

MISSISSIPPI  
ACADEMY OF SCIENCES



SIXTY-SEVENTH ANNUAL MEETING

February 13 & 14, 2003  
HATTIESBURG, MISSISSIPPI

Lake Terrace Convention Center  
One Conventon Plaza, Hattiesburg MS 39401  
(near the intersection of US 49 & US 59)

Hosted by

The University of Southern Mississippi



Journal of the Mississippi  
Academy of Sciences

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**GENERAL SCHEDULE**

**WEDNESDAY, FEBRUARY 12, 2003**

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<u>TIME</u>	<u>EVENT</u>	<u>LOCATION</u>
4:00 PM to 6:00 PM	Board of Directors Meeting	Oak Tree Room, Payne Center, University of Southern Mississippi

**THURSDAY, FEBRUARY 13, 2003**

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<u>TIME</u>	<u>EVENT</u>	<u>LOCATION</u>
8:00 AM to 4:30 PM	Registration	Lobby
8:30 AM to 4:30 PM	Divisional Programs	See Pages 10–92
8:30 AM to 4:30 PM	Divisional Poster Sessions	Exhibition Hall A
8:30 AM to 10:40 AM	Recent Research in Forensic Science	Lamar II
8:50 AM	Mississippi Center for Supercomputing Research	Conference Room
9:00 AM to 7:00 PM	Exhibits	Central Prefunction Area
4:30 PM to 6:00 PM	2003 Dodgen Lecture & Presentation of Awards; lecture by Christopher P. McKay	Exhibition Hall B
6:00 PM to 7:00 PM	Hospitality Hour (follows the Dodgen Lecture)	Central Prefunction Area

**FRIDAY, FEBRUARY 14, 2003**

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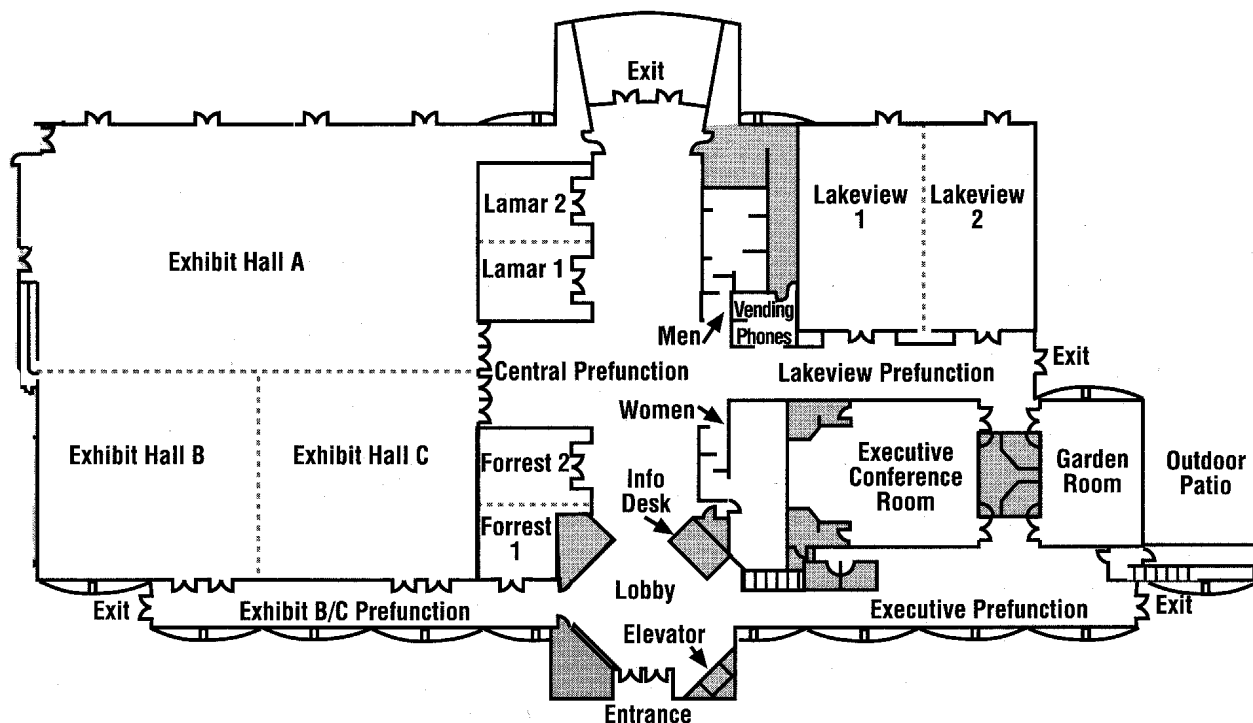
<u>TIME</u>	<u>EVENT</u>	<u>LOCATION</u>
7:00 AM	Past-Presidents' Breakfast	To Be Announced
8:15 AM to 8:45 AM	MAS Business Meeting	Lamar I
8:00 AM to 2:00 PM	Registration	Lobby
8:30 AM to 12:30 PM	Divisional Programs	See Pages 10–92
8:30 AM to 4:30 PM	Divisional Poster Sessions	Exhibition Hall A
8:30 AM to 11:30 AM	Mississippi Functional Genomics Network	Exhibition Hall B
9:00 AM to Noon	Exhibits	Central Prefunction Area
12:30 PM to 5:00 PM	Workshop on Molecular Visualization and Biochemistry Education; hosted by Robert C. Bateman, Jr.	USM Campus



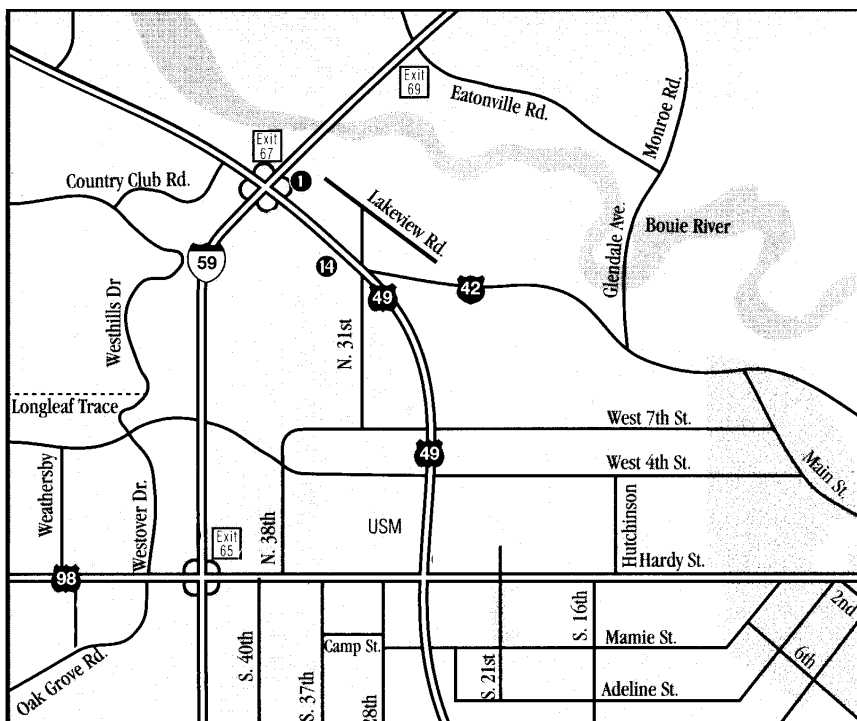


MISSISSIPPI ACADEMY OF SCIENCES MEETING OVERVIEW

	Lobby	Prefunction	Forrest II	Lamar I	Lamar II	Lake View I	Lake View II	Conference Room	Exhibition Hall A	Exhibition Hall B	Exhibition Hall C
	Registration	Exhibits	Marine and Atmospheric Science	Agriculture and Plant Science	Psychology and Social Sciences	Ecology and Evolutionary Biology	Health Sciences	Mathematics, Computer Science and Statistics	All Divisions Posters	Cellular, Molecular and Developmental Biology	Chemistry and Chemical Engineering
THURSDAY MORNING											
THURSDAY AFTERNOON	Registration	Exhibits	Marine and Atmospheric Science	Agriculture and Plant Science	Psychology and Social Sciences	Health Sciences	Mathematics, Computer Science and Statistics	All Divisions Posters	Cellular, Molecular and Developmental Biology	Awards and Dodge Lecture	Chemistry and Chemical Engineering
THURSDAY EVENING											
FRIDAY MORNING	Registration	Exhibits	Physics and Engineering	Geology and Geography	Science Education	History and Philosophy of Science	Zoology and Entomology	Mathematics, Computer Science and Statistics	All Divisions Posters	Cellular, Molecular and Developmental Biology	Chemistry and Chemical Engineering
FRIDAY AFTERNOON											



Hattiesburg Lake Terrace Convention Center floor plan



Hattiesburg area map. #1 Hattiesburg Lake Terrace Convention Center; #14 Comfort Inn (formerly Cabot Lodge)



## Dodgen Lecture—2003 Life on Mars: Past, Present, and Future

Christopher P. McKay

Christopher P. McKay, a Planetary Scientist with the Space Science Division of NASA Ames since 1982, researches the relationship between the chemical and physical evolution of the solar system and the origin of life. He is actively involved in planning for future Mars missions, including human settlements. Chris has been conducting polar research since 1980 in Mars-like environments such as the Antarctic dry valleys and, more recently, the Siberian Arctic. He has a strong interest in involving students in planning for the exploration of space, particularly Mars.

Christopher P. McKay received his doctorate in astrophysics from the University of Colorado in 1982 and has been a research scientist with the space science division of the NASA Ames Research Center ever since. The year McKay entered graduate school, the Viking spacecraft landed on Mars, an event that aroused his continuing interest in planetary science and the origins of life. Today McKay helps to plan future Mars missions, and he regularly journeys to the dry valleys of Antarctica to study life in cold, dry conditions.

Dr. McKay is currently a planetary scientist with the Space Science Division of NASA Ames Research Center. He received his Ph.D. in AstroGeophysics from the University of Colorado in 1982 and has been a research scientist with the NASA Ames since that time. Dr. McKay is one of the world's leading researchers studying Titan, and has been involved in numerical modeling of planetary atmospheres for many years. He is currently working on models of Titan's thick atmosphere in support of the joint NASA/ESA mission to the Saturn system. Dr. McKay is co-Investigator on the Titan probe atmospheric structure experiment (HASI). His broader interests focus on understanding the relationship between the chemical and physical evolution of the solar system and the origin of life. He has been actively involved in planning for future Mars missions including human settlements. Dr. McKay has also been involved with polar research since 1980, traveling to the Antarctic dry valleys and more recently to the Siberian Arctic to conduct research in these Mars-like environments.

The Dodgen lecture is named in honor of Charles L. Dodgen, University of Mississippi Medical Center. Dodgen joined the Academy in 1959. He became executive officer in 1972, a post he held until his death in 1980.



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Organizations that assist the Mississippi Academy of Sciences in its efforts to promote science in Mississippi

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Millsaps College	Pearl River Community College
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**AGRICULTURE AND  
PLANT SCIENCE**

Chair: Girish K. Panicker, Alcorn State University  
Vicechair: Juan L. Silva, Mississippi State University

**THURSDAY MORNING**

Lamar I

8:45 Introduction

9:00 THE EFFECTS OF COGON GRASS AND NATIVE SHRUBS ON SEED AND BUD BANKS IN A LONG LEAF PINE SAVANNA

Shanise Brown<sup>1\*</sup>, M. Effenik<sup>2</sup>, and Joseph M. Wahome<sup>1</sup>,  
<sup>1</sup>Mississippi Valley State University, Itta Bena, MS 38941,  
and <sup>2</sup>University of Mississippi, University, MS 38677

Cogon grass, *Imperata cylindrica*, is an invasive species in southeastern USA that reduces biological diversity in longleaf pine savannahs. The control of this species is difficult but important. A study to investigate the effects of invasive plants on seedling and bud banks was done to formulate ways of how to restore native plants. Experimental plots of burned cogon and andropogon grasses was compared with plots of unburned andropogon and yaupon holly in moist pine savannahs. Seed and bud banks in soils collected near and away from low shrub thickets in wet pine savannahs were also compared. Results showed that cogon grass had a negative impact on seedling emergence. There was a negative effect on sprout emergence. However, low shrub thickets did not have any significant effect on seedlings or sprout emergence. Implications of these findings will be discussed.

9:15 EVALUATING THE BIOLOGICAL ACTIVITY OF NATIVE DOGWOOD (*CORNUS FLORIDA* L.)

Greg Anazia\*, E.M. Croom, Jr., and Ilias Muhammad,  
University of Mississippi, University, MS 38677

Dogwood has been traditionally used to treat infectious diseases including malaria and diarrhea. In the Southeastern United States, Dogwood has been reported to treat malaria by Native, European and African Americans. *Cornus florida* an official drug used similar to Peruvian bark (quinine) in the 1800s. The plant has been reported to contain a bitter glycoside corvine but no active compounds have been found to explain a rational use for the plant in treating malaria. In recent years, the plant has been considered to be only a weak astringent. The plant was also used in the 1800 to treat diarrhea and has been reported to be

used as a laxative. Early investigations on *C. florida* revealed the presence of molluscicidal sarsapogenin, while the cytotoxic benzofuranone was isolated from *C. controversa*. The present study deals with the bioactivity-guided isolation of different collections of *C. florida*.

9:30 PRELIMINARY STUDIES IN CASTOR (*RICINUS COMMUNIS*) PRODUCTION FOR MISSISSIPPI

Jeremy T. Russell\*, Robert D. Cossar, and Brian S. Baldwin, Mississippi State University, Mississippi State, MS 39762

Castor (*Ricinus communis*) is a cross-pollinated perennial grown as an annual in the U.S. Castor is cultivated mainly for its oil, used by industry and the military. Castor production decline in the 1970s however, recently it has made a resurgence due to renewed interest in its oil which in turn makes it a high value alternative crop. The objective of this study was two-fold; one to determine the optimum planting date for Mississippi, two to evaluate common herbicides for the effectiveness in castor along with its tolerance. The plantings were established at Memphis, TN; Starkville, Shubuta, and Poplarville, MS. Each field consisted of a RCB design with four replications of six planting dates. Experimental unit was two rows, 20' in length. Seed were harvested and yields assessed. Twenty herbicides (pre- and post-) were applied to twin rows of castor arranged in a RCB. Castor plants were assessed for injury fourteen and twenty-one days after spraying. Mississippi yields of castor were considerably less than the USDA predicted 1000 lbs/A. Earliest plantings were too early for maximum yield. Several herbicides were shown to be useful for weed control, while others will be useful in controlling volunteer castor.

