drugs, antibiotic, dendrimers, bacteria, nano-biomaterials.

TOWARD METAL-ORGANIC FRAMEWORKS CONTAINING NONBENZENOID ISOCYANOARENES AND HALF-SANDWICH IRIDIUM (III)-BASED BUILDING BLOCKS**, Farrah M. Bakr*, John J. Meyers, Clayton State University, Morrow, GA 30260. Metal-organic frameworks (MOFs) are compounds composed of metal ions connected to organic ligands (or bridges) to provide a 2D or 3D porous structure. Unfortunately, 2D molecular squares and rectangles are not well studied. A 2D square or rectangle combines metal-based fragments, which serve as the corner pieces, with organic bridges, the edge piece, to create a planar macrocyclic structure. The focus of this study is to obtain a better understanding of 2D MOFs as a precursor to 3D MOFs. More specifically, this project examined the ability of the half-sandwich cyclopentadienyl-iridium(III) fragment to act as a corner piece and support multiple bulky 2-isocyano-1,3-diethoxycarbonylazulene (isocyanoazulene) ligands. To accomplish this, three nonbridging isocyanoazulenes were attempted to be successively added to a half-sandwich iridium(III)-based metal fragment. These complexes will serve as models of the corner piece of a 2D and 3D MOF when bridging ligands are used. Keywords: metal-organic framework, MOF, half-sandwich metal compounds, iridium, isocyanides

DETERMINATION OF TOXIC HEAVY METALS IN PEANUTS, Sydney Brown* and Samuel M. Abegaz, Department of Chemistry, Columbus State University, Columbus, GA 31907. Peanuts are currently one of the most important oil-seeds in the world, and the demand for this commodity is steadily increasing. In this study, the level of toxic heavy metals in peanut samples was determined. Peanut samples were collected from a Georgia farm and also purchased from local grocery stores. Samples were digested, filtered and analyzed for their cadmium and lead contents using graphite furnace atomic absorption spectroscopy. The analytical procedure was validated using a standard reference material. The results of this study indicated that the concentration of cadmium and lead in most peanut samples were found to be below the maximum limits of the various regulatory agencies. Keywords: Heavy Metals, Peanut, GF-AAS.

IMPROVED MEASUREMENTS OF THE EFFECTS OF GLYCINE BETAINE AND PH ON GLUTAMIC ACID SOLUBILITY** Red Chu*, Casey Wiltsek*, Grace Terry, Fergus King, Jonathan G. Cannon, Middle 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 added to our simple toolbox specific gravity bottles to improve measurements of density and solubility. We have implemented a new method to examine solubility of glutamic acid as a function of pH. These changes have improved the precision of saturated solution densities, and begun to generate a surface map of the density and solubility of glutamic acid solutions as a function of pH. We are one step closer to understanding discrepancies between two competing models for osmolyte effects on protein stability. Our results continue to support the hypothesis that a small number of errors, particularly on the solubility of glutamate and aspartate, are responsible for the major differences in conclusions between the group transfer free energy model (GTFE) and the local-bulk domain model (LBD) for the effects of glycine betaine on protein stability. Keywords: osmolytes, protein folding, solubility, density, amino acids, undergraduate research

INVESTIGATION OF TOXIC HEAVY METALS IN PERSONAL CARE PRODUCTS **, Brittney N. Menefee* and Samuel M. Abegaz, Department of Chemistry, Columbus State University, Columbus, GA 31907. The purpose of this study was to investigate the content of toxic heavy metals (Cd and Pb) in personal care products. Personal care products were purchased from local stores. Personal care samples were analyzed using graphite furnace atomic absorption spectroscopy following appropriate acid digestion. The results of this study indicated that the concentration of cadmium and lead in most of the analyzed samples were found to be within the permissible limits of the various international agencies. However, continued exposure from toxic heavy metals could pose environmental and human health risks. The analytical procedure was validated using standard reference material. Keywords: Heavy Metals, Personal Care products, GF-AAS

ICING BEHAVIORS OF SUPERHYDROPHOBIC ZINC OXIDATE **, Kelly English* and Liqiu Zheng, Natural and Forensic sciences department, Albany State University, Albany, GA 31705. The wettability and icing behaviors of a solid surface essentially are governed by its morphology and chemical composition. The great variety of morphologies of zinc oxide (ZnO), hinging solely on preparation methods, along with the intrinsic hydrophobicity of ZnO, provides a fertile playground for fundamental research and extensive technological applications of wettability and anti-icing. By adopting a facile hydrothermal method, the micro- and nanostructures of a ZnO surface will be synthesized. Wettability will be investigated. For the first time, icing behaviors of ZnO will be scrutinized. The study of icing behaviors of ZnO would provide insights into other outdoor applications of ZnO under harsh conditions. Keywords: Wettability, Superhydrophobicity, Superhydrophilicity, Icing, Morphology

EFFECT OF ACID STRENGTH AND TEMPERATURE ON ACTIVATION ENERGY FOR MUTAROTATION OF SUCROSE USING POLARIMETRY**, Andrew Duitsman*, Sean Carrigan*, Piedmont College, Demorest, GA 30535. The mutarotation of sucrose in acid was studied using polarimetry. Optical rotation data was collected using hydrochloric, nitric, and acetic acid solutions using a Perkin-Elmer Polarimeter. Sucrose solutions were prepared in each acid immediately prior to use and the change in observed rotation was recorded using acid concentrations of 0.125 M, 0.25 M and 0.50 M. Several hours of data was collected for each run. Temperature effects were examined and each acid was tested at 12°, 20°, and 37°C. Observed rotation was expressed as specific rotation and plotted graphically to determine the rate constants for mutarotation. R^2 values for the plots were typically 0.97 or higher indicating linearity. For each acid, the rate constants at 12°C, 20°C, and 37°C were also obtained to determine the activation energy. Rates of hydrolysis were consistent with acid strength with hydrochloric having a rate constant values of 1.4×10^{-3} , 2.5×10^{-3} , and $4.4 \times 10^{-3} \text{ M}^{-1} \text{ s}^{-1}$ in 0.125 M, 0.25 M, and 0.50 M HCl respectively. A similar trend was observed for nitric acid with rate constants of 1.8×10^{-3} , 3.5×10^{-3} and 6.2×10^{-3} in 0.125 M, 0.25 M, and 0.50 M HNO₃. While minimal change in optical rotation was observed in water alone, a correlation between the rate of hydrolysis and acid strength was noted with nitric and hydrochloric acids significantly higher rate constants than acetic acid. For temperature effects, the rate constants in 0.50 M nitric acid were 9.3×10^{-4} and 6.2×10^{-3} at 12 °C and 20 °C respectively. An Arrhenius plot was prepared for nitric acid yielding an activation energy of 165 kJ mol^{-1} . Additional data has been collected for both concentration and temperature

and is being analyzed including the rate constants in acetic acid and data at 37 °C. Key Words: nutrotation, optical activity, polarimetry, hydrolysis.