9:45 AN ASSESSMENT OF THE ANTHROPOGENIC AND PEDOGENIC SOURCES OF ARSENIC IN SOILS THROUGHOUT MISSISSIPPI

Edward J. Foan\* and William L. Kingery, Mississippi State University, Mississippi State, MS 39762

The objectives of the study were to collect historical and geological information pertaining to soil arsenic (As) inputs throughout the State of Mississippi. It is felt that the results of the study would be particularly useful to those in the fields of agriculture, civic planning and land remediation. Anthropogenic sources of As included arsenical biocides, applied mostly to cotton and fruit orchards, and poultry manure, containing the residues of arsenical growth promoters, applied to land as fertilizer. Estimates of total As loading on a county basis, from 1890 onwards, were calculated from acreage and livestock statistics from the Census of Agriculture and from historical accounts of recommended application rates. Geological As soil inputs were assessed for regions of the State using information from geological surveys and reported As compositions of

minerals. The data will be presented in a tabular form as well as a series of maps, each of which will be divided into the State's 82 counties.

10:00 MEASUREMENT OF METABOLIC RATES OF KIDNEY BEAN SEEDS AND SEEDLINGS OF *PHASEOLUS VULGARIS* AT ROOM TEMPERATURE

Julius O. Ikenga\* and Tracy M. Day, Mississippi Valley State University, Itta Bena, MS 38941

This research was undertaken to study the metabolic rates (mRs) of kidney bean seeds and seedlings of *Phaseolus vulgaris* at 24°C. Metabolic activities were measured using the direct respiratory technique. Fifty *P. vulgaris* seeds that were placed on four layers of water-drenched paper towels, in a bowl, were incubated and germinated in the dark. Seeds and, or seedlings were tested on a daily basis for two weeks. Prior to testing, each seed and, or seedling was blotted dry with a paper towel and transferred into a 250 ml Venier respirometer. The latter was fitted tightly with a Vernier Oxygen Gas Sensor Probe and then interfaced with a desktop computer. The computer was previously loaded with the Vernier Logger Pro™ Program. The Gas Sensor Probe was set to collect six samples per minute over a 10-minute period. Computer analyzed the initial data collected to determine metabolic rates (mRs). The control setup was treated the same as described above, except that the respirometer contained no seeds. The Day-0 seeds were not soaked in water prior to use as described above. We found that *P. vulgaris* seeds at Day-0 had a mR of 0.010% O<sub>2</sub>/min. at 24°C. The control setup registered 0.004% O<sub>2</sub>/min. while the germinating seeds and seedlings at Day-1 to -13 registered mRs that ranged from 0.053% O<sub>2</sub>/min. to 0.092% O<sub>2</sub>/min. All phases of the test conducted showed evidence of metabolic activities.

10:15 FRESH-CUT SWEETPOTATOES: INFLUENCE OF PRESERVATIVES AND BLANCHING

Hernan Cobo<sup>1\*</sup>, Juan L. Silva<sup>1</sup>, and James O. Garner<sup>2</sup>, <sup>1</sup>Mississippi State University, Mississippi State, MS 39762, and <sup>2</sup>University of Arkansas at Pine Bluff, AR 71601

Unclean, cured sweetpotatoes (*Ipomoea batatas*) were dipped in water for 30 min and hand brushed. They were then dipped in a 50 ppm chlorine solution for 5 min, manually peeled and julienne sliced (40 x 3 mm). The sweetpotato sticks were sanitized (sprayed) with 40 ppm Tsunami 2008® solution sprayed at 155 psig for 5 min. The sticks were then dipped into five different preservatives for 5 min: (A) 2 % citric + 2 % ascorbic acids, (B) 1 % Fruit Fresh®, (C) 50 ppm chlorine, (D) 100 ppm sulfite, and (E) water. A portion of sticks from each treatment was blanched in water at 90°C for 0 to 4 min. After blanching samples were tested for color and texture attributes. Blanching for one minute or more reduced shear values by 33 to 50%,

making them unsuitable for fresh consumption. Blanching also seemed to lower brightness (Hunter 'L' value), whiteness and chroma. Hue was not affected by blanching. Preservatives had little if any influence on color and texture of sticks. Refrigerated, unblanched sticks maintained their color and texture for at least two weeks. The peracetic acid wash may aid in inactivating the browning enzymes.

10:30 REDUCTION OF *LISTERIA MONOCYTOGENES* ON HOT-SMOKED CATFISH BY POST-PACKAGING PASTEURIZATION

T. Kim\* and Juan L. Silva, Mississippi State University, Mississippi State, MS 39762

*Listeria monocytogenes* is a significant foodborne pathogen that is readily present on ready-to-eat (RTE) meats, including RTE seafood products, luncheon meat, hot dogs and deli meats. Post-packaging pasteurization was suggested as one way to reduce foodborne pathogens that contaminate meat after cooking. However, there is little or no published information concerning post-packaging pasteurization on *Listeria monocytogenes* in hot-smoked catfish. The objective of this study was to determine the effect of post-packaging pasteurization on hot-smoked catfish contaminated with *Listeria monocytogenes*. *Listeria* inoculated fish were subdivided into non-vacuumed and non-pasteurization (control), vacuum packaging only, or vacuum packaging plus pasteurization. For pasteurization, vacuum packaged fillets were submerged in 85°C water contained in a water bath for 1, 5, 10, and 15 min. After 1 day storage, each fillet was analyzed for water activity (a<sub>w</sub>), moisture content, salt, and *Listeria monocytogenes* cell count. All smoked catfish samples had ranges of 0.91 to 0.86, 4.63% to 8.03%, 40.9 to 65.8%, and 7.55 to 16.4% for a<sub>w</sub>, salt, moisture, and water phase salt, respectively. Vacuum treated fish without heat treatment showed 0.02 log reduction after 1 day storage while no survival of *Listeria monocytogenes* cells were detected on vacuum and heat treated fish for 10 min. This data indicated that postpackaging pasteurization processing might be an effective microbial intervention against *Listeria monocytogenes* on smoked catfish.

10:45 Break

11:00 Divisional Poster Session

EFFECT OF DIFFERENT CROPPING SYSTEMS ON VEGETABLE PRODUCTION

Franklin Chukwuma\*, Patrick Igbokwe, and Liang C. Huam, Alcorn State University, Alcorn State, MS 39096

Intensive application of fertilizers, pesticides and other agrochemicals is now receiving wide attention with respect to the potential for contamination of soils, surface and groundwater. Hence, producing safe and nutritious food

for the consumers, ensuring profitability of farming enterprises, and monitoring the viability of rural agricultural communities through environmental practices are some of the major challenges facing agriculture today. However, farmers experience some loss in yields after discarding synthetic inputs and converting their operations to organic production. Sustainable approaches that allow judicious use of synthetic chemicals may be more suitable start options especially for small farmers. Therefore, gradual switching from conventional to organic production so that the entire operation is not put at risk is very important. Hence, field experiments were conducted on McLaurin loam and Memphis silt loam soil during the summers of 2001 and 2002 to determine the effect of cropping systems (conventional, transitional and organic) on sweet potato, tomatoes, bell pepper, and collard green growth and yield potential. Conventional cropping system involved mono cropping under the use of farm chemicals, while transitional and organic cropping systems involved crop (sweet potato, bell pepper and collard) intercropping under reduced-chemical and non-chemical input, respectively. Findings indicated that cropping system did not influence plant growth. However, marketable yield for sweet potato, bell pepper and tomatoes were higher for conventional cropping system while there was no yield difference on collard green due to the cropping system. Although yield were higher due to conventional cropping system, yield from the companion herbs when considered, overall yields from transitional and organic cropping systems will be compatible to conventional cropping system.

#### EFFECTS OF FD141 AND ITS ANALOGS ON THE GERMINATION AND MORPHOLOGY OF SELECTED PLANT PATHOGENIC FUNGI

Maritza Abril<sup>1\*</sup>, Kenneth J. Curry<sup>1</sup>, and David E. Wedge<sup>2</sup>,  
<sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Natural Products Utilization Research Unit, USDA, ARS, University, MS 38677

A USDA experimental natural product fungicide referred to as FD141, and seven of its chemical analogs plus seven commercially available fungicides were evaluated for their ability to inhibit fungal germination. *Botrytis cinerea*, *Colletotrichum acutatum*, *C. fragariae*, *C. gloeosporioides*, *Phomopsis obscurans*, and *P. viticola* were used for this purpose. FD141 and the commercially available fungicides were effective germination inhibitors, while most FD141 analogs were less effective. However, one of the experimental analogs, FD142 (4-bromo FD141) caused anomalous development in germ tubes of three of the six fungi.

#### EVALUATION OF DIFFERENT TRELLIS-SYSTEMS FOR MALABAR SPINACH (*BASELLA ALBA* L.) PRODUCTION

O.P. Vadhw<sup>1\*</sup>, C.R. Reddy<sup>1</sup>, James Spiers<sup>2</sup>, and D.S.

Marshall<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096, and <sup>2</sup>USDA Small Fruit Research Station, Poplarville, MS 39470

Malabar spinach (*Basella alba* L.) yield as influenced by four trellis systems was evaluated. Malabar spinach seeds were planted in the greenhouse and seedlings produced were used for this study and planted on May 15, 2002. From the limited data collected so far, it can be concluded that, Malabar spinach plants grown without trellis (control) were the least productive. Maximum yield was obtained with V-shaped trellis system followed by semi-vertical and vertical. Harvesting was more convenient with all trellis systems as compared to control where the plants were allowed to trail and spread on the ground. The first harvesting of spinach leaves was done on July 15, 2002, and last harvesting was done on October 28, 2002. Plants are still healthy and growing well, harvesting will be continue till frost.

#### TOLERANCE OF *IPOMOEA LACUNOSA* TO VARIOUS CONCENTRATIONS OF CADMIUM IN MEMPHIS SILT LOAM SOIL

M.S. Zaman<sup>1\*</sup>, C. Davis<sup>1</sup>, and P. Kumar<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39069, and <sup>2</sup>Mississippi School for Mathematics and Science, Columbus, MS

The optimum growth period and the tolerance of *Ipomoea lacunosa* to soil cadmium (Cd) were evaluated with the help of four experiments. In experiments 1–3, plants were grown in the greenhouse. In experiment 4, plants were grown under laboratory conditions. In experiment 1, plants were grown in soils containing 0–500 ppm of Cd for 30 days. Results show that soil Cd at 250–500 ppm levels, do not support the plant growth. In experiment 2, plants were grown in soils containing 0–200 ppm Cd for 30 days. In both experiments, plant growth was inhibited in all Cd-treated groups. No difference in plant growth was observed between 100–200 ppm Cd treated groups. In experiment 3, plants were treated with 0–200 ppm Cd in the soils, and grown for 60 days. Results indicate that plant growth was reduced in all Cd-treated groups, however, the 60-day growth period produced higher plant biomass compared to the 30-day growth cycle. In order to observe a time related growth pattern, in experiment 4, plants were grown under color corrected lights and harvested on days 14, 21, 28, and 35 of the experiment. Results indicate that plant growth was better in the laboratory conditions than in the greenhouse. Experiments show that the tolerance limit of *Ipomoea* to soil Cd lies between 200–250 ppm, plant growth response is similar between 100–200 ppm Cd, and a longer growth period produces higher biomass that may enhance Cd hyperaccumulation by plants.

#### EFFECTS OF LEAD AND CADMIUM ON SOIL PHOSPHATASE ACTIVITY

Umeko Griffin\*, Ashley Swanier, Courtney Young, Oscar Hundley, Afrachanna Butler, Maria Begonia, and Gregorio Begonia, Jackson State University, Jackson, MS 39217

Heavy metals, such as lead (Pb) and cadmium (Cd), have been found to exert an adverse effect on some soil biological activities such as respiration and biomass. One quick way to obtain information on the biological activity of soil microorganisms is by measuring phosphatase activity. The primary objective of this study was to investigate the effects of lead and cadmium on the phosphatase activity of soil amended with such metals. In this study, soils that were previously amended with various metal concentrations and planted with wheat for six weeks were used for the assay of phosphatase after they have been cleaned of debris, air-dried, pulverized and sieved to the desired particle size. Results showed that phosphatase activity exhibited different sensitivity to the heavy metals (cadmium and lead) and chelates (EGTA and EDTA) that were amended to the soil. Phosphatase activity decreased with increasing levels of soil Pb treatments compared to controls. Across 3 Pb treatments (e.g., 500, 1,000, and 2,000 mg Pb/kg dry soil), phosphatase activity was elevated at 500 and 1,000 treatments (but not at 2,000) with the addition of 5.0 mmol EDTA/kg dry soil before planting. Across 3 Cd treatments (e.g., 500, 1,000 and 2,000 mg Cd/kg dry soil), phosphatase activity increased at 500 but decreased at both 1,000 and 2,000 Cd treatments. The chelate EDTA generally increased phosphatase activity at 500 and 1,000 Cd treatments but not at 2,000 treatment. The results indicate that the phosphatase activity depends on the lead and cadmium contents of the soil.

#### CHEMICALLY-ENHANCED PHYTOEXTRACTION OF CADMIUM-CONTAMINATED SOILS USING WHEAT (*TRITICUM AESTIVUM* L.)

Courtney Young\*, Ashley Davis, Oscar Hundley, Umeko Griffin, Afrachanna Butler, Maria Begonia, and Gregorio Begonia, Jackson State University, Jackson, MS 39217

There is an increasing interest in phytoextraction as an alternative technology to clean up cadmium-contaminated soils. In phytoextraction, an efficient plant species must be able to tolerate toxic metal levels, and accumulate substantial amounts of the metal into the shoots. Phytoextraction also depends upon the availability of the metal for absorption by the roots. This study was conducted to determine the optimum concentration of [ethylenebis (oxyethylenetriolo)] tetraacetic acid (EGTA) on shoot accumulation of Cd by wheat grown on a Cd-contaminated soil. Wheat (*Triticum aestivum* L. cv. TAM109) seeds were sown in each 150 mL plastic tube containing a growth medium composed of sieved soil and peat (2:1; v:v). Desired Cd (0, 500, 1000 mg Cd/kg) and EGTA (0, 1.0, 2.5, 5.0 mmol/kg) treatments were imposed before planting. Treatments were arranged in a 3 Cd x 4 EGTA factorial in a Completely Randomized Design with 4 replications. Results showed that wheat plants

were relatively tolerant to Cd x EGTA combinations as exhibited by non-significant differences in their chlorophyll contents and dry biomass. Wheat plants grown in soils amended with a combination of 1000 mg Cd/kg x 5.0 mmol EGTA/kg had the highest root and shoot Cd accumulations.

#### THE ECONOMIC BENEFITS OF COLLARD YIELDS ON FARM INCOME USING PLANTING DENSITY FACTOR

Ahmed H. Al-Humadi\*, Liang C. Huam, Girish K. Panicker, and Cedric A. Sims, Alcorn State University, Alcorn State, MS 39096

Collard is a member of the Brassica family (Cruciferae). They are rich in protein, minerals, and vitamins A and C. A study was conducted in spring 2000, in the southwest Mississippi on a Collard cultivar namely *Brassica oleracea* var. *vates* to determine the cost benefits of production in relation to planting density. The cultivar was raised in two plots of ten rows each at low density planting (LDP), 0.914 m x 0.228 m and high density planting (HDP), 0.914 m x 0.152 m on Memphis Silt Loam Soil. Irrigation, fertilization, insecticides and herbicides were applied uniformly on both plots. Total costs of production were calculated and compared with the average costs of commercial production. Field results indicated that total yield was significantly higher in low density planting (16,729 kg/ha) than high density planting (15,388 kg/ha). Consequently, the economic benefits of low density planting were greater than high density planting.

#### CHELATOR INDUCED PHYTOACCUMULATION OF CADMIUM IN *BRASSICA JUNCEA* GROWN IN CADMIUM CONTAMINATED SOIL

M.S. Zaman<sup>1</sup>\*, C.P. Jennings<sup>1</sup>, and K.L. Shumaker<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39069, and <sup>2</sup>Jackson State University, Jackson, MS 39217

Environmental stress of soil cadmium (Cd) pollution on plant and chelator induced hyperaccumulation of Cd in plant tissue were studied in *Brassica juncea* (Indian Mustard) plants, grown in soil containing 50 ppm of Cd and various concentration of ethylene diamine tetraacetic acid (EDTA). Data were analyzed for plant biomass, Grade of Growth Inhibition (GGI), and Cd uptake by Cd treated plants. Root, shoot and total plant biomass was significantly reduced in plants treated with Cd and/or EDTA compared to Control group. Root, shoot and total plant GGI was also significant in all Cd and/or EDTA treated groups compared to Control group. Tissue Cd concentrations in root, shoot and total plant were significantly higher in Cd or Cd + EDTA treated groups. Without the application of EDTA, the root Cd accumulation was about 283% higher and the shoot Cd accumulation was about 167% higher than the 50 ppm soil Cd concentration, With the application of EDTA, Cd accumulations were found to be enhanced up to 458% and

400% above the soil Cd concentration in the root and shoot tissues respectively. Overall, data indicated that *B. juncea* is a Cd hyperaccumulator and can be used for phytoremediation of Cd contaminated soil. And application of EDTA to the soil will amplify the Cd hyperaccumulation and enhance the phytoremediation process.

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## THURSDAY AFTERNOON

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Lamar I

### 1:45 MODIFICATION OF INPUTS TO GROW ORGANIC BERMUDAGRASS HAY

D.J. Lang\*, M. Broome, and R.L. Elmore, Mississippi State University, Starkville, MS 39762

Alternatives to fertilizer for hay production include utilization of animal wastes and incorporation of persistent legumes. Objectives were to compare the first year response of 'Sumrall' bermudagrass *Cynodon dactylon* L. to combinations of poultry litter pellets (PP), legumes, conventional fertilizer (CF), and cultural weed control practices on yield and species composition. Bermudagrass was burned with fire in late February, 2001. Poultry Pellets (6-2-4) were applied at 65 lbs N/Acre (1100 lbs/acre) 2x (May and August) or 3x (May, July, August). Commercial fertilizer (15-5-10) was also applied 2x and 3x as above. 'Bigbee' Berseem clover (*Trifolium alexandrinum*) was planted along with 'Marshall' Ryegrass (*Lolium multiflorum* L.) in October for winter weed control in no-herbicide plots. Species composition was determined visually at each harvest and yield was obtained by clipping. Bermudagrass yield fertilized with PP3x was low (4384 lbs/A) compared with PP 2x + CF1x (6796 lbs/A). Nitrogen release from PP was initially inadequate to provide vigorous bermudagrass growth. Transition from conventional inorganic fertilizer to organic fertilizer will require both higher equivalent N rates and additional time for organic bound N in PP to be mineralized. The unique aspect of this study is that we are using biological and ecological processes to control weeds and provide nutrients for economically viable organic bermudagrass hay production.

### 2:00 EFFECT OF C:N RATIO AND SOIL DEPTH ON THE RATE OF DECOMPOSITION OF *BRASSICA OLEACEAE* RESIDUES

Girish K. Panicker\*, Ahmad H. Alhumadi, and Cedric A. Sims, Alcorn State University, Alcorn State, MS 39096

Residue management has been established as a valuable technology for reducing soil erosion from agricultural lands. Data on the rate of residue decomposition is an integral part of erosion prediction models. As a part of the research being conducted on horticultural crops for erosion prediction models, fresh residues of cabbage (*Brassica*

*oleraceae* L. var. *capitata*) were placed in fiberglass mesh bags either at the surface or 15 cm deep in a Memphis Silt Loam soil (Typic Hapludalf, silty, mixed, thermic) and were allowed to undergo decomposition for a period of six months. Decomposing samples were collected from the field every 10 days and analyzed for organic C and N. Subsurfaced residues with low C:N ratios decomposed faster than the subsurfaced root residues with high C:N ratios. The surfaced root and shoot residues decomposed slower than the subsurfaced residues. The decomposition rates of both subsurfaced shoot and root were negatively correlated with the low C:N ratios. The results in general showed that the decomposition of crop residues was a function of C:N ratio and the placement in soil.

### 2:15 MAXIMIZING SWEET POTATO (*IPOMOEA BATATAS*) YIELD IN THE MISSISSIPPI DELTA THROUGH REMOTE SENSING GLOBAL POSITION SYSTEMS (GPS) AND GROUND TRUTHING

Abdullah F.H. Muhammad\*, Kwekor Donkor, and Kendrea Shelvy, Alcorn State University, Alcorn State, MS 39096

A 2.72 acre plot of the virus tested (G1/G2) sweet potato cultivar 'Beauregard' were divided into 21 GPS studied over a two year period (2001 and 2002) at the Alcorn State University Extension/Research Farm in Mound Bayou, MS. The objectives were to use remote sensing, GPS, ground truthing via grid sampling and statistical analysis to: 1. Identify soil and plant properties that enhance or limited yield and quality of sweet potatoes. 2. Identify problematic areas in field associated with soil moisture, texture, pH etc. 3. Developed corrective techniques based on results obtained that may increase yield and improve quality in problematic areas. Results indicate tremendous variability among the twenty one GPS points in soil moisture, texture, pH, nutrition status, canopy temperature and yield. Some specific recommendations are deep plowing, liming and rehipping raised beds.

### 2:30 RESPONSE OF *VIBRIO VULNIFICUS* AND *V. PARAHAEMOLYTICUS* 03:K6 TO HOT WATER/COLD SHOCK PASTEURIZATION PROCESS

Linda S. Andrews\* and Susan DeBlanc, Mississippi State University, Biloxi, MS 39531

*Vibrio vulnificus* and *V. parahaemolyticus* are natural inhabitants of estuarine environments world wide. Pathogenic strains of these bacteria are often transmitted to humans through consumption of raw oysters which flourish in these same estuaries. Previous studies by these authors reported the effective use of hot water pasteurization followed by cold shock to eliminate, from raw oysters, naturally and artificially incurred environmental strains of *V. vulnificus* and *V. parahaemolyticus* common to the Gulf of

Mexico. This study was continued with the use of the pasteurization method to reduce pathogenic strains of *Vibrio*, known to be more process resistant. Oysters were artificially contaminated with pathogenic strains of *V. vulnificus* and *V. parahaemolyticus* at a concentration of  $10^6$  cfu/g oyster meat. Contaminated oysters were pasteurized at  $52^\circ\text{C}$  for up to 22 minutes. Samples of processed oysters were enumerated for *Vibrios* at 2 min intervals after their internal temperature reached  $50^\circ\text{C}$ . The *V. vulnificus* and *V. parahaemolyticus* O3:K6 proved to be more process resistant than nonpathogenic environmental strains found in Gulf of Mexico waters. A total process time of at least 22 minutes, in  $52^\circ\text{C}$  water, was recommended as a valid process parameter to eliminate potential pathogenic *Vibrios* from shell stock oysters.

3:00 Divisional Business Meeting and Awards

**CELLULAR, MOLECULAR AND  
DEVELOPMENTAL BIOLOGY**

Chair: Ross Whitwam, Mississippi University for  
Women

Vicechair: Yuan Luo, University of Southern  
Mississippi

**THURSDAY MORNING**

Exhibition Hall B

Session I—And What Is It You Do Again? Investigating  
Molecular Functions and Effects

8:00 Introduction

8:15 TYROSINE PHOSPHORYLATION OF THE  
JAK2 ACTIVATION LOOP IS ESSENTIAL FOR  
A HIGH ACTIVITY CATALYTIC STATE, BUT  
DISPENSIBLE FOR A BASAL CATALYTIC  
STATE

Roy Duhe\* and Kiranam Chatti, University of Mississippi  
Medical Center, Jackson, MS 39216

The phosphorylation of an “activation loop” within protein kinases is commonly associated with establishing catalytic competence, and phosphorylation of the Tyr1007 residue in the activation loop of JAK2 is essential for intracellular propagation of cytokine-initiated signalling. The transition of JAK2 from basal to high activity states can be partially described via two kinetically distinct ATP binding sites. Phosphorylation of the JAK2 activation loop was essential for conversion to the high activity state, which was

characterized by high efficiency ATP utilization during autophosphorylation. Mutagenesis of activation loop tyrosine residues Tyr1007/1008 to phenylalanine residues severely impaired, but did not abolish, the enzyme’s ability to autophosphorylate; the mutant enzyme remained in a basal activity state characterized by low efficiency ATP utilization during autophosphorylation. Mutagenesis of a critical Lys882 residue to a glutamate residue abolished all evidence of kinase activity, confirming that the observed phosphorylation of Tyr-to-Phe mutants was not a trans-phosphorylation catalyzed by another kinase. Our data are consistent with the proposal that JAK2 is an inefficient, but active, enzyme in the absence of activation loop phosphorylation, and is capable of autoconversion to a high activity state under physiological ATP concentrations, which would preclude the need for an extraneous trans-activating kinase.

8:30 THE DETERGENT-LIKE ACTION OF CYT1A,  
A DELTA-ENDOTOXIN FROM *BACILLUS*  
*THURINGIENSIS* VAR. *ISRAELENSIS*

Slobodanka Manceva<sup>1\*</sup>, Marianne Pusztai-Carey<sup>2</sup>, and Peter Butko<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Case Western Reserve University, Cleveland, OH

Cyt1A is a mosquitocidal delta-endotoxin from *Bacillus thuringiensis* var. *israelensis*, whose mechanism of cytolysis is not fully resolved. Some data support the notion that Cyt1A forms pores in lipid bilayers, but other are consistent with a detergent-like dissolution of the membrane. We used epifluorescence microscopy to study changes in the size and morphology of fluorescently labeled giant unilamellar vesicles (GUV). In an osmotically balanced medium, Cyt1A induced a rapid disintegration of 5-micrometers GUVs into objects 100 times smaller, which the pore-formation model cannot explain. Chemical cross-linking and SDS PAGE electrophoresis revealed that in the presence of lipid Cyt1A formed high-molecular-weight protein aggregates, which did not enter the gel. The pore-formation model postulates the existence of stoichiometric oligomers in the membrane. Thus, our results give support to the detergent-like model of the Cyt1A’s action.

8:45 ANALYSIS OF THE SNXA1 MUTATION OF  
*ASPERGILLUS NIDULANS*

Sarah McGuire\* and David Norris, Millsaps College,  
Jackson, MS 39210

In eukaryotic cells, the cyclin-dependent kinase Cdc2 is the master mitotic regulator: when active, cells can divide. The *Aspergillus nidulans* homolog of the Cdc2 gene is termed nimX. Mutations in nimX cause phenotypes in which the cells may or may not undergo division, depending upon the environmental conditions. In particular the nimX2 mutation prevents mitosis at temperature of  $42^\circ\text{C}$  or higher. Previous work has identified several extragenic suppressor

mutations of *nimX2*. The first of these is termed *snxA1* (for suppressor of *nimX*). It allows normal cell division to occur above the restrictive temperature but also confers a cold sensitivity when cultured below 20°C. Evidence from plate and plug growth assays performed as part of this experiment have confirmed the suppressor and cold-sensitive phenotypes of *snxA1*. Further, nuclear morphology assays conducted have shown that *snxA* is involved in one of the cell cycle checkpoints, likely between G2 and M. Transformation and cloning have thus far been unsuccessful, but future work will likely lead to the sequencing of the gene and subsequent identification of the protein for which it codes.

9:00 THE PROTECTION OF RIBULOSE-1,5-BISPHOSPHATE CARBOXYLASE/OXYGENASE BY THE SELECTIVELY PERMEABLE PROTEIN SHELL OF THE CARBOXYSOME

Eric Williams\*, Gordon C. Cannon, and Sabine Heinhorst, University of Southern Mississippi, Hattiesburg, MS 39406

*Halothiobacillus neapolitanus* carboxysomes are polyhedral proteinaceous micro-compartments that have been shown to contain much of the cell's ribulose-1,5-bisphosphate carboxylase/oxygenase (RuBisCO). To date, RuBisCO is the only protein demonstrated to have enzymatic activity within carboxysomes. Cell growth under CO<sub>2</sub> limiting conditions results in an increase of carboxysomal RuBisCO levels. Further more, mutants whose RuBisCO is not packaged into carboxysomes require elevated CO<sub>2</sub> levels for growth, indicating that sequestering of RuBisCO into carboxysomes is essential for efficient CO<sub>2</sub> fixation. The molecular mechanism by which carboxysomes enhance the catalysis of CO<sub>2</sub> fixation by RuBisCO is not clear. However, RuBisCO is a bi-functional enzyme that catalyzes CO<sub>2</sub> fixation, in addition to the competitive and wasteful fixation of O<sub>2</sub>. Therefore, the carboxysomal shell may act as a selectively permeable membrane that excludes O<sub>2</sub> from RuBisCO inside the carboxysome. To test this hypothesis, carboxylation reaction was measured with intact, *H. neapolitanus* carboxysomes and with free RuBisCO in saturating levels of O<sub>2</sub>. As expected, O<sub>2</sub> acted as a competitive inhibitor of the carboxylation reaction in both free and carboxysome bound enzyme. However, the degree of inhibition was significantly less in intact carboxysomes. To further examine the ratio of carboxylase to oxygenase activity, carboxysomes were subjected to treatments that compromise the integrity of the shell. Preliminary experiments with treatments that disrupt carboxysomal shell suggest a reaction ratio shift towards oxygenation.