SYNTHESIS OF CONJUGATED STYRENE-ALT-MALEIC ANHYDRIDE**, N.M Sikes*, D.W. Holley, Columbus State University, Columbus, GA 31907. Polymer-based solar cells offer the potential of cheap, flexible, and readily customizable alternatives to silicon-based solar cells. However, reaching high power conversion efficiencies in polymer solar cells has proven to be problematic. To reach higher power conversion efficiencies, a low bandgap polymer capable of absorbing higher proportions of solar irradiation is ideal. Bandgap is influenced by factors such as conjugation length, aromaticity, and substituent effects. Here styrene-alt-maleic anhydride is synthesized and then brominated at the α -carbonyl position to allow for elimination and the formation of a fully conjugated polymer. This material will then be characterized with regard to both molecular properties and potential as a photovoltaic polymer. Keywords: polymer, photovoltaic, conjugated, alternating

Section III: Earth and Atmospheric Sciences

Maxwell Center, Room 116

Mark Groszos, Presiding

9:00 THE ABILITY OF WATER TREATMENT RESIDUALS TO FILTER RHODAMINE-COATED MICROPARTICLES AS PATHOGEN PROXIES AT DIFFERENT IONIC STRENGTH AND PH LEVELS**, C., Lever, A., VandeVoort, and S., Mutiti, Georgia College & State University, Milledgeville, GA 31061. Contamination of water by pathogens such as bacteria, viruses, and protozoa is a worldwide problem and the most common source of these contaminants is point sources from cattle enterprises. Water treatment residuals (WTRs), a byproduct of surface water treatment for drinking, were studied for their ability to filter contaminants through column flow experiments. WTRs are good candidates for filtration devices due to their high clay content, and resulting high numbers of sorption sites. The WTR used in this study are composed primarily of kaolinite clay. Quartz sand is widely used as a filtration medium, and was used as a control in this study. Sand and WTRs were filtered at size-60 mesh to remove fine particles. Rhodamine-coated microparticles (RMPs) were sent through column flow experiments as proxies for pathogens such as large bacteria such as *Salmonella enterica* and small protozoa such as *Cryptosporidium* because they are of similar size, and can be easily measured with through fluorimetry. WTRs filter RMPs primarily through sorption and/or straining. Column flow experiments are being run to test WTR filtering ability under varying solution chemistry at two different pH levels (5 and 7.6) and two different ionic strengths (3 mM and 15 mM) representative of environmental conditions found in Georgia. The pH and ionic strength changes alter the surface charge environment and potentially sorption of RMPs onto WTRs and quartz sand. A conservative chlorine tracer was used for comparison. Preliminary data shows WTRs had a small retardant effect on the RMP compared to the normal flow of water through the column, but also had created preferential flow and moved RMPs through the column more quickly. The different combinations of pH and ionic strength have not yet appeared to have any significant difference on the retardation of the RMP. Keywords: Contamination, Pathogens, Water Treatment Residuals, Ionic Strength, Rhodamine Coated Microparticles

9: 15 AN ASSESSMENT OF CARBON DIOXIDE EMISSIONS AMONG CONTRASTING URBAN DEVELOPMENT PATTERNS IN POPULATED AREAS**, Evan M. Rentz and Weimin Feng, Valdosta State University, Valdosta GA 31698. In response to public concern regarding the sustainability and energy efficiency of urban development, carbon dioxide (CO₂) concentration was measured for contrasting patterns of populated areas including urban centers and suburbs of medium to high population density. This study aims to determine if there exists a significant difference in CO₂ concentration between such differing patterns of development. Air samples are collected in five liter sealed tedlar bags from five sites in urban centers and eight sites in suburbs from each of four metropolitan areas, including Atlanta, GA MSA, Macon, GA MSA, Tallahassee, FL MSA, and Jacksonville, FL, MSA for a total of planned fifty-two locations (Atlanta and Tallahassee samples have been collected). The air samples are analyzed at Valdosta State University using an LGR CCIA-36EP carbon dioxide isotope analyzer to determine each sample's CO₂ concentration in parts per million. Diurnal cycles in atmospheric carbon dioxide concentration were recorded by collecting and analyzing hourly air samples in a single location over a thirteen hour period (from 7:00 AM to 8:00 PM) to ensure that analyses pertaining to urban centers and suburbs can be corrected when necessary. Results from Atlanta and Tallahassee so far ranged from about 410 to 440 ppm and seemed to show greatest CO₂ concentration in suburban areas where population density exceeded 2500 people per square mile. On the other hand, the lowest concentrations are found in urban centers (in which all locations showed a population density greater than 5000 people per square mile) and in suburban areas where population density exceeded 1000 people per square mile. These results may suggest that the characteristics of high density suburbs, such as high automobile traffic volume, lead to greater carbon dioxide emissions than do those of urban centers and medium density suburbs. Keywords: Sustainability, urban development, CO₂ concentration

9:30 A PETROLOGIC AND PETROGRAPHIC ANALYSIS OF SANDSTONES FROM THE BROXTON ROCKS EXPOSURE, BROXTON, GA**, Eric L. Parrish, Dept. Physics, Astronomy and Geosciences, Valdosta State University, Valdosta, GA 31698. The Broxton Rocks are a prominent exposure of well-indurated sandstone assigned to the Miocene Altamaha Formation of the Georgia Coastal Plain. Early workers called this unit the "Altamaha Grit." The sandstones here form impressive 3-10 m high vertical cliffs on either side of a small valley formed by Rocky Creek. The cliffs consist of multiple beds of sandstone 0.5 to 1.5 m thick. Some layers contain abundant granules and pebbles of quartz, and some layers show vague cross-bedding. No obvious channels were observed. Similar exposures of the Altamaha Formation occur elsewhere in Georgia, including a series of outcrops along I-75 near the Ashburn GA rest stop. Initial petrographic examination reveals these sandstones to be composed primarily of very poorly sorted, highly angular quartz grains with a significant clay matrix (>10%?). Minor quartz overgrowths and some microcline grains were also observed. All of the samples and thin sections display at least some secondary iron-oxide staining. The iron-oxide is locally well-developed and in some places overprints and obscures the original material. A total of ten samples were collected from the Broxton Rocks Preserve north of Broxton, Georgia. These samples will undergo further study including petrographic point counts. The Broxton Rocks Preserve is owned and managed by The Nature Conservancy. We are grateful for their permission to visit the preserve and their assistance with this project. Keywords: Altamaha Formation, Coastal Plain, Altamaha Grit, Miocene, sandstone

9:45 HISTORIC DEMISE OF SELECTED GLACIERS IN THE BEARTOOTH MOUNTAINS OF MONTANA: AN UPDATE UTILIZING OVER 120 YEARS OF PHOTGRAPHIC AND CLIMATIC DATA, Edward E. Chatelain, Valdosta State University, Valdosta, GA 31698. Successive summers of sustained elevated temperature maxima during 2006, 2007, 2011--2014, and 2016 have brought about nearly total decimation of the Castle Rock and Grasshopper Glaciers, once the largest glaciers in the region; and significantly reduced the size of the Snowdrift and Wolf Glaciers since the last study was conducted in 2005. Prior ice-margin loss and regional drought in the interval between 1978-2000 reduced glacier size below the sustainability threshold. Summer temperature and winter snowfall data of the last 11 years provided by higher elevation Sno-tel stations suggest seasonal elevated temperature minima as a significant factor in their accelerated disappearance. Keywords: Beartooth glaciers, global warming, elevated summer temperatures, Sno-Tel stations

10:00 Section Business Meeting

Section IV: Physics, Mathematics, Computer Science and Technology

Maxwell Center, Room 107

L. Ajith DeSilva, Presiding

8:00 EXPERIENTIAL LEARNING IN ENGINEERING: BUILDING A ROBOT AND ELECTRONIC CONTROL SYSTEM, S.M. Remington, R.T. Atnip*, T.H. Zeigler*, T.G. Lebsekal*, G. Mellors, and B. Hojjatie, Valdosta State University, Valdosta, GA 31698. In order to enhance students' interest in engineering to improve retention, we have developed a directed study course in robotics and electronic control so that small group of sophomore engineering students can participate in experiential learning projects related to these subjects. In the first project, simple and affordable robot kits were purchased and students developed a robot and associated software that could have a controlled motion within a convex 2D space (simulating motion of a carpet cleaner robot). In the second project an affordable and portable laboratory kit for an engineering control course was developed based on the Ph.D dissertation of R. M. Reck's at the University of Illinois, Urbana-Champaign. These laboratory projects not only have generated students' interest in learning control systems and robotics but also created opportunity for collaboration and interaction with other students from local high schools. Supported by the VSU Innovation Grant. Keywords: Robot, Electronic control, Experiential learning

8: 15 A MODIFIED HUBBERT MODEL FOR RESOURCE RECOVERY, Ronald E. Mickens, Clark Atlanta University, Atlanta, GA 30314. The recovery rate, the amount per unit time, of a finite resource, x , was modeled by Hubbert [1]. This model, now called the Hubbert model (HM), is based on the assumption that the recovery rate, $R(t)$, takes the mathematical logistic form, i.e.,

(*)
$$R \equiv \frac{dx}{dt} = ax - bx^2, (a > 0, b > 0).$$

We investigate a modified (HM) for which the recovery rate has a combustion-type functional behavior, i.e.,

$$(**) \quad R \equiv \frac{dx}{dt} = a_1 x^2 - b_1 x^3, (a_1 > 0, b_1 > 0).$$

For both models, we calculate the peak recovery rate, and the times to achieve this value and the value at 90% recovery of the resource. We conclude that while the general properties of the two models are similar, they differ in the details. This fact provides evidence for the general conclusion that the class of Hubbert models

$$(***) \quad \frac{dx}{dt} = f(x); f(0) = f(x_{\max}) = 0, 0 < x < x_{\max},$$

where x_{\max} is the maximally recovered amount, can only provide qualitative information on the actual recovery rates. [1] M. King Hubbert, National Academy of Sciences, Publication 1000-D (1962). Keywords: Hubbert model, Resource recovery, Differential equations.