9:15 Break

9:30 MODULATION OF CELL STRESS RESPONSE AND REACTIVE OXYGEN SPECIES PRODUCTION IN AMYLOID-BETA SECRETING NEU-

ROBLASTOMA CELLS BY THE GINKGO BILOBA EXTRACT EGb761

Julie Vining Smith\*, Adam J. Burdick, and Yuan Luo, University of Southern Mississippi, Hattiesburg, MS 39406

Standardized Ginkgo biloba extract (EGb761), used extensively in clinical trials, is popularly used in the USA as a natural dietary supplement for memory enhancement, and is being prescribed in European countries for the treatment of cerebral insufficiency, age-related deterioration of mental functions such as that commonly found in Alzheimer's Disease (AD). Recent findings suggest links between AD and deposition of Amyloid Beta-peptide (ABeta), oxidative stress, and apoptosis. Existing pharmacological data and clinical trials show EGb761 to be a potent antioxidant with neuroprotective effects, however specific mechanisms of protection are still being investigated. We examined potential mechanisms of neuroprotection using N2a neuroblastoma cells (wild type), or the ABeta-secreting N2a cell line stably expressing double Swedish mutant human APP695 and exon-9 deleted mutant PS1 (swe/D9). In a recent publication, we showed that in these cells EGb761 caused a marked decrease in caspase-3 activity, a key enzyme in the apoptosis cell-signaling cascade, as well as inhibition of ABeta aggregation. We now additionally suggest that EGb761 provides neuroprotection by modulating multiple cell signaling pathways, including prevention of intracellular oxygen free radical accumulation, and regulating the activity of the Caspase-12 protein, an endoplasmic reticulum-specific caspase capable of initiating a separate, stress-induced apoptosis cascade in response to toxic insults to the cell.

9:45 APOPTOTIC MACHINERY IN DIFFERENTIATED PC12 CELLS IS MODULATED BY GINKGO BILOBA EXTRACT EGb761

Adam J. Burdick<sup>1\*</sup>, Julie Vining Smith<sup>1</sup>, Paul Golik<sup>2</sup>, Douglas Wallace<sup>2</sup>, and Yuan Luo<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Emory University, Atlanta, GA 30322

Recent literature suggests links between oxidative stress and nerve cell death occurring in a variety of neurological disorders, including Alzheimer's Disease. Therefore, the determination of cellular mechanisms of known neuroprotectants such as EGb761, the standardized Ginkgo biloba extract, is important in understanding the molecular basis of neurodegeneration. However, the mechanisms of protection remain unclear. Differentiated PC 12 cells are a well-established cellular model for studying apoptosis and potential neuroprotective mechanisms. We have determined the effects of EGb761 on cellular apoptotic machinery following cellular insult with staurosporine or juglone on PC 12 cells, using assays of intracellular levels of free radicals, cytochrome c release, DNA microarray, and



Bcl-2 western blotting. Our results show that pre-treatment with EGb761 attenuates the levels of cytochrome c in the cytosol. Data from DNA microarray indicates that transcription of multiple apoptosis-related genes such as Bcl-2 like protein and caspase-12 was up- and down-regulated respectively, in cells treated with EGb761. The results of microarray were confirmed with Bcl-2 western blotting indicating that Bcl-2 immunoreactivity is increased in cells pre-treated with EGb761. Free radical analysis indicates a decrease in intracellular hydrogen peroxide in cells pretreated with EGb761. These results suggest that modulation of multiple targets of the cellular apoptotic machinery may, at least in part, mediate the neuroprotective effects of EGb761.

10:00 EGb761 INCREASES OXIDATIVE STRESS RESISTANCE, EXTENDS LIFE SPAN, AND ATTENUATES THE HEAT SHOCK PROTEIN HSP-16 EXPRESSION IN *CAENORHABDITIS ELEGANS*

Amy Strayer\*, Zhixin Wu, Astrid Gutierrez-Zepeda, and Yuan Luo, University of Southern Mississippi, Hattiesburg, MS 39402

EGb761, a standard extract of *Ginkgo biloba*, has been known to enhance cognition, stress resistance, and longevity in mammals; however, its cellular and molecular mechanisms are still unclear. Using the model nematode organism *Caenorhabditis elegans*, we were able to demonstrate the positive pharmacological effects of EGb761 on oxidative and thermal (heat) stress. EGb761 extended the wild type (N2) worms' mean and maximum life span when exposed to a mild oxidative stress. EGb761 also increased the N2s resistance to a more severe oxidative stress by 33% and thermal stress by 25%. The effects of EGb761 on the expression of the small heat shock protein hsp-16 was directly observed by the co-expressing gene, hsp: GFP (this strain of worm is known as CL2070). We observed a decrease in the expression of this gene in the nematode when treated with EGb761, indicating that EGb761 aided in protection where heat shock proteins are normally used. Under oxidative stress, CL2070 showed a 21% increase in mean survival when pretreated with EGb761. These results suggest that EGb761, through antioxidative and anti-stress properties, holds protective effects for *C. elegans* under oxidative and thermal stress.

10:15 ANALYSIS OF THE ACTIVATOR CPER DURING CHROMATIC ADAPTATION

Lee Peeples\* and David Kehoe, Alcorn State University, Alcorn State, MS 39069, and Indiana University, Bloomington, IN

The cyanobacterium *Fremyella diplosiphon* undergoes complementary chromatic adaptation (CCA) in response to changes in ambient light color. This photo-

reversible process works optimally in red and green light conditions, is controlled at the transcriptional level, and is regulated by a complex signal transduction pathway. CCA begins with the perception of light by the photoreceptor, RcaE, which initiates a chain of events leading to the expression of either cpeB2A2 in red-light (RL) or cpeBA in green-light (GL). The products of these genes, phycocyanin and phycoerythrin, respectively, accumulate in the light-harvesting complexes of *F. diplosiphon* cells, increasing their ability to absorb photons. A class of mutants was generated which showed no significant accumulation of CpeBA protein in GL while exhibiting normal regulation of cpeB2A2 in RL. Complementation of one of these Turquoise mutants revealed a gene designated cpeR. This gene may act as a global regulator. Mutation of this gene results in no transcript accumulation of either CpeBA or the GL-activated ppeAB. To further study CpeR and its role in CCA, it was overexpressed in *E. coli*. CpeR was purified and used to generate antibodies which will be used to further analyze CpeR function. Western hybridization will be used to examine in what light condition(s) the protein is present. The current hypothesis is that CpeR acts as an activator of cpeBA and ppeAB expression and thus should be present in GL and absent in RL. Study of CpeR will lead to a better understanding of its role in CCA and elucidating the controlling signal transduction pathway.

10:30 Break

Session II—Is Anybody Else Feeling a Bit Whoozy?  
Molecular Aspects of Toxicology

11:00 ASSESSMENT OF THE DEVELOPMENTAL TOXICITY OF PEROXISOME PROLIFERATING AGENTS IN THE JAPANESE MEDAKA (*ORYZIAS LATIPES*)

Mary L. Haasch, University of Mississippi, University, MS 38677

The majority of studies assessing the developmental toxicity of peroxisome proliferating agents (PPAs) have been done in mammals. Little is known regarding possible adverse effects to aquatic species. Environmental chemical contamination has been suggested to be a possible causative agent in the decline of wild fish populations. PPA environmental chemical contaminants include plasticizers, solvents, herbicides, lubricants, and pharmaceuticals. The Japanese medaka (*Oryzias latipes*) has previously been used as a developmental model because development within the egg is external, the egg has a clear chorion allowing visualization and the time to hatch is relatively short (10–12 d), yet long enough to easily discern abnormalities. The medaka embryo-larval assay (MELA) was used to assess the developmental toxicity of 1 and 10 ppm di-*n*-butyl phthalate (DBP; plasticizer; 3.59 and 35.9

nM), perchloroethylene (PCE; tetrachloroethylene; solvent; 6.03 and 60.3 nM), 2,4-dichlorophenoxyacetic acid (2,4-D; herbicide; 4.52 and 45.2 nM) or WY14643 (3.09 and 30.9 nM), a potent model PPA and representative of pharmaceuticals. Developmental abnormalities increased over time and with increasing concentration. DBP produced changes in eye pigmentation, spinal deformities, enlarged gall bladders and cardiovascular abnormalities including tube heart and blood clot formation and delayed or prevented hatching. DBP has been reported to have a mean bioconcentration factor of 167 mg/g. Concentrations of DBP in secondary sewage effluent of 450 ppm have been reported. Taken together these findings suggest that PPAs, when present at concentrations found in secondary sewage effluent, may be an important determinant in declining wild fish populations. Supported by ES07929.

#### 11:15 INVESTIGATION OF COPPER TOXICITY ON ZEBRAFISH

Carloas Wilson<sup>1\*</sup>, Mudlagiri B. Goli<sup>1</sup>, Joseph M. Wahome<sup>1</sup>, Mike Mattie<sup>2</sup>, and Jonathan Freedman<sup>2</sup>, <sup>1</sup>Mississippi Valley State University, Itta Bena, MS 38941, and <sup>2</sup>Duke University, Durham, NC 27708

A study was carried out to observe the effect of copper sulfate (CuSO<sub>4</sub>) on the fast growing embryos of Zebrafish. Embryos were collected approximately three hours after fertilization and were examined for 15 days. The embryos of non-exposed, control embryos started hatching on the third day (13.6% hatched) and eventually 100% hatched by the fifth day. A delay in hatching was observed in embryos that were incubated in copper sulfate. Concentrations of 250 mg CuSO<sub>4</sub>/L or higher were toxic for the embryos. None of the embryos hatched when the concentration of the metal reached 250 mg/L and higher. A detailed study of the toxic effect of the metal on hatching characteristics will be presented in the meeting.

#### 11:30 BACTERIA ISOLATED FROM SOIL CONTAMINATED WITH POLYCYCLIC AROMATIC HYDROCARBONS ARE RESISTANT TO THE HIGHER MOLECULAR WEIGHT REPRESENTATIVES

Stephen I.N. Ekunwe, Rochelle D. Hunter\*, Huey-Min Hwang, and Lynette Ekunwe, Jackson State University, Jackson, MS 39217

Polycyclic Aromatic Hydrocarbons (PAHs), environmental contaminants made up of fused benzene rings, are byproducts of incomplete combustion of organic matter. Other sources of PAHs include motor vehicle emissions, cigarette smoke and petroleum production and processing. Because many PAHs are toxic and mutagenic, their cleanup is necessary. Low molecular weight PAHs, e.g., naphthalene, phenanthrene, are readily degraded by many soil bacteria, but higher molecular weight PAHs, e.g.,

pyrenes, are not. Standard bacteria isolation protocol was followed. Partial characterization of the 1 liter pure cultures obtained was done utilizing their Gram staining properties, morphology, and fluorescence. Growth of isolates in the presence or absence of 1-aminopyrene (I-AP) and 1-hydroxypyrene (1-HP) has been evaluated. Results indicate 7 Gram negative and 4 Gram positive rod shaped isolates. Isolates tested so far are resistant to I-AP and 1-HP at the concentration of 10 µg/ml. This may suggest potential degradation abilities of the isolates. According to literature, PAH degradation involves an upper and a lower pathway. In the upper pathway, hydroxylation of an aromatic ring to a cis-dihydrodiol is catalyzed by dioxygenase, a multicomponent enzyme consisting of reductase, ferredoxin, and large and small ironsulfur proteins (ISP). ISP sequence presence may be used to predict PAH degradation capability. Five isolates were found to contain plasmids (12.2 kb). PCR is being used to probe DNA isolated from these bacteria for presence of ISP sequence. Acknowledgements: This work was supported by a grant from the Army Research Office (Grant No. DAAD 19-01-1-0733), awarded to Jackson State University.

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### THURSDAY AFTERNOON

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Exhibition Hall B

Session III—Come Out, Come Out Wherever You Are. Searching for Genes and Proteins

1:30 Introduction

#### 1:45 RECOMBINANT EXPRESSION OF SULFITE REDUCTASE FROM *ARABIDOPSIS THALIANA*

Steve Adamson\*, Cecilia Chi-Ham, Sabine Heinhorst, and Gordon C. Cannon, University of Southern Mississippi, Hattiesburg, MS 39406

Plastids are organelles that serve a variety of functions depending on the cell type in which they reside. Replication and expression of their DNA are believed to be involved in coordinating the maturation of immature proplastids into the green chloroplasts of photosynthetic tissue. During this development, dynamic structural changes of the organellar nucleoid have been observed that likely accompany differences in function of the protein-DNA complexes. A major constituent of plastid nucleoids is sulfite reductase (SiR), a siroheme enzyme that also participates in the sulfur assimilation pathway. The protein compacts DNA and inhibits DNA synthesis *in vitro*. To further explore cellular strategies that coordinate which one(s) of the two roles SiR plays in response to internal and external cues, antibodies are needed to locate and quantitate

the protein. To obtain large amounts of protein, recombinant SiR from *Arabidopsis thaliana* was expressed in *E. coli* as a fusion protein with an intein tag that contains a chitin-binding domain. After purification of the fusion protein on a chitin column, the intein is removed under reducing conditions and recombinant SiR eluted. The chicken antisera against recombinant *A. thaliana* SiR protein are currently being characterized with respect to specificity and cross-reactivity towards nucleoid proteins from *Glycine max*.

2:00 CLONING OF TWO GENES OF UNKNOWN FUNCTION FROM THE CARBOXYSOME OPERON OF *HALOTHIOBACILLUS NEAPOLITANUS* AND DEVELOPMENT OF AN EXPRESSION CONSTRUCT

Devon Ingram<sup>1\*</sup>, Kristi Budzinski<sup>2</sup>, Gordon C. Cannon<sup>2</sup>, and Sabine Heinhorst<sup>2</sup>, <sup>1</sup>Cedar Crest College, Allentown, PA 18104, and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406

Carboxysomes are the protein bodies of many chemotrophic and phototrophic bacteria that enhance the catalytic properties of the resident enzyme, ribulose-1,5 bisphosphate carboxylase/oxygenase, by an as yet ill-defined mechanism. While most of the carboxysomal proteins can easily be purified and have been assigned a structural function, the protein products of two open reading frames (*orfA* and *orfB*) in the carboxysome gene cluster of *Halothiobacillus neapolitanus* have not been identified. To be able to determine the role these rather small proteins of apparently low abundance play in carboxysome structure, function and assembly, they have to be overexpressed in a suitable host. To that end, the coding sequences of *orfA* and *orfB* were amplified by the polymerase chain reaction (PCR) using primers that were designed to contain appropriate restriction sites for the pTYB1 vector. After restriction digestion, the amplified fragments were inserted to yield a C-terminal in-frame translational fusion with an intein tag that features a chitin-binding domain. The ligation products were introduced into *E. coli* DH5 $\alpha$  cells and the presence of the insert was verified by restriction digestion and PCR amplification.

2:15 ANALYSIS OF KNOCKOUT LINES FOR INSERTION MUTANTS IN THE SULFITE REDUCTASE GENE OF *ARABIDOPSIS THALIANA*

Sudha Sankaran\*, Sabine Heinhorst, and Gordon C. Cannon, University of Southern Mississippi, Hattiesburg, MS 39406

Chloroplasts are semi-autonomous organelles that have their own genome. The organellar DNA is complexed with DNA binding proteins into structures termed nucleoids. Composition and morphology of these nucleoids are vital to the different roles these complexes play in the replication and transcription of the chloroplast genome. One nucleoid

associated protein is DCP68, which was identified from *Glycine max* suspension cells was identified as ferredoxin:sulfite reductase. To further delineate the roles this bifunctional protein plays in the chloroplast, T-DNA insertion mutants of *Arabidopsis thaliana* were screened for an insertion in the sulfite reductase gene. Two candidate lines were identified and are currently being characterized. In parallel, post-transcriptional silencing of the sulfite reductase gene is being attempted using an RNA interference (RNAi) construct that is designed to trigger specific degradation of the homologous RNA in the transformants and to allow one to make transgenic plants with a functional knockout of the gene in question. It is hoped that the RNAi approach will reveal important information about the biological effects of a sulfite reductase knockout and of the mechanisms used by the plant to coordinate the two functions of sulfite reductase protein in the chloroplast.

2:30 Break

2:45 DEVELOPING A HUMAN LIBRARY SCREEN FOR HUNTINGTIN (HTTQ103) TOXICITY ANTAGONIZERS IN YEAST

Heather Vanpelt<sup>1\*</sup>, Kavita Bapat<sup>2</sup>, and Yuri O. Chernoff<sup>2</sup>, <sup>1</sup>Mississippi University for Women, Columbus, MS 39701, and <sup>2</sup>Georgia Institute of Technology, Atlanta, GA 30332

HttQ103 is a mutant form of the human huntingtin protein which contains an abnormally-long stretch of 103 glutamines. When HttQ103 is transformed into yeast, the glutamine repeats cause a misfolding and aggregation of the protein, resulting in toxic prion formation in the yeast similar to that found in human Huntington's disease. Due to the evolutionary conservation of mechanisms, we believe that there may be compounds similar to those which have been found in yeast (e.g., Hsp104) relieving huntingtin toxicity in human cells. We hope to find human proteins, which when transformed into HttQ103-expressing yeast, can antagonize the toxicity and allow the yeast cells to resume normal growth. If a cDNA can be found in the Human Brain Library which negates the toxicity, it could potentially be used as a gene therapy for patients with Huntington's disease or other prion-associated diseases. The HttQ103 gene along with cDNAs from the Human Brain Library were transformed into yeast and some of these colonies grew to normal size, appearing to not show the effects of huntingtin toxicity. Colonies with normal growth were checked for the spontaneous loss of prion-forming capability. Those that retained the capability had the cDNA-containing plasmid isolated, transformed into *E. coli*, re-isolated from *E. coli*, and transformed back into yeast with the Q103 plasmid to check for reproducibility of the huntingtin toxicity-negating effects.

3:00 EXPRESSION OF OPEN READING FRAMES A

### AND B (*ORFA* AND *ORFB*) FROM THE CARBOXYISOME OPERON OF *HALOTHIOBACILLUS NEAPOLITANUS*

Kristi Budzinski<sup>1\*</sup>, Devon Ingram<sup>2</sup>, Gordon C. Cannon<sup>1</sup>, and Sabine Heinhorst<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Cedar Crest College, Allentown, PA 18104

Carboxysomes are polyhedral protein nanocompartments found in many chemoautotrophs and in cyanobacteria. Approximately 60% of the carboxysomal protein consists of the CO<sub>2</sub>-fixing enzyme ribulose-1,5-bisphosphate carboxylase/oxygenase, indicating that the carboxysome serves a function in carbon metabolism. Genetic studies of the carboxysome operon in *Halothiobacillus neapolitanus* have led to the discovery of two open reading frames (*orfA* and *orfB*) that could encode small polypeptides. However, these gene products have not yet been identified in *H. neapolitanus* and do not seem to be structural components of the carboxysome. To develop antibodies against the *orfA* and *orfB* polypeptides and use the antisera to detect the proteins *in vivo* and *in vitro*, the *orfA* and *orfB* genes were cloned into the pTYB1 vector and heterologously-expressed in *E. coli* as an in-frame translational fusion with a self-cleavable intein with a chitin-binding domain. Transformants were screened for the presence of the *orfA* and *orfB* genes by restriction digestion. Positive clones were grown in liquid culture under different conditions and expression of *orfA* and *orfB* was induced by exposure of the cells to IPTG. The fusion protein was purified by chromatography on a chitin affinity column.

### 3:15 METHYL PARATHION INTOXICATION ALTERS THE NEUROCHEMISTRY OF THE SEPTOHIPPOCAMPAL PATHWAY

Ben Quilter\*, N.T. Averett, and J.B. Hutchins, University of Mississippi Medical Center, Jackson, MS 39216

Enzymes called cholinesterases remove acetylcholine from the cholinergic synapse. Methyl parathion (MP), which is converted by the liver into the active metabolite methyl paraoxon, can permanently inhibit these enzymes. MP is also used as a pesticide, and has been used illegally in private residences. Exposure of children to MP has been reported to cause problems with learning and memory. We think that the expression of acetylcholinesterase messenger RNA will be increased in the septal nuclei of mice treated chronically with dermal MP compared to vehicle-treated controls. The expression of cholinergic receptor message, particularly for the m2 muscarinic receptor, should be decreased in the hippocampus of mice treated chronically with dermal MP as compared to vehicle-treated controls. Adult mice (C3H and B6C3F1 strains) were treated daily for seven days using a 10 mg/ml mixture of MP dissolved in ethyl alcohol. The controls are dosed with alcohol. The MP dose is calculated

to give 10 mg/kg body weight. The mice were then perfused with fixative for immunohistochemical analysis, or they were killed and their septum or hippocampus were removed and frozen for further analysis. We carried out gene array analysis to determine which genes were up- or down-regulated by MP in the septum and hippocampus. We found a number of transmitter-related and apoptosis-related genes that changed their expression levels after MP treatment. Support provided by the Howard Hughes Medical Institute 51000122 and Centers for Disease Control and Prevention R06/CCR419466.

3:15 Session IV—Poster Carnivale!

### MATURATION OF DENDRITIC CELLS FOR CANCER IMMUNOTHERAPY

Antoinette L. Walker<sup>1\*</sup>, James Kobie<sup>2</sup>, and Emmanuel Akporiaye<sup>2</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174, and <sup>2</sup>University of Arizona, Tucson, AZ 85721

Cancer is a group of diseases characterized by uncontrolled growth and spread of abnormal cells. Dendritic cells (DCs) are antigen-presenting cells that stimulate immune responses. This experiment was designed to develop a more efficient method to generate mature dendritic cells for cancer immunotherapy. Mature DCs express high levels of major histocompatibility complex (MHC) class I and II molecules and co-stimulatory molecules (CD80, CD86, and CD40). Mature DCs are effective at presenting tumor antigens to T cells. The stimulated T cells develop into cytotoxic T cells, which encounter the tumor antigens and kill the tumor cells. Tumor Necrosis Factor Alpha (TNF- $\alpha$ ) is a cytokine that contributes to the maturation of dendritic cells. Prostaglandin E2 (PGE2) is an immunomodulator that upregulates the expression of MHC molecules and co-stimulatory molecules on DCs. The murine DCs were treated with maturation factors TNF- $\alpha$ , PGE2, or TNF- $\alpha$  + PGE2 and analyzed by flow cytometry. Dendritic cells treated with the maturation factors had a higher expression of co-stimulatory molecules and MHC class II molecules than the DCs that remained untreated.

### CORRELATION BETWEEN GROWTH PROCESSES AND GENETIC ENDPOINTS

Babu P. Patlolla<sup>1\*</sup>, Anita K. Patlolla<sup>2</sup>, and B.S. Sekhon<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096, and <sup>2</sup>Jackson State University, Jackson, MS 39217

Halogenated aliphatic hydrocarbons have long been regarded as pharmacological and toxicological entities. Human exposure to complex mixtures of chlorinated compounds has been extensive and effects following long-term exposure to them can be investigated through toxicological laboratory studies. In the present study the effects of three chlorinated hydrocarbons (1,1-dichloroethane; 1,1,1-tri-

chloroethane and 1,1,2,2-tetrachloroethane) on growth in plants are compared with the effects of the same chlorinated compounds on genetic endpoints in mice. Four different concentrations of each chemical were used in this study. Correlation coefficients (r-values) were calculated to establish the correlation and further confirmed by the Z-values. There was a strong negative correlation between the shoot length of *Zea mays* and chromosomal aberrations in mice bone marrow for 1,1-dichloroethane (r-value = -0.9400), for 1,1,1-trichloroethane (r-value = -0.9249) and for 1,1,2,2-tetrachloroethane (r-value = -0.8925). The results of this investigation indicated that observing their effects on shoot length, thus reducing the unwanted usage of animals, could monitor the harmful effects of chlorinated hydrocarbons.

#### A SIMPLE METHOD FOR HIGH RESOLUTION RANDOM AMPLIFIED POLYMORPHIC DNAs ASSAYS IN PLANT POPULATIONS

Janet Marie Gibson McDaniel\* and Robert G. Hamilton, Mississippi College, Clinton, MS 39058

Using 43 cm x 0.45 mm 5% polyacrylamide gels and silver staining has been a high quality method for the detection and analysis of random amplified polymorphic DNAs (RAPDs). This method is, however, time consuming and tedious. We developed 8 cm x 1.0 mm 5% polyacrylamide gels as an equally high quality method for the analysis of RAPDs fragments. The 8 cm x 1 mm gels can be purchased pre-made, and do not have to be electrophoresed at high power levels. Electrophoresis at 4 mA for 11 hours produced very high quality data on the 8 cm x 1.0 mm gels for DNA fragments ranging in size from about 400 bp to about 1000 bp in length. The range in size of fragments that can be visualized on a single gel is the major limitation of the 8 cm gel over the 45 cm gel. Silver staining the 8 cm x 1.0 mm gels is much easier than silver staining the 43 cm x 0.45 mm gels, as there is no requirement to separate the plates such that the gel remains adhered to one plate. Measurement of fragment sizes can be completed manually using semi log graph paper with just one logarithmic series, as all DNA fragment sizes are in the hundreds of base pairs. The use of an 8 cm x 1.0 mm polyacrylamide gel allows high quality visualization and analysis of RAPDs to be completed under a much greater diversity of laboratory conditions, as it requires far preparation and less technical expertise.

#### THE EXPRESSION OF THE TROL GENE'S THIRD DOMAIN, TROL III

Caronda Moore<sup>1\*</sup>, Sumana Datta<sup>2</sup>, and Derek Crunk<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>Texas A&M University, College Station, TX 77843

The research project was a part of an ongoing project to express the five domains of the trol gene, a mutant

gene in the fruit fly *Drosophila melanogaster*. The project focused on the third domain in order to determine what role does the third domain of the trol gene play in the stimulation of the growth hormone FGF. Studies have shown that the FGF growth hormone is needed for stem cell division in early development. The procedure for expressing the third domain were to put together a DNA construct and inject it into the neuroblast of the fly. ANA cDNA, which is about 2.5 kb, was purified out of a pBS vector as the insert. pUAST, which is about 9kb, was purified as the cloning vector with flanking restriction sites. The ANA insert was ligated into the pUAST vector, and the ANA coding sequence was cut out leaving behind a signal peptide which will release the trol III (received from yellow white genomic DNA) from the cell therefore expressing it. The ANA and pUAST were ligated together, but it was noticed that the ANA insert was turned the wrong way (viewed through gel electrophoresis). This problem was approached with several different techniques, including trying to recut the transformed ANA/pUAST with restriction enzymes. The trol III sequence was successfully PCR'd but not yet ligated and transformed with the ANA/pUAST. The construct has not been injected into the neuroblast.

#### GEOGRAPHIC DISTINCTNESS OF *ESCHERICHIA COLI* IN SEAGULLS BETWEEN GULFPORT, MS, AND DAUPHIN ISLAND, AL, AS DETERMINED BY BOX-PCR DNA FINGERPRINTING

David Oliver\*, Wail M. Hassan, Dawn Rebarchik, R.D. Ellender, and Shiao Y. Wang, University of Southern Mississippi, Hattiesburg, MS 39406

Fecal coliform bacteria is an environmental pollutant and high counts cause the closure of recreational waters and oyster harvest areas. Bacterial source tracking methods compare bacteria from environmental samples to isolates of known animal source to ascertain the likely animal origin of the environmental sample. Because the tracking method compares environmental isolates to those in a database, an important consideration is geographic distinctness of isolates. If fecal coliform bacteria from an animal species appear similar over a wide geographic area, information in the database can then be used to infer the animal origin of isolates from the same broad area. The present study compares the BOX-PCR DNA fingerprints of *Escherichia coli* isolates from seagulls in Gulfport, Mississippi and Dauphin Island, Alabama to determine whether seagulls harbored distinct *E. coli* populations based on geographic location. A total of 32 seagull samples and 168 *E. coli* isolates were included in the study. The two most basal branches of the dendrogram using BOX-PCR DNA fingerprints showed distinctive clustering of isolates based on geographic location. In one, 31 of 37 isolates (84%) were from Gulfport seagulls. In the other, 47 of 55 isolates (85%) were from Dauphin Island seagulls. Our

results suggest that geographic location should be considered when BOX-PCR is used in bacterial source tracking.