8:30 A MATHEMATICAL MODEL OF THE WAY MICROORGANISMS REPRODUCE AT THE EXPENSE OF NUTRIENT CONSUMPTION IN THE CHEMOSTAT, 'Kale Oyedeji, Morehouse College, Atlanta, GA 30314-3773. One of the simplest experiments in microbiology is the growing unicellular microorganisms such as bacteria and following changes in their population over a period of time.

We discuss the mathematical representation of such an experiment as modeled by [1]

$$\begin{aligned} \frac{dN}{dt} &= N \left(\frac{K_{\max} C}{K_n + C} \right) - \mu N \\ \frac{dC}{dt} &= D [C_0 - C(t)] - \alpha N \left(\frac{K_{\max} C}{K_n + C} \right), \end{aligned} \tag{1}$$

Where $N(t)$ represents the density of the microorganism, $C(t)$ is the concentration of the stock nutrient, C_0 is the initial concentration, K_{\max} represents an upper bound for $K(C)$, and for $C = K_n$, $K(C) = \frac{1}{2} K_{\max}$, μ is the mortality rate of the microorganism, while D and α are rate parameters.

We use dimensional analysis to reduce the number of parameters and also calculate the steady states and investigate their linear stability properties. [1] G.F Gause, *The Struggle for Existence*. (Hafner Publishing, New York, 1969). Keywords: Unicellular microorganisms, Dimensional analysis, Steady states, Stability of solutions

8:45 THE NORTH POLAR REGION OF MARS DURING 2016, Richard W. Schmude, Jr. Gordon State College, 419 College Dr., Barnesville, GA 30204. On January 3, 2016 Mars' Northern hemisphere reached its summer solstice (Astronomical Almanac for 2016). The NPC

and clouds were examined afterwards and these are described. A large spiral-shaped cloud developed on March 10-11, 2016. During the last 11 Mars years, similar clouds have been imaged in eight of them. Therefore, it is concluded that a spiral-shaped cloud usually develops near Mars' NPC during summer. The permanent North Polar Cap (pNPC) had a mean radius of 9.1° which is similar to that in apparitions between 1903 and 2014. It is concluded that after late spring, the pNPC retains the same size. A study of cloud abundance near the pNPC with respect to longitude and seasonal date was also carried out. It is concluded that the North Polar Hood develops gradually. The data are also consistent with a large number of clouds developing near 210° W longitude in the North Polar Region during mid-summer. The writer is grateful for a Faculty Development Grant which enabled him to use the WinJUPOS software package. Keywords: Mars, North Polar Hood, Spiral-shaped cloud, Permanent North Polar Cap

9:00 THE NORTH POLAR HOOD DURING NORTHERN AUTUMN, Richard W. Schmude, Jr. Gordon State College, 419 College Dr., Barnesville, GA 30204. Images of the North Polar Hood (NPH), a large area of cloud cover over the North Polar Region, was examined. Several blue filter images, recorded in 2003, were examined using the software package WinJUPOS. The southern boundary of the NPH was measured at different local Mars times. Local noon is defined as the longitude on Mars when the Sun is at the local meridian. During late autumn ($240^\circ < L_s < 260^\circ$), the NPH extended down to a mean latitude of 43° N. The mean latitude was farther north (45° N) at 3 pm local time but was farther south (37° N) at 9 am local time. It is concluded that the NPH extends to latitudes farther south during the early morning hours but retreats during the day. Measurements earlier in the autumn are consistent with this conclusion. On August 29 and September 12, southward point bulges in the North Polar Hood were imaged. These bulges may be cold fronts. The writer is grateful for a Faculty Development Grant which enabled him to use the WinJUPOS software package. Keywords: Mars, North Polar Hood.

9:15 THREADED DISCUSSION OPTIONS BEYOND THE TEXT FOR COLLEGE ALGEBRA COURSES, Debra M. Kean, DeVry University, Decatur, GA 30030. Typical topics for threaded discussions in college algebra courses include: Define a mathematical term. Include a real-world application of it. Demonstrate a problem-solving process in a homework assignment. Write a compare/contrast essay (e.g., three methods of graphing). Prove-or-disprove a theorem (e.g., derive the quadratic formula). The above topics address several categories in Bloom's Taxonomy of Cognitive Skills. However, students seldom explored beyond the drill-and-kill homework problems. Thus, they rarely surpassed the Application level of learning in the threaded discussions. Since mathematics is approachable outside the Discussion textbox, a challenge was issued to the students. Instead of tediously keying mathematical symbols in the threaded discussions, for five sessions, the students could create and submit a homework-related video, artwork, science exhibit, etc. The students' participation rate rose in the weekly discussions. They demonstrated mathematical principles by crocheting, producing videos, making scientific modelling, etc. In conclusion, students' cognitive skills in the threaded discussions were enhanced beyond the text level by incorporating multiple media options. Keywords: College Algebra, Threaded discussion

9:30 SOLAR ECLIPSE ON AUGUST 21, 2017, Bob Powell and Ben Jenkins, University of West Georgia, Carrollton, GA 30118. Northeast Georgia will experience a total solar eclipse on

August 21, 2017. The remainder of the state will have a partial eclipse of the sun. Plans are being made to observe this eclipse at two locations. One site is on campus in Carrollton, Georgia (west Georgia), where about 95% of the solar disk will be covered at mid-eclipse. As part of its public service which has been a major role of the West Georgia Observatory since 1979, telescopes equipped with solar filters and solar shades will be available for students, faculty and staff, and the community to observe the eclipse. Another group of West Georgia faculty and students will travel to the path of totality and transport portable telescopes. Although the northeastern section of the State of Georgia is in the path of totality, the most readily accessible locations for many observers are in South Carolina via I-20 or I-85. Keywords: Solar eclipse, August 21, 2017

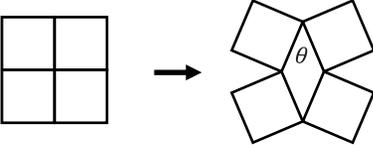
9:45 EFFECT OF GAMMA IRRADIATION ON CdTe/ZnTe BILAYER THIN FILMS, Madhavi Thakurdesai¹ and L. Ajith DeSilva², ¹Thin Film Research Laboratory, Department of Physics, Birla College, Kalyan, India – 421 301, ²Department of Physics University of West Georgia, Carrollton, GA 30118. In the present investigation, CdTe/ZnTe bilayer thin films were deposited by vacuum evaporation technique followed by vacuum annealing. The individual layer thickness in CdTe/ZnTe bilayer was varied in different ratios. These bilayer thin films were subjected to 100 KGy doses of ⁶⁰Co gamma (γ) rays. The morphological studies were carried out by Scanning Electron Microscopy (SEM). The SEM micrographs suggested that γ -irradiation induces surface modifications. The elemental composition was studied by Energy Dispersive X-ray Spectroscopy (EDAX). EDAX studies indicated no compositional changes after γ - irradiation. The optical constants of γ -irradiated films were estimated on the basis of optical absorption spectra obtained from UV-vis-spectrophotometer. The Photoluminescence (PL) spectroscopy was carried out for defect studies. PL-studies indicated that the γ - irradiation results in defect annihilation. Support from the Faculty exchange program between the University of West Georgia, USA and the Birla College, Kalyan, India is acknowledged. Keywords: CdTe/ZnTe bilayer, SEM, EDAX, PL-Spectroscopy, UV-Vis Spectroscopy