#### TARGETED DELIVERY OF THERMALLY SENSITIVE CYTOTOXIC POLYPEPTIDES

Gene L. Bidwell III, Melissa A. Skertich, and Drazen Raucher\*, University of Mississippi Medical Center, Jackson, MS 39216

To improve specificity and efficacy, while at the same time reduce toxicity caused by the current anticancer treatments, we developed a thermally targeted polypeptide-mediated therapeutic delivery vehicle. The design of this therapeutic delivery vehicle is based on elastin-like polypeptide (ELP), which is soluble in aqueous solution below physiological temperature (37°C), but aggregates when the temperature is raised above 41°C. Therefore, intravenously delivered ELP polymers are rapidly cleared under physiological conditions, but they accumulate at targeted diseased sites where local heat (41–43°C) is applied. We modified the coding sequence for ELP by addition of penetratin and a cytotoxic peptide, and expressed and purified from *E. coli*. Penetratin represents a membrane translocating sequence from helix 3 of Antennapedia, which mediates intracellular uptake of large ELP aggregates and increases its uptake by more than 100-fold in HeLa cells. The cytotoxic peptide is derived from helix 1 of c-Myc. It has been shown that this peptide prevents c-Myc DNA binding and inhibits cell proliferation. The cytotoxicity, uptake, and localization of this ELP construct are examined by MTS assay, flow cytometry, and confocal fluorescence microscopy, respectively.

#### REGULATION OF THE MN/CA9 PROMOTER IN RENAL CELL CARCINOMA

Shenekia A. Wells\* and Thomas A. Gardner, Alcorn State University, Alcorn State, MS 39069, and Indiana University School of Medicine, Indianapolis, IN 46202

MN/CA9 is a tumor-associated antigen that was originally detected in human cervical carcinoma HeLa cells. It is a member of the carbonic anhydrase (CA) family and is speculated to be a potential marker and key target for gene therapy of the most common kidney cancer, Renal Cell Carcinoma (RCC). The MN/CA9 antigen is expressed in more than 90% of RCC and other cancer cells with malignant phenotypes in the cervix and ovaries of females. Despite all of the remarkable ways of using this antigen, the mechanism controlling the regulation in RCC has yet to be determined. This research explores the usage of the MN/CA9 promoter in gene therapy for RCC and mechanisms controlling its expression in RCC.

#### EFFECTS OF MONOTERPENES ON THE SERUM-INDUCED MORPHOLOGICAL CHANGE OF *CANDIDA*

#### ALBICANS

Roger D. Holloway\* and Paul McGeedy, Alcorn State University, Alcorn State, MS 39069, and Clark Atlanta University, Atlanta, GA 30314

Perillyl alcohol and carveol were shown to inhibit the transformation of *Candida albicans* to a filamentous form, but not at a higher concentration than was previously shown for the corresponding aldehyde (perillyl aldehyde) and ketone (carvone). This morphological change is associated with *C. albicans* pathogenicity; hence these naturally occurring monoterpenes are not suitable lead compounds in the development of therapeutic agents against *C. albicans* infections.

#### USING RAPID IDENTIFICATION TEST TO CATALOG THE DIFFERENT STRAINS OF *E. COLI*

Valarie Acoff\*, Al Mikell, and Trent Fivecoat, University of Mississippi, University, MS 38677

Recently, pathogenic strains of *Escherichia coli* have emerged. They are common in feces of warm-blooded terrestrial animals. *E. coli* is known as an indicator bacteria and strain for fecal pollution. It is an enterotoxigenic organism that is spread by fecal contamination of animal or human origin to food and water. This research was based on a series of procedures where seven samples were collected from seven domesticated and wildlife animals. Growth and isolation of the different bacteria were conducted on selective media to the third generation where suspected *E. coli* development was detected. By using commercial kit system identification, different strains of *E. coli* and other bacteria were identified and characterized. In addition to identification, a B-antigen specific test for O157:H7 enterohaemorrhagic *E. coli* strain was conducted on all *E. coli* samples. This test is called the Pro-Lab *E. coli* O157 Latex Test Reagent Kit. It is an agglutination test kit specifically for identifying the serogroup O157 antigen on selective media. Once this experiment was conducted, the results identified specific virulence factors, bacteria, and strains. Overall, this research identified and cataloged no pathogenic strains of *E. coli*.

#### HUNTINGTONS AGGREGATES VISUALIZED IN LIVING COLORS

Akita Evans\* and Lois Greene, Tougaloo College, Tougaloo, MS 39174, and National Institute of Health, National Heart, Lung, and Blood Institute, Bethesda, MD 20892

Huntington's Disease (HD) is a fatal neurodegenerative disease with clinical manifestations including progressive dementia, psychiatric symptoms, and movement disorder. It is characterized by an unusually long CAG expansion on the huntingtin gene giving rise to a very long polyglutamine repeat at its amino end. The effect of HD aggregates in cellular pathogenesis is not known. Through the use of spectro-proteins with different polymerization

properties—Green Fluorescent Protein (GFP), a monomer, and DsRed, a tetramer—the effect of huntingtin aggregation with the two spectral variants was determined. DsRed huntingtin formed many aggregates throughout the cytosol of cells, whereas GFP huntingtin formed aggregates in the nucleus and usually one large one at the MTOC. In addition, DsRed promoted the aggregation of GFP huntingtin. With these findings, future studies can be done relating the lethality of the huntingtin to aggregation.

#### ALTERATION OF PROTEIN EXPRESSION IN MURINE IMMUNE CELLS DUE TO ESTRADIOL AND BISPHENOL A EXPOSURE

Derese Getnet, Ella Lazo, and Rebecca Roberts\*, Ursinus College, Collegeville, PA 19426

The discovery of estrogen receptors (ER) on lymphocytes and antigen presenting cells (APCs) has sparked a growing interest in the role of estrogen (E2) in cell-mediated immunity. Antigen presentation in uterine and vaginal cells of rats has been demonstrated to be under the regulation of estrogen. The mechanisms of action by which estrogen and estrogenic endocrine-disrupting chemicals (EEDCs) affect cellular function is not fully understood. Bisphenol-A (BPA), an EEDC, is used as a monomer in polycarbonate plastic production. Here, we report the effect of E2 and BPA on the protein expression of splenocytes and dendritic cells. Splenocytes from three strains of mice and a murine dendritic cell line were exposed to BPA and E2 in culture. Protein expression in treated samples was altered compared to controls. However, expression of the endosomal cysteine protease cathepsin L did not appear to be affected.

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### FRIDAY MORNING

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Exhibition Hall B

Session V—Special Joint Session with Mississippi Functional Genomics Network

8:30 BRIN Meeting and Presentations

See program on page 25.

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### FRIDAY AFTERNOON

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Exhibition Hall B

Session VI—It's an RNA World, We Just Live in It. Ribozymes

1:00 Introduction

1:15 PROBING RNA CONFORMATION CHANGES BY FLUORESCENCE SPECTROSCOPY

Peter Butko\* and Michelle Magee, University of Southern Mississippi, Hattiesburg, MS 39406, and Centenary College, Shreveport, LA 71134

Flavine adenine dinucleotide (FAD) exhibits fluorescence due to its isoalloxazine conjugated ring structure. In principle, this fluorescence can be used as a tool to detect conformation changes in FAD-coupled macromolecules. We tested this with the recently synthesized RNA ribozymes, able to catalyze the synthesis of flavine adenine dinucleotide (FAD) from flavine mononucleotide (FMN). It is known from kinetic data that these ribozymes require the presence of divalent cations  $Mn^{++}$  and possibly  $Ca^{++}$ . We used fluorescence spectroscopy of FAD-RNA to study the possible effect of the cations on the structure of the ribozyme. None of the tested cations influenced fluorescence of free FAD, but  $Mn^{++}$  caused a significant increase in fluorescence of FAD-RNA, which is ascribed to a Mn-induced conformation change in RNA. We conclude that FAD fluorescence can be used to monitor conformation changes in FAD-ribozymes. The current results will be confirmed and extended by time-resolved fluorescence spectroscopy.

# Funding Opportunities

## Mississippi Functional Genomics Network funded by NIH-NCRR

Funding currently available for biomedical and biotechnology research in Mississippi:

- ✓ **Seed Grants**
- ✓ **Small Equipment Grants**
- ✓ **Summer Research and Travel Grants**

MFGN is an initiative funded by the National Institutes of Health to facilitate biomedical research in Mississippi. In addition to funding opportunities, MFGN has five research facilities with state-of-the-art equipment available for use by scientists in Mississippi, including:

- ✓ **Genomics Facilities**
- ✓ **Proteomics Facility**
- ✓ **Imaging Facility**

Be sure to visit the MFGN Web site ([mfgn.usm.edu](http://mfgn.usm.edu)) that now includes a message board and chat room to keep you aware of recent developments.

### **For further information contact**

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# **MFGN Session at the MAS**

## **February 14, 2003**

**8:30-11:30 a.m.**

- I. Introduction-George Santangelo (8:30-8:40)**
- II. Facilities-George Santangelo (8:40-9:55)**
  - A. Proteomics-Alan Wood
  - B. Cellomics-Paul Tchounwou
  - C. Pharmacogenetics-John Williamson
  - D. Genomics-Don Sittman
  - E. Imaging-Rebecca Phelps
- III. Training and Mentoring Core-Glen Shearer (9:55-10:50)**
  - A. Overview of Criteria
  - B. 2002 Awards
    - 1. REO- Susan Pedigo
    - 2. SIdER- Cindy Wolfe and Mona Norcum
    - 3. SGO- Jinghe Mao and Gregory Chinchar
- IV. Bioinformatics-Mo Elasri (10:50-11:10)**
- V. Web Site-Terry Haley (11:10-11:30)**
- VI. Question/Answer (11:30-)**
- VII. Adjourn**

## 1:30 RIBOZYME KINETICS

Jason Manning\*, Tricia M. Coleman, and Faqing Huang, University of Southern Mississippi, Hattiesburg, MS 39406

The 'RNA world' hypothesis posits that early life forms employed RNA as both an informational and catalytic molecule. In this preprotein world, RNA served the role of both DNA (informational) and proteins (catalytic). A technique known as *in vitro* selection has been used in the isolation of numerous artificial catalytic RNA molecules in various research laboratories. Although catalytic RNA (ribozymes) cannot enhance catalytic rates as efficiently as protein enzymes, they can increase the rate of reactions significantly. Kinetic characterization of ribozymes can give valuable information about reaction mechanisms and a standard for the "fitness" of a ribozyme. A series of thioester synthase ribozymes have previously been isolated in our laboratory from size heterogeneous pools containing random regions of 30, 60, 100, and 140 nucleotides. Ribozymes isolated from the 100 N size group (N = number of nucleotides) were characterized kinetically by standard Michaelis-Menten kinetics. Each active thioester synthase ribozyme sequence was allowed to react with different concentrations of substrate Biotin-AMP for varying times to yield apparent first order rates. These rates were then plotted versus substrate concentrations to give kinetic parameters of  $k_{cat}$  and  $K_M$ . The kinetic parameters for each sequence from this size group were compared to each other to determine the most efficient ribozymes. Reaction rates for individual ribozymes from the 100 N group could then be compared to ribozymes from the other three size groups in order to form conclusions about the size versus activity relationship for thioester synthesis by RNA.

1:45 *IN VITRO* SELECTION OF A MINIMUM RNA LIGASE

Guocan Wang\* and Faqing Huang, University of Southern Mississippi, Hattiesburg, MS 39406

The "RNA world" hypothesis proposes that RNA performed both genomic and catalytic functions in the very early history of life on earth. In such an RNA world, RNA should have performed similar biochemical reactions as protein enzymes do in modern biology. Relatively large RNA can form complex structures and can potentially perform sophisticated catalytic functions. However, synthesis of large sizes of RNA was thought to be very difficult by RNA alone, based on known efficiency and accuracy of RNA catalysis. Therefore, there exists a fundamental problem of how the first large RNA arose. Large RNA can be made by two different mechanisms: (1) stepwise addition of nucleotides to an existing RNA chain or (2) ligation of two or more short RNA pieces. The first mechanism is used by current biology to make RNA. However, we believe that the second mechanism may be advantageous to synthesize large RNA by primitive catalytic

RNA, and ribozymes with RNA ligation activity might have been an essential catalytic activity in the RNA world. We are using SELEX to isolate minimum RNA ligase sequences. Unlike conventional SELEX, an 18-nucleotide complete random RNA library without constant flanking primer sequences is being used in order to remove the effect of primer regions. The selection process involves a combination of RNA/DNA ligation, dephosphorylation, phosphorylation, and restriction enzyme digestion, in addition to reverse transcription, PCR, and *in vitro* transcription. Isolated ribozymes are expected to catalyze the formation of RNA dimer, trimer, etc. Our results will define the minimum sequence requirement for an RNA ligase, which can be used to evaluate the complexity of an early RNA world.

## 2:00 RNA-CATALYZED PEPTIDE FORMATION FROM ACYL CoA

Na Li\* and Faqing Huang, University of Southern Mississippi, Hattiesburg, MS 39406

Many toxins and antibiotics, such as  $\alpha$ -amanitin, cyclosporin, vancomycin, contain both D- and L-forms of amino acids connected by peptide bonds. These peptide bonds are made not by ribosomes, but rather by large protein complexes called nonribosomal polypeptide synthetases (NRPS). The NRPS, by modular design, define the sequence of antibiotics. In the process of antibiotic peptide synthesis, amino acids are first activated and attached to pantetheinyl groups as thioesters, followed by peptide bond formation. Having succeeded in isolating ribozymes making CoA and its thioesters, we are isolating new ribozymes by SELEX from random RNA libraries to catalyze the peptide bond formation from acyl CoA. The experiment was designed according to the mechanism of NRPS. The results will provide evidence to support our hypothesis of RNA-based metabolic pathways (metabolic ribozymes). Integration of our *in vitro*-generated various ribozyme activities may lead to novel antibiotic synthesis through rational modular ribozyme design. It is conceivable that modular multi-component RNA systems can be engineered (based on Watson-Crick base pairing) to produce different products, once each ribozyme module's function is defined. Due to drug resistance of bacteria, current available antibiotics are becoming less effective. Production of new antibiotics has become a serious challenge. An RNA-based system for antibiotics synthesis may provide a new solution.

## 2:15 Break

Session VII—And If All Else Fails, Give It a Really Hard Whack! Developing Molecular Tools

2:30 Introduction

2:45 AN INVESTIGATION INTO THE SIZE-ACTIVITY RELATIONSHIP OF RNA CATALYSIS

Tricia M. Coleman\*, Jason Manning, and Faqing Huang, University of Southern Mississippi, Hattiesburg, MS 39406

A technique known as *in vitro* selection (SELEX) makes it possible to isolate individual RNA sequences with novel biochemical properties from large pools ( $10^{13}$ – $10^{15}$  different sequences) of random RNA molecules. It has been argued that longer sequences are more desirable for the selection process because RNA can then form into more complex secondary and tertiary structures, which would in turn allow for more complex and rare activities to be isolated. The known replication inefficiency of longer sequences, however, puts longer sequences at a disadvantage in a competitive situation. This effect would have been especially significant in the harsh conditions of the RNA world. To determine whether shorter sequences are advantageous in selection experiments, we have used size heterogeneous RNA pools to isolate a series of thioester synthase ribozymes. RNA molecules with random regions of 30, 60, 100, and 140 nucleotides were allowed to compete under identical conditions during selection. The selection therefore mimics natural selection in that RNA molecules compete for representation, and only those with the correct balance between replication efficiency and catalytic efficiency survive. At the end of the selection the relative size distribution was  $30N > 60N \gg 100N, 140N$ . We have also conducted a comprehensive kinetic analysis on the sequences isolated from each of the four size groups. These results indicate that there is an optimal size for catalytic activity centered around 60 nucleotides.

3:00 A STUDY OF GLOMERULAR DEVELOPMENT IN THE OLFACTORY BULB OF ZEBRAFISH, *DANIO RERIO*

Antony Schwartz\* and Christine A. Byrd, Jackson State University, Jackson, MS 39217, and Western Michigan University, Kalamazoo, MI 49008

Glomeruli are anatomical and possibly functional modules in the vertebrate olfactory bulb. These spherical neuropilar structures are a prominent and ubiquitous feature of both invertebrate and vertebrate olfactory bulbs and represent the first relay stations in the olfactory pathway. A typical adult zebrafish olfactory bulb contains a small number of about 80 glomeruli that have a stereotyped configuration. In this study our aim was to identify markers that specifically label glomeruli in zebrafish embryos and then quantify glomeruli at different stages of development.

DiI labeling and whole-mount immunocytochemistry procedures were utilized to study glomerular labeling under a confocal laser microscope. Alpha-tubulin and anti-keyhole limpet hemocyanin (alpha-KLH) antibodies were used in the immunocytochemistry procedure. We found that DiI, alpha-tubulin and alpha-KLH labeled the olfactory receptor neurons, but only alpha-KLH labeled the axons leading away from the olfactory receptor and going toward the olfactory bulb. This indicates that alpha-KLH has potential, with adequate testing, as a labeling tool to study glomerular development in zebrafish embryos. This study was made possible by REU grant from NSF.

3:15 THE DEVELOPMENT OF A REP-PCR DNA FINGERPRINT DATABASE FOR BACTERIAL SOURCE TRACKING IN MISSISSIPPI

Wail M. Hassan\*, Mary Phares, David Oliver, Brian Robinson, Dawn Rebarchik, R.D. Ellender, and Shiao Y. Wang, University of Southern Mississippi, Hattiesburg, MS 39406

The goal of the present project is to develop a bacterial DNA fingerprint database against which unknown environmental samples can be compared for identifying sources of fecal pollution in Mississippi. A total of 387 fecal samples were collected from human, cow, chicken, deer, dog, horse, and seagull (57, 73, 38, 39, 9, and 59 samples, respectively). Over a thousand isolates each of *Escherichia coli* (EC) and *Enterococcus* spp. (EN) were isolated and analyzed by a PCR-based fingerprinting method that amplifies repetitive sequences in the bacterial genome. Two different sets of primers (REP and BOX) were tested and the usefulness of EC as an indicator of fecal pollution was compared to that of EN. To compare the reliability between the two primer sets and the two indicator bacteria, Jackknife analysis was used to calculate the rate of correct assignment (RCA). The RCA values for REP-PCR using EC and EN were 64% and 62%, respectively. The RCA values for BOX-PCR using EC and EN were 62% and 84%, respectively. We conclude that BOX-PCR using EN is the method of highest fidelity. Currently, the reliability of the DNA fingerprint database for bacterial source tracking in south Mississippi is being evaluated using a blind test.

3:30 THE DEVELOPMENT OF A REAL-TIME RT-PCR METHOD FOR THE QUANTIFICATION OF TAURA SYNDROME VIRUS IN SHRIMP

Zhiming Cao\*, Anne Marie Flowers, Verlee Breland, Jeffrey M. Lotz, and Shiao Y. Wang, University of Southern Mississippi, Hattiesburg, MS 39406

Taura syndrome virus (TSV) is an enveloped single-stranded RNA virus in the family *Picornaviridae*. It is one of the most detrimental shrimp viral pathogens in the western hemisphere, causing high mortalities at shrimp aquaculture farms. To better understand progression of the

TSV disease process, a sensitive procedure to quantify TSV in shrimp is urgently needed. A reproducible real-time RT-PCR assay to quantify TSV in shrimp hemolymph was developed in the present study. The assay relies on the use of Molecular Beacon technology and a Cepheid Smartcycler real-time detection system. The assay is sensitive to  $2 \times 10^4$  RNA copies per reaction with a dynamic range between  $10^4$  and  $10^9$  RNA copies. The coefficient of variation of threshold cycle (Ct) values in intra- and inter-runs were less than 2.01% and 2.61%, respectively. In a study of changes in viral titer over time, we observed large variations among shrimp. The highest viral titers occurred 4 days after infection with titers ranging from  $7.7 \times 10^5$  to  $2.2 \times 10^9$  copies/ $\mu$ l hemolymph ( $n = 10$ ). On day 61 of the study when the last surviving shrimps were assayed, four of the six shrimp were still TSV-positive and the highest titer was  $1.1 \times 10^7$ , indicating that persistent infections take place with TSV.

#### Session VIII—Awards and Elections

### CHEMISTRY AND CHEMICAL ENGINEERING

Chair: John H. O'Haver, University of Mississippi  
Vicechair: Timothy J. Ward, Millsaps College

## THURSDAY MORNING

Exhibition Hall C

### 9:45 NUMERICAL SIMULATIONS OF TRANSIENT INTERFACIAL PHENOMENA IN MISCIBLE FLUIDS

Nick Bessonov<sup>1</sup>, John A. Pojman<sup>2\*</sup>, and Vitaly Volpert<sup>1</sup>,  
<sup>1</sup>Universite Lyon I, Villeurbanne Cedex, France, and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406

To study theoretically interfacial phenomena in miscible fluids, we consider a continuous medium with a composition gradient. We describe it with the model consisting of the heat and diffusion equations with convective terms and of the Navier-Stokes equations with an additional volume force written in the form of the Korteweg stresses arising from nonlocal interaction in the fluid. It is proportional to the square of the composition gradient with the proportionality coefficient depending on temperature. We carry out numerical simulations of this model and show that the capillary force can cause convection in the initially quiescent liquid. For physically realistic values of parameters the liquid motion, though decreasing rapidly in time, can be observed experimentally. We include in the

model viscosity that depends on temperature and concentration. We also include mass diffusion coefficients that depend on temperature. Because concentration and temperature gradients also cause buoyancy-induced convection, experiments must be performed in weightlessness. Therefore, long term, high quality weightlessness is required to test the predictions of the modeling, and we propose a photopolymerization system to create the concentration and temperature gradients. Transient Interfacial Phenomena in Miscible Polymer Systems (TIPMPS) is the experiment planned for the ISS.

### 10:00 INVESTIGATION INTO SUBTLE CHARACTERISTICS OF GLUTATHIONE AND OTHER SULFAHYDRIL AMINO ACIDS BY HIGH PRESSURE LIQUID CHROMATOGRAPHY (HPLC)

Mudlagiri B. Goli\*, Deepa M. Goli, and Jonathan Freedman, Mississippi Valley State University, Itta Bena, MS 38941; Southern Testing Research Laboratories, Wilson, NC; and Duke University, Durham, NC 27708

Glutathione (g-GSH) a tripeptide plays a crucial role in the biological functions. The two methods available to quantify GSH and its oxidized product GSSG are plate reader and HPLC. The reported general extraction methods consist of extracting the compounds from tissue or the cell culture followed by getting the sample ready for analysis. This paper has aimed at looking into the HPLC characteristics of the g-GSH (tri peptide) and its other two sulfahydril components g-glutamic cysteine (dipeptide) and cysteine (Cys) on the column. These three compounds have couple of COOH, carboxylic groups with very low pKa (~1.92–3.59) along with a one basic NH<sub>2</sub> group (pKa ~8.75) that play a crucial role in derivatisation and in final analytical schemes. In fluorescent detection schemes, the derivative of SH, sulfahydril group is usually done with compounds like mono bromo bimane (MBB) or mono chloro bimane (MCB) in basic medium (pH ~8.0) followed by studying the final products either after acidifying like by using 5% SSA or in basic medium. Irrespective of the final method of analysis, the plate reader or HPLC what really matters is what are we specifically measuring and what form of the compound out of the maximum possible three forms one is looking at. The attempt is made to answer these questions by using a new versatile HPLC method. With respect to reaction of peptides with MBB or MCB, it is our observation that it is important to add enough of a water soluble organic solvent like acetonitrile (CH<sub>3</sub>CN) in aqueous system The reaction is also best carried out in a fairly basic medium pH of ~8.0.

10:15 USING SPINNING DROP TENSIOMETRY TO DETERMINE THE SQUARE GRADIENT PARAMETER FOR DODECYL ACRYLATE/POLY (DODECYL ACRYLATE) FOR USE IN THE TIPMPS FLIGHT INVESTIGATION

Brian Zoltowski\* and John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

Two techniques were used to estimate the square gradient parameter for a dodecyl acrylate, poly (dodecyl acrylate) system. Using spinning drop tensiometry an effective interfacial tension (EIT) of  $0.08 \pm 0.01$  mN/m was measured. The corresponding transition zone width was determined to be 0.10 mm, yielding a square gradient parameter of  $5^{-8} \times 10^{-9}$  N. A numerical approach using various thermodynamic theories coupled with concepts from light scattering yielded a molecular weight dependent square gradient parameter. The resulting values were shown to fall within the range of  $10^{-11}$ - $2.5 \times 10^{-9}$  N for MW's of  $10^4$ - $10^6$ .

10:30 MONO AND BICHROMOPHORIC COMPOUNDS FOR MODELING THE PERTURBED ELECTRONIC SPECTRA OF LIQUID CRYSTALLINE POLYMERS

David Creed<sup>1\*</sup>, Rabih Al-Kaysi<sup>1</sup>, Alline M. Somlai<sup>1</sup>, Edward J. Valente<sup>2</sup>, and Stephanie Dearmon<sup>3</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406; <sup>2</sup>Mississippi College, Clinton, MS 39058; and <sup>3</sup>University of Mobile, Mobile, AL 36663

UV-Vis spectra of pure films of liquid crystalline polymers (LCP) are almost invariably perturbed relative to those of simple model compounds in solution. A simple model compound (4'-pentyloxyphenyl)-4-pentyloxy cinnamate dispersed at high loadings in a polymer matrix shows an almost identical UV-Vis spectrum to an LCP with the same chromophore. A single crystal X-ray study of this model reveals the aryl ester group is twisted out of the plane of the cinnamoyl group. This supports our earlier conclusion that chromophore aggregation, not chromophore twisting, leads to the perturbed spectra of the LCP. The spectra of alkyl 4-alkoxyphenyl cinnamates are almost identical in solution to those of the analogous aryl esters suggesting the aryl esters are twisted even in solution. Several model compounds with covalently linked aryl cinnamate chromophores have been synthesized to explore the arrangement of chromophores in the LCP aggregates. Several of these bichromophoric models also show perturbed UV-Vis spectra but these spectra are unlike those seen from the LCP.

10:45 Break

11:00 SEPARATION OF BACTERIA UTILIZING

CAPILLARY ELECTROPHORESIS

Timothy Ward\*, Daisy-Malloy Hamburg, Stacy Ponder, Geoffrey Stone, Bryant Jones, David Smith, and Robert Nevins, Millsaps College, Jackson, MS 39120

Identifying and quantitating bacteria and other microorganisms is a difficult problem that is becoming increasingly important. The traditional method for characterizing microorganisms is by isolation of pure cultures. Compounding this problem is the fact that sample analysis is slow, thus limiting the number of samples that can be analyzed in a given time. At the present time, there are no reliable and easy to perform techniques for separating and identifying intact microorganisms. Recently, a number of groups have explored the possibility of applying the technique of capillary electrophoresis in order to separate intact microorganisms such as bacteria and viruses. The application of this technique to this particular field of study would be advantageous, because it allows the bacteria to remain intact while being analyzed quickly and efficiently with broad applicability. In general, microorganisms tend to be amphoteric, containing multiple charges thus ideally suiting them for analysis by electrophoresis. We will present a number of examples of separation via capillary electrophoresis and discuss the relevant characteristics associated with microorganisms that must be carefully controlled before a practical and useful separation can be achieved.

11:15 CONCENTRATED ACID HYDROLYSIS OF SOFTWOOD

Wing Lian\* and Roger D. Hester, University of Southern Mississippi, Hattiesburg, MS 39406

The conversion of softwood to glucose and its oligomers is optimized for a co-rotating twin screw extruder. The study identifies how each design factor affects the impregnation system and its effect on the conversion of cellulose. Conversion of cellulose is directly proportional to temperature, screw speed, back pressure, and acid concentration. The acid to solids ratio exhibits a critical point at 0.95. The ability to operate the twin screw extruder depends on the material viscosity and torque which can be controlled by adjusting material temperature, screw speed, and exit die flow restriction.

11:30 THE IMPACT OF NONIONIC SURFACTANT HYDROPHOBE STRUCTURE AND LIPOPHILIC LINKERS ON STYRENE ADSOLUBILIZATION

Yongqiang Tan\* and John O'Haver, University of Mississippi, University, MS 38677

Adsolubilization, solubilization of sparingly soluble compounds in adsorbed surfactant aggregates has demonstrated applications in many fields including composite materials, pharmaceuticals, and separation

processes. The adsolubilization of styrene by different nonionic surfactants, polyethoxylated alkylphenols (Triton X-series) and polyoxyethylene lauryl (BRIJ-series) on amorphous precipitated silica was investigated. The effects of added lipophilic linkers (long chain linear alcohols) on the adsolubilization was examined also. The adsolubilization isotherms of surfactants with various structures were compared. The results show that at concentrations below the critical micelle concentration (CMC), adsolubilization decreased with increasing numbers of ethoxylated (EO) groups, especially at higher styrene feed levels. The adsolubilization of styrene increased with increasing the lipophilic linkers concentration. The adsolubilization isotherm can be expressed by Langmuir-type isotherm. A basic model of adsolubilization is provided. It is clear that lipophilic linkers can increase the solubilizing capacity of the adsorbed surfactant aggregates to some degree by increasing the interaction between the styrene and the hydrophobic group of the surfactants.