10:00 Section Business Meeting

10:30 UMBRELLA PHYSICS — NEW WINE IN AN OLD BOTTLE, K. C. Chan and Arun Saha, Albany State University, Albany GA 31705. Surprisingly an umbrella turns out to be the most common form of mechanical metamaterial being used in every life long before the concept was even invented. Accordingly, previously reports on physics of an umbrella concentrate mainly on aerodynamic behaviors rather than its auxetic properties. To fill this knowledge gap, we report here the preliminary results of kinematics and dynamics of a mechanical metamaterial modeled by a simplified version of an umbrella composed of an auxetic structure constructed by only two pairs of ribs and stretchers. The implication of elucidating periodic mechanical properties of a mechanical metamaterial composed of 2D arrays of infinite numbers of the simplified umbrellas will also be discussed. Keywords: Mechanical metamaterials, Auxetic materials, Umbrella physics, Periodic mechanical properties

10:45 DYNAMICS OF A SQUARE MECHANICAL METAMATERIAL SYSTEM, K. C. Chan, Albany State University, Albany GA 31705. Mechanical metamaterial system (MMS) is a class of material structures that exhibits negative Poisson's Ratio instead of positive normally found in nature. The kinematics of the square MMS is well documented but its dynamics is not.

We report here the derivation of the rotational dynamics obtained from applying the work-energy principle to a 2D square MMS system. In response to an externally applied force f , the angular velocity of each of the rotating unit of the square MMS as a function of the angle θ between two squares rotating away from each other is:

$$\omega^2 = \frac{12f(1+\sin\theta)^{3/2}}{ma((1+\sin\theta)+3\cos^2\theta)}$$


where f is the applied force, m is the mass of a unit square, ' a ' is the length of the side of the unit square, θ is the angle between the sides of two adjacent squares whose corner vertices are connected as shown in diagrams above. Keywords: Mechanical metamaterial, Metamaterial

11:00 ON CALCULATING THE OPTICAL PATH LENGTH IN SIMPLE SYSTEMS PART II, 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. In addition to the Monte Carlo approach presented last year [1] based on the work of Gould and Tobochnik [2] that calculates the OPL for the refraction of a light ray traversing through two media with different refractive indices. Here, the study is extended to include a calculation of the OPL using the variational principle [3] to obtain an Euler equation for the OPL. For a two-layer media an analytic expression can be obtained that agrees with Snell's law. This concept is extended to more general media so as to solve the Euler equation numerically. The results of the Euler equation method are compared with the Monte Carlo calculations.

[1] "A monte carlo calculation of the optical path length in simple systems," J. E. Hasbun Georgia Academy of Science annual meeting, V74, p48 (2017).

[2] "An Introduction to Computer Simulation Methods" 2nd. Ed, H. Gould and J. Tobochnik (Addison Wesley, Reading MA, 1996)

[3] "Mathematical Methods in the Physical Sciences," 2nd. Ed., M L. Boas (J. Wiley, NY, 1983). Keywords: Optical path length, Monte Carlo, Euler equation, Variational method

11:15 A CONTINUUM MODEL OF PHONONS IN TWO-DIMENSIONAL MATERIALS, L. C. Lew Yan Voon¹ and M. Willatzen², ¹University of West Georgia, Carrollton, GA 30118 and ²Technical University of Denmark, Lyngby 2800, Denmark. Phonon spectra in two-dimensional nanomaterials have almost exclusively been computed using density-functional theory based codes and are complex and prone to qualitative errors due to the various approximations such as use of functionals. An alternative model is a classical continuum model and one such model has been introduced for acoustic phonons in graphene nanoribbons. A new continuum theory of phonons in

two-dimensional nanomaterials has been derived from the elastic equations, taking into account the crystalline symmetry. The resulting equations of motion for the displacement fields are given for graphene, silicene and molybdenum disulphide and the results compared. Keywords: Two-dimensional nanomaterials, Graphene, Silicene and molybdenum disulphide, Phonon

11:30 DESIGN AND TESTING OF MICROSTRIP RESONATOR-BASED BAND PASS FILTER, Arun K Saha, Ervin Mccarroll III, Albany State University, Albany GA 31705. Any electronic device that receive signal such as cell phone, radar, television etc. need a bandpass filter which is considered as the heart of that device. Bandpass filters are fabricated by placing several identical resonators close to each other such that resonators can have electromagnetic coupling among those. In this research, two microstrip resonators are modeled in 3D electromagnetic simulation software HFSS and coupling between those are ensured by placing those side by side (edge coupling) or by placing those one above another (broadside coupling). Coupling coefficient between those resonators is determined for both cases. For each case, external Q factor is also determined to understand the impedance matching between filter and external circuit. Calculated coupling coefficient and external Q factor is then used to design Narrow band pass (edge coupling) and Wide band pass (broadside coupling) filter. According to the design parameter, band pass filter is simulated and tested. Simulation result shows that, filter properties, in terms of center frequency and fractional bandwidth, are in good agreement with the design values. Keywords: Microstrip resonator, Band pass filter, External Q factor, Coupling coefficient

11:45 EMISSION MODES IN ELECTRO CO-FLOW, J. Guerrero¹, A.J. Hijano², M. A. Lobato^{2,3}, I.G. Loscertales² and A. Fernandez-Nieves³, ¹Augusta University, Augusta, GA 30912, ²Universidad de Malaga, Spain, ³Georgia Institute of Technology, Atlanta, GA 30332. We use glass-based microfluidic devices to study the emission regimes in electro co-flow. In contrast to classical electrospray, in electro-coflow a liquid is ejected through a nozzle into another co-flowing liquid. As a result, additional parameters provide control over the emission; these include the viscosity and flow rate of the outer, co-flowing liquid. These two new variables affect the parametric window where typical emission modes in electrospray are observed, and result in the observation of new modes that have not been reported before. Keywords: Fluid mechanics, Microfluidics, Electric field, Co-flow, drops.

POSTERS

USING MODELING AND SIMULATION FOR A DEEPER UNDERSTANDING OF INTRODUCTORY PHYSICS CONCEPTS**, M Puerta*, J.H. Lawson*, B. Ray and A. Roy, Young Harris College, Young Harris, GA 30582. There is always a pressing need to come up with ways for motivating students in algebra (or calculus) based introductory physics classrooms. Students often lack the necessary concepts required at this level for further studies of physics. It is critically important that students have the required skills which would help them in the upper level classes. Here we present a combination of methods to increase student understanding of introductory physics. Ungraded Interactive Video Vignettes (IVVs) helps ensure that students make authentic physics predictions without feeling they are being judged. It provides the instructor with an excellent handle on the progress of the class. Coupled with the above is the use of Easy Java simulations (EJS). Here students create and test their own models and modify existing ones

to analyze a certain physics problem. We discuss the use of software and the associated learning curve and its potential rewards. Student feedback and lessons learned would also be considered. Keywords: Introductory physics, Vignettes, Easy Java Simulations

A STUDY OF OPTICAL BAND GAP ON TITANIUM DIOXIDE NANOPARTICLE LAYERS**, J. Preston*, W. Johnson* and L. Ajith DeSilva, Department of Physics, University of West Georgia, Carrollton, GA 30118, Bulk TiO_2 is a wide band gap (3.2 eV) semiconductor with interesting electronic and optical properties with a wide range of applications. Engineering the Bandgap of TiO_2 thin films is highly important for many applications. Quantum Dots (QD) are nano-sized particles whose electronic properties are similar to that of molecules rather than bulk materials. We managed to engineer optical band gap of anatase thin films by using layer-by-layer assembly. The thin layers were prepared on glass substrate by spin coating techniques using commercially available colloidal TiO_2 nanoparticles of average size 10 – 15 nm. The samples were characterized by UV–visible spectroscopy and the optical band gap were determined using Tauc's relation. The band gaps of thin films were varied from 3.8 eV to 3.4 eV merely due increase of film thickness from 0.24 to 1.84 μm by layer-by-layer assembly. Financial support from UWG SEEP and SRAP programs are acknowledged. Keywords: TiO_2 quantum dots, TiO_2 band gap, Spin coating

HOMEMADE DIODE FOR PHYSICS AND ELECTRONICS LABS**, T. King*, L. Ajith DeSilva and J. E. Hasbun, Department of Physics, University of West Georgia, Carrollton, GA 30118, We constructed a simple diode from commercially available compound semiconductors namely n- TiO_2 and p-CuI. The diode is a semiconductor p-n junction, the most basic device of all electronics. The entire diode can be made within 10 minutes without any sophisticated instruments. The current-voltage characteristics showed a similar behavior to a regular Si diode. We use a non-linear fitting procedure to analyze the experimental results. The fitting non-linear model used is based on the work of Danielson and Depoy [1] with slightly fewer parameters. Diode characteristics and rectification properties are discussed and compared with a regular Si diode. [1]"Accurate Method for Forward and Reverse Bias Curve Fitting of TPV I-V Data," L. R. Danielson and D. M. Depoy, (2006, <http://www.osti.gov/scitech/servlets/purl/882557>). Financial support from UWG SEEP and SRAP programs are acknowledged. Keywords: Homemade diode, Experimental physics labs

PREPARATION OF TITANIUM DIOXIDE NANOPARTICLE LAYERS FOR DYE-SENSITIZED SOLAR CELLS**, W. Johnson*, J. Preston* and L. Ajith DeSilva. Department of Physics, University of West Georgia, Carrollton, GA 30118. The dye-sensitized solar cells (DSSCs) have drawn a tremendous research interest due to their lower cost and easy fabrication compared to those of silicon solar cells. Most DSSCs reported use a photo electrode prepared with TiO_2 Degussa P25. We studied thin layers of anatase TiO_2 nanoparticles as the photo anode for DSSC. The thin layers were prepared on Fluorine doped Tin Oxide (FTO) glass plates by spin coating techniques using commercially available colloidal TiO_2 nanoparticles of average size 10 – 15 nm. A polymer based gel-electrolyte with iodine/triiodide system was used in DSSCs. A thin layer of electrolyte was sandwiched between the TiO_2 anode (sensitized with N719 dye) and the Pt counter electrode. The constructed DSSC revealed open circuit voltage, short circuit current values of 0.70 V, 4.0 mA respectively under 1 sun irradiation. The samples were characterized by

UV–visible spectroscopy and scanning electron microscopy (SEM). Further performance of DSSC prepared with nanoparticle layers were compared with that of DSSC prepared with TiO₂ Degussa P25. Financial support from UWG SEEP and SRAP programs are acknowledged. Keywords: Solar cell, Spin coating, TiO₂ films

Section V: Biomedical Sciences

Rollins Conference Center, Room 257

Seyed H. Hosseini, Presiding

10:00

Break and Section Business Meeting

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

POSTERS

THE ROLE OF LEPTIN IN TRIPLE NEGATIVE BREAST CANCER TREATED WITH CHEMOTHERAPEUTICS, Ann A Kurian* and Ruben Rene Gonzalez-Perez, Morehouse School of Medicine, 720 Westview Drive, SW, Atlanta, Georgia 30310. Triple negative breast cancer (TNBC) tumors lack estrogen, progesterone and HER2 receptor expression, and its occurrence has been linked to obesity. Chemotherapy remains as the key therapy for TNBC as there is no targeted treatment. Leptin is a hormone secreted mainly by the adipose tissue that is elevated in obese people. Leptin signaling could affect TNBC survival during chemotherapy, which may open a new ways to combat the disease and reduce chemoresistance. Hypothesis: Leptin is a proliferative and survival factor for TNBC that could reduce the effectiveness of commonly used drugs: Doxorubicin (DOX) and 5-fluorouracil (5-FU). Methods: TNBC cell lines MDA-MB-231 and MDA-MB 468 were seeded (2×10^5 cells) in six well plates. Cells were cultured and at 80% confluent treated as follows: 1) basal medium; 2) 2.5nM leptin; 3) 2.5nM leptin plus 2.5nM PEG-LPrA2 (pegylated leptin antagonist developed by us); 4) DOX at ED50 5) 5-FU at ED50; 5) 2.5nM leptin plus DOX; 6) leptin plus 5-FU; 7) 2.5nM leptin, 2.5nM PEG-LPrA2 plus DOX ED50; 8) 2.5nM leptin, 2.5nM PEG-LPrA2 plus 5-FU ED50, apoptosis and cell cycle were determined after treatment. All treatments lasted 6 days. Nexcelom Cellometer technology was used to complete Annexin V assay for apoptosis and PI staining for cell cycle assay. Results: Leptin increased cell cycle progression by inducing progression of S phase. DOX and 5-FU induced apoptosis, which was attenuated by leptin. PEG-LPrA2 abrogated leptin effects on cell cycle and survival with chemotherapeutics. Discussion: High levels of leptin in obese TNBC patient can decrease chemotherapeutic effectiveness and induce drug resistance. Thus, inhibiting leptin signaling using antagonist could serve as a new strategy to improve chemotherapeutic effectiveness, decrease drug resistance and reduce dosage of chemotherapeutics. Keywords: MBA-MB 231 and MDA-MB468 cells, Triple negative breast cancer, obesity, leptin, PEG-LPrA2, Chemotherapeutics (DOX, 5-FU)

EFFECTS OF NICOTINE USE IN CIGARETTES AND VAPORIZERS ON THE ORAL MICROBIOTA, Sazma Al-Rashid*, and A. L. Kwiatkowski, Young Harris College, Young Harris, GA 30582. The purpose of this experiment was to determine the effect of smoking or vaping on the oral microbiota. The study was approved by the YHC IRB. Seventeen YHC students were divided into three test groups: control (did not smoke or vape), smokers, and vapers. All participants were given a survey regarding their oral hygiene and nicotine use. Swabs of

participants' mouths were placed in saline, which was used to inoculate blood agar (to assess total microbial count and hemolysis) and mitis salivarius agar (selective for *Streptococcus*). Plates were grown anaerobically for 48 hours at 37°C and colonies were counted. A sample of colonies were Gram stained and colony morphology was assessed. Participants' saliva was used to inoculate Snyder agar deeps which indicates propensity for dental caries. Snyder deeps were grown for 72 hours aerobically and checked for yellow color change (an indicator of acid production) every 24 hours. Survey results showed no difference between participant characteristics in the groups except that vapers were significantly younger than the other two groups (p value 0.0282), only smokers reported that they smoked (p value 0.0005) and only vapers reported that they vaped (p value 0.0004). There were no significant differences between the number of colony forming units grown on blood agar (between 7.4×10^4 and 1.1×10^5 CFU/ml) or mitis salivarius agar (between 4.8×10^3 and 1.2×10^4 CFU/ml) or in Snyder agar results between the groups. The results of this study indicate there are no differences between the oral microbiota we surveyed in smokers, vapers, and controls. Supported by the YHC Undergraduate Research Initiative. Keywords: oral microbiota, smoking, vaping

EXPRESSION OF MITOCHONDRIAL GENOME ALTERATION AS A POTENTIAL BIOMARKER FOR COLORECTAL ADENOPOLYPS IN RELATIVE TO AGE AND RACE, Anju Mary Cherian¹, L.Wallace, and F.O.Aikhionbare¹ Internal Medicine¹, Morehouse School of Medicine¹, 720 Westview Drive, SW, Atlanta, Georgia 30310, Colorectal cancer (CRC) is a major cause of morbidity and mortality in the United States. The precision of an appropriate staging of colorectal polyp progression to cancer is misperceived among pathologists as well as doctors. Alternative approaches, such as identification of molecular markers associated with CRC progression, will be a useful predictive tool, to decrease the incidence colorectal cancer. The mitochondrial DNA (mtDNA) is predominantly susceptible to mutations because of high levels of reactive oxygen species (ROS) within the organelle. The cumulative frequency of mitochondrial genome mutations is age-related. Given that colorectal cancer is most frequently seen in older people, mtDNA mutations may play a vital role in CRC tumorigenesis which may inhibit oxidative phosphorylation due to increase ROS production. This study aims to identify a profile of mtDNA mutations/protein expression patterns in the early stages of colorectal tumors within and among African-American (AA) and Caucasian patients relative to age stratification. A combination of PCR-based sequencing and qRT-PCR technologies were employed to determine the mtDNA variants and different proteins expression levels in 16 CRC tissues samples obtained from the University of Alabama-Cooperative Human Tissue Network. Fifty-eight mtDNA mutations were identified out of which 93% of mutations were somatic and 7% were germline mutation. Most germline mutations were found in COIII region. Three of the mutations of COIII Ade19409, A9437G Gde19438 were not reported previously. Additionally, the relative RNA expression in ATP6 region in the early stages CRC adenoma was higher in AA compare to Caucasian tissue samples. Our preliminary results suggest that there are certain mitochondrial mutations/expressions that may be associated with specific adenoma stages. Subsequently, our findings may aid in designing new clinical strategies for early screening and prevention in individuals with high risk.

THE ROLE OF RBP-JK IN LEPTIN-INDUCTION OF BREAST CANCER PROGRESSION AND CHEMORESISTANCE**, Sha'Kayla Nunez*¹, Ruben R Gonzalez-Perez*^{1,1} Microbiology,

Biochemistry and Immunology; Morehouse School of Medicine, Atlanta, GA 30310, In cancer tissues leptin and its receptor, ObR, are significantly overexpressed, where Notch signaling is altered. In obese individuals, leptin levels are abnormally high. Accumulated data from the Gonzalez lab suggests that leptin induces the expression of Notch, its nuclear partner RBP-JK, and cancer stem cell expansion. These leptin-induced effects are related to higher cancer incidence and aggressiveness, chemoresistance, and poor prognosis in obese patients. RBP-JK is a tumor suppressor and key regulator of leptin-induced Notch signals that increase cancer cell proliferation. RBP-JK was reported to be down regulated in solid tumors and linked to more aggressive cancer. It is hypothesized that loss of RBP-JK would induce constitutive activation of Notch target genes and cell proliferation independent of leptin and Notch crosstalk signaling. The parental murine breast cancer cell line EO771 [estrogen receptor (ER+), and Progesterone receptor (PgR-) and Her2-) and its derivative cell line Tamoxifen-resistant (TAM-EO771, unresponsive to estrogen) were genetically modified using CRISPR/Cas9 technology to knock out RBP-JK gene. Cells were treated with leptin and a chemotherapeutic [Paclitaxel (TAX)] and their effects on cell cycle, proliferation and survival were determined using Cellometer technology and MTT assay, respectively. Results show that leptin is a proliferative factor for EO771 cancer cells. However, leptin induced greater proliferation effects in RBP-JK^{-/-} cells. RBP-JK^{-/-} cells displayed higher TAX resistance capability in comparison to RBP-JK⁺ cells. Our results suggest that loss of RBP-JK allows leptin-induction of Notch-independent activation by alternate mechanisms. Additionally, leptin induces more Notch3 and Notch4 in RBP-JK^{-/-} cells that can affect chemoresistance and cell proliferation. These data open the possibility that targeting leptin signaling and RBP-JK gene expression could be a new way to treat breast cancer progression and chemoresistance. Key words: Obesity, Leptin, RBP-JK

THE ROLE OF BODY HABITUS ON AEROBIC FITNESS IN NCAA BASKETBALL PLAYERS **, Sarah N. Garner* and Linda G. Jones, Young Harris College, Young Harris, GA 30582. This study was designed to determine whether body habitus affects aerobic fitness in male and female basketball players. Body types range from endomorph to ectomorph, and while most basketball players tend to be of a mesomorph body type (with well-developed musculature), we view guards, in general, to tend more to the ectomorphic side of the scale and post players to be more aligned with the endomorphic side. Our hypothesis is that an athlete's body type (which may also reflect his/her team position) will affect the level of an individual's overall aerobic fitness. For the fitness tests, participants were fitted with a heart monitor and a filtered breathing face mask and asked to perform a modified stress test; i.e. a series of exercises of increasing intensity (increased height and pace of steps used in basketball training) followed by a period of recovery. The test was continued until the subject reached volitional exhaustion or his/her maximum heart rate (standardly determined as the subject's age subtracted from 220). Heart rates and respiratory exchange ratios (RER= ratio of VCO₂/VO₂) were measured using an iWORX TA system. Statistical analysis of the data is ongoing. Keywords: aerobic fitness, body type

Section VI: Philosophy and History of Science

Maxwell Center, Room 117

Charmayne E. Patterson, Presiding

9:00 RACIAL HISTORIES, PAST AND PRESENT, Tom McMullen, Georgia Southern University, Statesboro, Georgia 30460. Lawyer and eugenicist Madison Grant (1865-1937) is known for his book ‘The Passing of the Race,’ subtitled ‘The Racial Basis of European History’ (1916). Adolph Hitler praised the work and Nazi lawyers cited it in their defense at the Nuremberg Trials. A statement from Madison’s book referenced at the trials is: “The laws of nature require the obliteration of the unfit and human life is valuable only when it is of use to the community or race.” Nearly a century later science writer Nicholas Wade, in ‘A Troublesome Inheritance: Genes, Race, and Human History’ (2014), dismisses eugenics as a pseudoscience. However, he holds onto the idea that “race” is a meaningful term and thereby takes sides in an ongoing debate. There is a general divide today, as in the past, on whether “race” is real or is a social construct. This article compares the two books on the basis of history, geography, culture, religion, environment, and science. The conclusion is that while genetic differences do exist among and between populations, they are not significant in the final analysis. Keywords: Eugenics, Race, Madison Grant, Nicholas Wade

9:30 COUNTERFACTUAL HISTORIES OCCUR IN CLASSICAL PHYSICS, Ronald E. Mickens¹, and Charmayne Patterson², Department of Physics¹, and Department of History², Clark Atlanta University, Atlanta, GA 30314. In a previous discussion [1], arguments were given to support the view that “counterfactual histories” exist and their occurrence is consistent with the multi-universe interpretation of quantum mechanics. Further, within this framework, it was demonstrated that for a given system, its history is unique, while its future evolution is uncertain. The purpose of the current work is to show that these features also occur in systems modeled by classical physical theories. A major consequence of either the classical or quantum formalisms is that different counterfactual histories do not communicate or interact. Several explicit examples of this phenomenon will be given. In general, counterfactual histories will exist for a system if it can be modeled by a physical theory which allows multi-outcomes in the evolution of any of its sub-systems.

Reference

[1] Ronald Mickens and Charmayne Patterson, “Are counterfactual histories realizable?”, Georgia Journal of Science, Vol. 174 (2016), 57.

Keywords: Counterfactual history, multi-universe quantum mechanics, classical physical theories

10:00 Section Business Meeting

10:30 OUT OF HIDING: HOW THE BOOK AND FILM ‘HIDDEN FIGURES’ HAVE RAISED THE VISIBILITY OF AFRICAN AMERICAN WOMEN IN THE SCIENCES, Charmayne E. Patterson and Ronald Mickens, Clark Atlanta University, Atlanta, Georgia 30314. The recent

releases of the book and film ‘Hidden Figures’ have chronicled the contributions of African American women in the space race. Significant book sales and strong showings at the box office have resulted in an increased interest in the historic role of African Americans, particularly African American women, in America’s space program. This paper chronicles the participation of African Americans in the sciences between the 1940s and the 1960s. It also examines the impact of ‘Hidden Figures’ on the present day interest in the STEM fields by African American women. Keywords: Hidden Figures, African Americans and STEM, Space Program

11:00 DEVELOPMENTS IN SCIENCE EDUCATION: PAST, PRESENT, AND FUTURE*, Ozden Sengul, Ph.D. in Science Education, Georgia State University, Atlanta, GA 30303. History and philosophy of science education can be an essential source material that reflects the richness and diversity of scientific culture and practice. Science education has been struggling with pedagogical battles between progressive educators and traditionalists, teacher shortages, low teacher salaries, and poorly qualified teachers since the 1930s (Ravitch, 1981). The decisions made about national security, economic growth, and political issues have influenced the pathways of science education in the United States since the 1950s with the launch of the Sputnik orbiting satellite. One of the major tasks of science education should be to document and compare what has happened, and what might happen to resolve the discrepancies and to lessen the achievement gaps (Kolsto, 2008). Most recent reforms in science education emphasize the preparation of scientifically literate students (Van Zee, 2000). *A Framework for K-12 Science Education* (NRC, 2012) define scientific literacy as “the knowledge and understanding of scientific concepts and processes required for scientific decision-making, participation in civic and cultural affairs, and economic productivity” (NRC, 2012). This study provides the historical review for the development of the idea of scientific literacy and science education in the United States from the 19th century to the present to discuss how the goals have competed with one another for public attention. By building a bridge between the present and the past, this review seeks to explain how science has been included as part of the curriculum, what educators thought, what kinds of developments have been made and how these improvements influenced and may influence the society. Keywords: History, philosophy, science education, scientific literacy

Section VII: Science Education
Rollins Conference Center, Room 258
Peter Roessle, Presiding

10:30 A REVIEW OF THE BENEFITS OF ARGUMENTATION IN THE SCIENCE CLASSROOM, Amy F. Salter*¹, Maggie D. Renken, PhD. Georgia State University College of Education and Human Development Atlanta, GA 30303. In the current study, we review a body of literature to examine how learners engage in the learning process during scientific argumentation. Argumentation is a collaborative learning exercise rooted in a cognitive process. Therefore, researchers have begun to examine what individuals learn through argumentation to better understand how students develop abilities in and appreciation for explanations and the evaluation of claims in scientific practice. This study explores the situated nature of the relationship between argumentation and learning in science education contexts. To address this dynamic, we consider the question: How do learners engage in the learning process during

scientific argumentation? To address our guiding question, we present research-based evidence and theory-driven explanations for the benefits of argumentation in science education settings. Our findings revealed argumentation promotes conceptual gains, equips learners with the ability to overcome misconceptions, promotes real-world problem solving, and prepares children to participate in authentic scientific reasoning. Future directions for research and classroom applications are discussed.

10:00 **Section Business Meeting**

Section VIII: Anthropology

Maxwell Center, Room 113

Teresa P. Raczek, Presiding

8:45 HOW ONE SKELETON OPENS THE WINDOW INTO THE DAILY LIVES OF ROMANIZED CRETANS**, Eden J. C. Ryan* and Susan Kirkpatrick Smith, Kennesaw State University, Kennesaw, GA 30144. Research in Anthropology is a qualitative endeavor as well as a science. In this paper, we argue that an emphasis on high quantities of samples can obscure valuable research. Anthropology is more of a qualitative field, in which even minimal data finds provide valuable insight. We will use as a case study a Greco-Roman skeleton excavated from a site in Ierapetra, Greece which presents pathologies and abnormalities not found in other skeletons from the same population. We used the sciatic notch as well as different sites on the skull to determine sex. The skeleton overall had very gracile features that pointed to female. Age of the skeleton was determined using the auricular surface in conjunction with suture closure. The skeleton was on the older end of young adult (20-35 years) and the younger end of middle adult (35-50 years); we determined her age to be between 28-32 years. With regard to her pathologies we are looking at the advanced stages of osteoarthritis present on her phalanges and the severe malocclusion wear on her teeth. The abnormal pathologies seen in this skeleton lead to research questions that would have otherwise been unobserved if she had not been studied. Research questions such as: What work were women on Roman Crete doing that would include use of their teeth? How early did children start working? Was this due to family or community obligations? Having only one skeleton present with such severe teeth wear and early onset arthritis allows for me as an anthropologist to think more meaningfully about this population. Anthropology needs to focus carefully on qualitative data more than quantitative data because qualitative data leads to better research questions. Keywords: Crete, Osteoarthritis, Malocclusion, Romanization, archaeology, burials

9:00 THE ANALYSIS OF INTEROBSERVER ERROR TO TEST THE LIMITATIONS OF AVAILABLE METHODS IN ANCESTRY AND SEX ESTIMATION OF TEACHING SKULLS**, Vivien N. Kibble, Kennesaw State University, Kennesaw, GA 30144. The teaching skulls at Kennesaw State University and the University of West Georgia have minimal information about their specific ancestry or sex. Available methods used in bioarchaeological analysis and forensic identification can only provide an estimation of ancestry and sex. The use of these methods incurs a degree of uncertainty because of documented interobserver error that has been attributed to ambiguous anatomical landmark descriptions and experience level of the measurer.

If the available methods are unable to determine the estimated sex or ancestry of a teaching skull, then instructional utility for students and research becomes limited. The interobserver error of two morphological methods, metric ancestry estimation (N=16) and non-metric sex estimation (N=7), were analyzed to test the limitations of each. Twenty-eight craniometric measurements were taken on sixteen teaching skulls by two undergraduate observers with basic experience. The non-metric method used a scale (1-5) to evaluate five morphological features of the skull by three observers, two undergraduates and a professor. The mean differences with significance were lower than anticipated, but where significance occurred, an anatomical pattern related to the eye orbit was identified. The mean difference in metric measurements of Orbital Breadth were significantly different between observers ($t=-3.67$, $p<0.01$ / $t=-4.11$, $p<0.01$), as was the mean difference in Interorbital Breadth measurements ($t=2.573$, $p<.01$). Non-metric assessment of the Supraorbital Margin also proved to be significantly different between observers ($p=0.007$, $p<.01$). These inconsistencies in method application require further study because the biological profile is critical to identifying human remains in forensics and bioarchaeology. Methodological improvement could increase forensic identification and enable bioarchaeological analysis to further examine patterns of human variations in past populations. Keywords: ancestry, sex estimation, craniometrics, interobserver error, physical anthropology

9:15 LINEAR ENAMEL HYPOPLASIA IN ROMAN IERAPETRA, Morgan E. McKenna* and Susan K. Smith, Kennesaw State University, Kennesaw, GA 30144. This study focuses on the prevalence of linear enamel hypoplasia in a sample of teeth from the Roman site of Ierapetra in southeast Crete. Linear enamel hypoplasia (LEH) is a dental defect that can be caused by childhood physiological stress like malnutrition or illness. It can be observed macroscopically as a horizontal line across the tooth where the enamel stopped growing and then started growing again later after the period of stress had ended. The presence of linear enamel hypoplasia was recorded by tooth rather than by individual, because some of the remains were commingled and in poor condition, which made it impossible to say for certain how many individuals were present, and which teeth belonged to which individual. Out of 858 total teeth, 805 could be assessed for linear enamel hypoplasia. Out of the 805, 73 were found to have the dental defect, or 9.1%. Using chi-square tests, it was found that there was a significant difference between the frequencies of LEH between Ierapetra and two Hellenistic sites, Agios Nikoloas and Chania, both also on Crete. Agios Nikolaos had a much higher rate of LEH than Ierapetra, while Chania had a much lower rate. Two other Roman sites, Paphos and Kourion, on the island of Cyprus, were not significantly different when compared to Ierapetra. A Proto-Byzantine site, Eleutherna, on Crete, also did not have a significant difference in the amount of LEH in the population compared to Ierapetra. Mediterranean island populations in the Roman period seem to have consistent levels of childhood stress from the common numbers of LEH that have been found, while Hellenistic sites appear to be more variable. Keywords: Crete, Linear enamel hypoplasia, dentition, archaeology, burials

9:30 PERIOSTEAL REACTION AND SIGNS OF STRESS FOUND IN SKELETAL REMAINS FROM IERAPETRA, CRETE, Logan Howard and Susan Kirkpatrick Smith Kennesaw State University, Kennesaw, GA 30144. In this study, I examined periosteal reactions within a population to determine evidence of stress and disease. The bones studied date from the Roman Crete period, which ranged from 69 BC to 961 AD. This period is historically marked as a time when the island was part of a very prosperous trade route. While there are some studies which

include examinations of evidence of disease present on skeletal remains, the Roman Crete period is largely unaccounted for. This study seeks to recognize patterns of periosteal reaction from a population excavated from Ierapetra, Crete. These Roman period skeletons were studied over four seasons from 2013 to 2016 and the data were subsequently analyzed. Overall, eighty-four instances of periosteal reaction were recorded and analyzed. We compared the results to populations with existing research from Santa Barbara, Mycenae, and The Democratic Republic of Congo. We found that the patterns of periosteal reactions pointed to a probability of stress afflicting the overall population. Keywords: periosteal reaction, Roman Crete, Archaeology, burials

9:45 TESTING THE MANIFESTATION OF THE MEDICAL GAZE IN THE USE OF HUMAN SKELETAL REMAINS IN A UNIVERSITY SETTING, Caitlin N Olsen, Kennesaw State University, Kennesaw, GA 30144. In many institutional settings, human remains are used as teaching tools to facilitate the learning of human anatomy and forensic analytical methods. This consistent handling of human material may possibly correlate with high manifestations of what Michele Foucault named “the medical gaze” in institutions of higher learning. This study uses questionnaires and interviews, in both student and faculty populations at Kennesaw State University, to test individual opinions in how ethical it is to assume ownership over collections of human remains. Questions asked were related to participants’ perspectives towards current issues in anthropology, such as if human remains have personhood after death, who possesses authority over these remains, and who is qualified to handle them. The population consisted of both anthropology and non-anthropology students and faculty (N=127). Overall, regardless of anthropological affiliation or education-level, participants on average felt neutral towards the general use of human remains in an academic setting. However, in general, the anthropology population tended to believe that dead individuals do not possess authority over their body and if a need for these remains presents itself, it should be fulfilled. Lastly, faculty and students, who had utilized human remains in multiple educational settings, tended to display higher manifestations of the medical gaze. The findings for this study are interesting because anthropologists are trained to be culturally sensitive and outstanding global citizens, however the results demonstrate that in the context of human osteology and studying human remains, those ethical principles are negated. KEYWORDS: physical anthropology, ethics, agency, medical gaze, human remains.

10:00 Section Business meeting

10:30 ARCHAEOLOGICAL INVESTIGATIONS OF ANTEBELLUM SLAVE QUARTERS AT A PLANTATION SITE IN NORTH GEORGIA**, Ethan M. Williams, Kennesaw State University, Kennesaw, GA 30144. In Fall of 2015, previous archaeological research conducted at the Walnut Grove Plantation in Cartersville, GA, was designed to locate the enslaved African quarters that once stood on the property. The methods used in this investigation included archival research, mapping, Phase I shovel testing, metal detecting, and Phase II test units. The aforementioned methodology yielded a robust assemblage of artifacts including nails, brick, stoneware, glass, as well as charcoal and burned brick. According to the past research, this assemblage suggested that structures once stood in the field adjacent to the Walnut Grove Plantation house. The objective of this current research is to continue to search for the slave cabins. As a means of furthering the 2015 investigations, additional methodologies will be incorporated

in the investigation. Most notably, Phase III excavation tactics, including backhoe scrapes, will be utilized, in hopes of revealing cultural features, including the stone/brick foundational remains upon which the cabins were built. The search for material evidence pertaining to the enslaved African population of the Walnut Grove Plantation has the potential to reveal information about a group of people who, though often marginalized, played a very distinct role in the history of this region. No funding sources were utilized. Keywords: historical archaeology, slave cabins, Walnut Grove Plantation, Cartersville

10:45 FIVE THOUSAND IN THE PINES: BLACKSHEAR'S CONFEDERATE PRISON CAMP, M. Jared Wood¹, Lance Greene² and Inger Wood¹,¹Georgia Southern University, Statesboro, GA 30460 and ²Wright State University, Dayton, OH 45435. Late 1864 saw the chaos of Union troops' advancement through the heart of Georgia as the American Civil War waned. Caught in this were thousands of war captives, whose incarceration at various locales left stories of tragedy and resilience in the archaeological record. Recent efforts by the authors attempt to reveal the story and evidence of a little-known Confederate prison camp in Blackshear, Georgia. Using historical documents and a battery of archaeological tests, the likely location of the prison camp is confirmed. Keywords: American Civil War, Confederate, POW Camp, Prison Camp, Archaeology, Georgia

11:00 AN ANALYSIS OF MIDDLE WOODLAND PERIOD POTTERY FROM THE LOWER DABBS SITE IN NORTH GEORGIA**, Briana K. Johnston, Savana Deems Kennesaw State University, Kennesaw, GA 30144. Recent archaeological investigations on the Etowah River, near the Leake Site in Cartersville, Georgia, have uncovered many cultural features dating to the Middle Woodland (300 BC-AD 700) period. We have an understanding of how prehistoric Native Americans lived in this area in the shadow of Etowah during the Mississippian (AD 1000-1550) period. However, we know very little about how small villages, like the Lower Dabbs Site, interacted with Leake, the preeminent site in the region during the Middle Woodland. Excavation, analysis, and interpretation of the artifacts recovered from the features at Lower Dabbs will provide much needed information about the daily lives of the people living in the shadow of Leake. Of prime importance is being able to date the ceramic material found in the features to determine the exact relationship chronologically between both sites. During the Middle Woodland stamped pottery is common. A detailed analysis of these decorations, focusing on unique designs found within the assemblages, will allow us to compare our results with those from Leake to see what patterns, if any, emerge. Similar decorative patterning may indicate a close relationship existed between these sites given they are located across the Etowah River from one another. Through our analysis we can explore the connections that once existed between these sites, among others, in the Etowah River Valley. Keywords: Archaeology, Middle Woodland, ceramic analysis, Dabbs Site, Cartersville

11:15 A PRELIMINARY COMPOSITIONAL ASSESSMENT OF MUD BRICK AND CLAYS FROM THE PHOENICIAN *EMPORIUM* OF MOZIA, SICILY, William M. Balco, University of North Georgia, Dahlonega, GA 30597. The Phoenician *emporium* of Mozia, located on the near-shore island of San Pantaleo, was first established by Phoenician merchants in the eighth century BC. The construction of a circuitous mud brick wall during the sixth century BC fortified the island, offering protection to the mercantile center and its inhabitants. One sample of decomposed

mud brick from the fortifications at the South Gate and four samples of clay from various parts of the island were collected for mineralogical analysis. X-Ray Diffraction and petrographic analysis of these samples demonstrates the brick differs mineralogically from the San Pantaleo clays, suggesting the importation of either raw clay or finished bricks for the construction of the fortification wall. Keywords: Mozia, X-Ray Diffraction, Petrography, Phoenician, Fortification

POSTERS

THE GOOD, THE BAD, THE DEVIANT: NON-NORMATIVE GRAVES AT TUMILACA LA CHIMBA (AD 950-1300), MOQUEGUA, PERU**, Danielle E. Carmody* & Nicola Sharratt, Department of Anthropology, Georgia State University, Atlanta, GA, 30302. Archaeologists study mortuary contexts both to examine how the dead were treated and mourned and to reconstruct social organization, belief systems, and identity structures in the past. When analyzing cemeteries archaeologists identify a standard repertoire of funerary treatments (including the location and shape of a burial, the orientation and position of a body or bodies, and grave offerings interred with the corpse) at a site. Burials that deviate from these norms are referred to as “deviant” or non-normative graves, and often reflect something distinct about the deceased individual (e.g. an outcast, a criminal, or suicide). In this poster, we examine non-normative burials at Tumulaca la Chimba, an archaeological site in southern Peru. There were two phases of occupation at this village site. The first dates to the terminal Middle Horizon (Terminal MH) (AD 950-1200), the centuries immediately following the collapse of the Tiwanaku state. The second occupation dates to the Late Intermediate Period (LIP) (ca AD 1250-1470), a period of regional political fragmentation. At Tumulaca la Chimba, both occupations are represented by cemeteries as well as residential sectors. Drawing on excavation data collected over the past decade and on analyses of excavated material from a total of 85 graves, we identify non-normative burials in the terminal Middle Horizon and the LIP cemeteries at Tumulaca la Chimba. We demonstrate that although funerary practices were not radically different between the two occupations, concepts of non-normative burial differed between the terminal Middle Horizon and the LIP. Situating my data in the wider literature on Tumulaca la Chimba and the region, we conclude that the changes in non-normative burial are explained by the changing socio-political context of this tumultuous period in Andean pre-history. Keywords: Archaeology, South America, Peru, Burials