11:45 THE MUTAGENESIS OF ALPHA BUNGAROTOXIN TO FACILITATE THE CLEAVAGE OF A POLYHISTIDINE PURIFICATION TAG

Kristin S. Fairley<sup>1\*</sup>, Philip Caffery<sup>2</sup>, and Edward Hawroot<sup>2</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174, and <sup>2</sup>Brown University, Providence, RI 02912

Alpha Bungarotoxin (alpha-Bgtx) is an essentially irreversible antagonist of the Nicotinic Acetylcholine receptor (nAChR). The discovery of alpha-Bgtx has been of great importance to the Pharmacological community in the understanding of neurotransmitter receptors. Since its isolation alpha-Bgtx has been widely used in the experimental characterization of the nAChR. Because of its great pharmacological importance, a-Bgtx has been used in labs worldwide. In order to investigate the molecular basis of its binding, alpha-Bgtx can be mutated at the amino acid level. To achieve this, the protein must be expressed recombinantly. The Hawrot Lab, at Brown University, has been able to successfully resynthesize recombinant alpha-Bgtx in *E. coli*. Alpha-Bgtx is recombinantly expressed in an unfolded form and is biologically inactive. To recover its full activity after refolding, the polyhistidine tag, originally attached to purify alpha-Bgtx, needs to be removed. However, the enterokinase cleavage site is only partially accessible to the enzyme. Causing incomplete cleavage of the His-tag. The goal of this project is to insert four glycines between the gene encoding a-Bgtx and the polyhisitidine tag, with the hopes of moving the enterokinase sight away from the protein, giving the enzyme better access to the cleavage sight. If this project is successful, it will be a great step in finally obtaining a biologically active form of recombinant alpha-Bgtx in high yields.

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THURSDAY AFTERNOON

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Exhibition Hall C

1:30 ADSOLUBILIZATION OF STYRENE BY CETYLTRIMETHYLAMMONIUM BROMIDE ADMICELLES AT WATER/MICA INTERFACES

Chun Hwa See\* and John O'Haver, University of Mississippi, University, MS 38677

Tapping Mode Atomic Force Microscopy was used to study the dependence in the morphology of the polystyrene thin film formed by polymerization of styrene solubilized in adsorbed surfactant aggregates on silica. The impact of varying feed concentrations of styrene and surfactant were examined. On polished silica discs, a homogenous thin film forms at high styrene concentrations while polymer droplets were observed at low concentration of monomer. To examine the reason for these changes we have investigated the pre-polymerization surfactant/monomer aggregation behavior by soft contact mode AFM imaging in water. In soft contact mode, the tip scans the adsorbed aggregate interface by detecting the electrostatic repulsive interaction between the charge interface and silicon nitride tip. The results show that in the absence of the adsolubilized styrene, adsorbed cetyltrimethylammonium bromide (CTAB) forms rod-like adsorbed micelles with a thickness close to that of two fully-extended CTAB molecules. With increasing styrene concentration, the morphology of the adsorbed phase changes from patchy rod-like structures to a lamellar phase and finally to disk-like droplets at high styrene concentrations. Funding for this project was partially provided by National Science Foundation grant 9724187 and funding from the University of Mississippi.

1:45 AN ANALYSIS OF THE EFFECTS OF TIRE RESIDUAL ON WATER UNDER DIFFERENT pH CONDITIONS

Amanda C. Winters\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

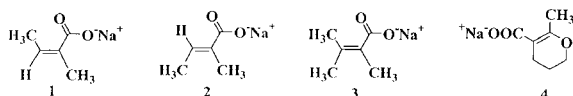
The landfilling of scrap tires has been a prominent and controversial practice in Mississippi (and in other states) for a number of years. Little conclusive evidence exists regarding the potentially harmful environmental effects of depositing scrap tires in landfills. In conjunction with its continuing development of alternative uses for tire materials, the Wertz lab at the University of Southern Mississippi is testing the effects of tire residual—shredded tire with exposed metal wire—on water under different pH conditions. Identical amounts of tire residual were submerged in large beakers containing unmodified tap

water, tap water treated with nitric acid, and tap water treated with potassium hydroxide, respectively. These experimental conditions were intended to roughly simulate possible conditions under which groundwater could be exposed to the tires in landfills. A control beaker containing only tap water was also set up. After approximately one month, the contents were filtered, dried, and analyzed with both an x-ray fluorescence spectrometer and an x-ray diffractometer. The former instrument was used to identify individual elements in the samples; the latter was used to identify the compounds formed from these elements. Preliminary analysis has revealed only iron oxides in the residue from the beakers. More analyses will be performed.

2:00 THE EFFECTS OF SUBSTRATE POLARITY AND STRUCTURE ON THE REGIOCHEMISTRY OF THE SINGLET OXYGEN ENE REACTIONS OF  $\alpha$ ,  $\beta$ -UNSATURATED CARBOXYLATE SALTS

Anisha Bajaj\* and Kristina L. Stensaas, Millsaps College, Jackson, MS 39210

Photooxidations of angelic acid salt (1), tiglic acid salt (2), 2,3-dimethyl-2-butenoic acid salt (3), and 3-ethoxycarbonyl-5,6-dihydro-2-methyl-4H-pyran-2-one acid salt (4) were conducted in deuterated water ( $D_2O$ ). A deuterated solvent was chosen in order to increase the lifetime of singlet oxygen in solution thus decreasing reaction times. In each reaction, proton nuclear magnetic resonance spectroscopy was utilized to monitor the product distributions. The results indicate that the dominant factor in dictating the regiochemistry of the ene product is the polarity of the salt and the subsequent strong hydrogen bond that is formed between the salt and  $D_2O$ .



2:15 RECOVERY OF LEAD FROM SPIKED SOILS  
William C. Mahone\* and Tammy Johnson, Mississippi Valley State University, Itta Bena, MS 38941

Environmental contamination with lead has been identified as a serious public health problem. Soil has been identified as one of the six major sources of lead. To test or to perform remediation procedures on soil contaminated with lead, or any other heavy metals, a way to efficiently and reproducibly remove lead from the soil matrix must be found. In the current research effort to be discussed, two methods of removing lead from soil are investigated. Soil samples were spiked, then extracted using an appropriate extraction matrix. The following research focused on nitric acid and ethylene-diamine solutions as the removal matrix. Spikes and extractions were performed in triplicate in order

to check the reproducibility of the process. Based on the stock standards concentration and injection volume, we used our data to calculate backwards to the amount of lead injected. This was in effect a recovery parameter. We experienced percent recoveries that ranged from 70 to 95%. We were encouraged by these results considering the small amounts of spike involved. The results of our investigation and the implications for analysis and remediation will be discussed.

2:30 MODELING OF THE PHOTOPOLYMERIZATION KINETICS OF DODECYL ACRYLATE

William J. Ainsworth\*, John A. Pojman, Yuri A. Chekanov, and Victor T. Wyatt, University of Southern Mississippi, Hattiesburg, MS 39406

Using estimates of the rate constants for the free radical photopolymerization of dodecyl acrylate (lauryl acrylate), a kinetic model has been developed to predict the temperature and conversion behavior for use in the TIPMPS flight investigation. Isothermal photo-DSC was used to estimate the polymerization constants for use in the model. Using Arrhenius reaction kinetics we have found that this model provides rather accurate predictions for the temperature and conversion in the course of the adiabatic polymerization reaction.

2:45 Break

3:00 INVESTIGATION OF GAS SCRUBBING DURING THE PROCESSING OF SCRAP TIRE RESIDUAL BY MEANS OF THE WERTZ OXIDATIVE METHOD

A. Giselle Schnaubelt\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

Due to the large inventory of scrap tires generated worldwide, the development of environmentally friendly methods of dealing with scrap tires has become an important issue. Scrap tires are also a reservoir of potentially valuable materials. Tire shredders can mechanically separate the rubber sidewall from other tire components—many useful recycling applications for pure tire rubber are well known. However, the remaining tire material, known as “residual,” consisting primarily of steel wire and synthetic fibers that are still strongly bonded to rubber scraps, is extremely difficult to separate into useful components. The goal of this project is the implementation of the Wertz oxidative method for processing scrap tire residual on a pilot plant scale, to demonstrate that it is both environmentally friendly and economically viable. The technology is designed to convert scrap tire residual into marketable products, without generating noxious waste. Separation of the scrap tire residual into components is achieved by the oxidative breaking of metal-sulfur bonds and sulfur bonds within the rubber matrix. During the process,  $NO_x$  gas is formed.

Laboratory-scale scrubbing of this gas by absorption in potassium hydroxide solution was evaluated for effectiveness. The influence of KOH concentration, gas dispersion, and scrubber geometry were investigated. It was determined that the method can be effective, and recommendations for larger-scale scrubber design were made.

### 3:15 STIMULI RESPONSIVE POLYMERS FOR ENHANCED OIL RECOVERY

Todd Rushing\* and Roger D. Hester, University of Southern Mississippi, Hattiesburg, MS 39406

Petroleum is forced out of underground porous rock formations by flooding the reservoir with water. Dissolving small amounts of polymer in the water can enhance petroleum recovery by increasing the viscosity of the flooding fluid. The efficiency of the technique depends on the amount of polymer added versus the increase in petroleum recovery. The polymer additive must perform efficiently in the underground environment. Polymer molecules can be designed so that environmental conditions (i.e., temperature, salt content, and pH) serve as stimuli to impart desired changes in solution properties. Polymer solution properties have been theoretically modeled and experimentally measured to better understand the relationship between molecular conformation and solution behavior.

### 3:30 pH FRONTS IN MICROEMULSIONS

Kayce Leard\*, John A. Pojman, William J. Ainsworth, and Brian Zoltowski, University of Southern Mississippi, Hattiesburg, MS 39406

The focus of this investigation was to determine how the velocity and pattern of various pH front systems were affected by preparing the solutions as microemulsions. Previously investigated systems, such as the bromate-sulfite and chlorite-sulfite systems, were used in these experiments. The pure front velocities were confirmed by eliminating convection through increased viscosity or decreased tube diameter. Front velocity as a function of droplet size was then studied by preparing solutions as microemulsions. Preliminary results indicated that the velocity of the system in a microemulsion was significantly slower than the velocity in the pure system. In another set of experiments, a multi-functional acrylate, 1,6-hexanediol diacrylate, was added to the microemulsion solution and the pH front was initiated. Observations suggested that the pH front initiated polymerization of the acrylate during front propagation, thus acting as an initiator in the system.

### 3:45 MEASURING VISCOSITY VIA FLUORESCENCE DURING THE ADIABATIC, NEAT PHOTOPOLYMERIZATION OF DODECYL ACRYLATE

Victor T. Wyatt<sup>1\*</sup>, Patrick H. Bunton<sup>2</sup>, Kayce Leard<sup>1</sup>, and John A. Pojman<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>William Jewell College, College Liberty, MO 64068

This work is as a part of a series of experiments designed to address several areas of interest in polymer research about miscible and immiscible fluids and the stresses that influence the properties of these fluids. Eventually photopolymerization reactions are to be performed aboard the International Space Station. Photopolymerization reactions possess the ability to form a sharp concentration gradient between the monomer and the polymer being formed. During the photopolymerization reactions, measuring the viscosity of the polymer is necessary in order to compare the experimental results to fluid mechanical calculations. Therefore, the experiments require a method for determining the viscosity of the polymers during the polymerization reaction. For years, scientists have used fluorescence probes to monitor the temperature, polarity and viscosity of a system. These probes are ideal because their emissions are sensitive to changes in their local environment. Examples of such behavior are shown in probes whose intensity increases upon polymerization or during other rigidification processes such as physical aging. In our studies, pyrene and bis-pyrene have been used as molecular probes to non-invasively monitor viscosity during the polymerization of dodecyl acrylate. Fluorescence and viscosity correlation measurements were performed as a function of concentration and temperature for polymers of two different molecular weights.

### 4:00 INVESTIGATION OF THE THERMAL AND MECHANICAL PROPERTIES OF NOVEL GLASS AND CARBON FIBER-REINFORCED THIOL-ENE COMPOSITES

Kalena D. Stovall\*, Charles E. Hoyle, Eric P. Taylor, and Joshua U. Otaigbe, University of Southern Mississippi, Hattiesburg, MS 39406

The thermal and mechanical properties of pure thiol-ene resins, and their composites with glass and carbon fiber mats were explored. The composites were prepared by soaking the fiber mats in the resins, and photopolymerizing the systems under UV light. The thermal and mechanical properties of the composite systems were examined as a function of the glass or carbon fiber content. The results showed an increase in the stiffness and strength of the composites with increasing volume concentrations of the glass and carbon fibers.

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FRIDAY MORNING

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Exhibition Hall C



9:30 MEASURING THE DIFFUSION COEFFICIENT FOR DODECYL ACRYLATE/POLY (DODECYL ACRYLATE) USING LASER LINE DEFLECTION

Charles Edwards\*, Lydia Lee Lewis, and John A. Pojman, University of Mississippi, University, MS 38677; Millsaps College, Jackson, MS 39120; and University of Southern Mississippi, Hattiesburg, MS 39406

The coefficient of diffusion for a dodecyl acrylate/poly dodecyl acrylate system was measured as a function of concentration, molecular weight, and temperature using laser line deflection. As monomer and polymer diffuse, a concentration gradient forms. A line laser passing through this gradient is bent. By projecting this onto a screen, recording as a function of time, the coefficient of diffusion as a function of time and concentration can be extracted.

9:45 CONTROLLED INITIATION OF FRONTAL POLYMERIZATION USING MICROENCAPSULATION TECHNIQUES

Brian McFarland\* and John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

In frontal polymerization, a monomer is converted into a polymer by thermal initiation through a self-sustaining front of propagation. One innate problem with frontal polymerization is that the front temperature can be so high that foaming can occur, disrupting the system. This problem may be addressed by dilution of the monomer, but too much dilution can result in a front temperature too low to self-sustain. Another problem is that frontal polymerization systems often have a short pot life as a result of decomposition of the initiator. As a result, the components of the system must be stored separately until the desired time of the reaction. A possible solution to both of these problems is microencapsulation. Microencapsulation allows a component of the system to be separated from the other components by means of trapping it in a chemical shell or coating. By using a microencapsulated initiator in conjunction with the proper redox accelerator, it may be possible to achieve low-temperature fronts that are sustainable in dilute monomer. The microcapsules may also provide an advantage in storage/pot life as well, as the components of the frontal polymerization system could be stored together for a period of time without the initiator coming in contact with the rest of the system. The effectiveness of different methods of microencapsulation that are used in this application is studied, as well as different release methods and shell materials.

10:00 INVESTIGATION OF THE THERMAL AND MECHANICAL PROPERTIES AND POLYMERIZATION RATE OF

HOMOPOLYMER AND COPOLYMER LYOTROPIC LIQUID CRYSTAL SYSTEMS

Kalena D. Stovall\*, Demetrius T. McCormick, and C. Allan Guymon, University of Southern Mississippi, Hattiesburg, MS 39406

This study focuses on the synthesis of homopolymer and copolymer hydrogels via the photopolymerization of water-soluble and oil-soluble monomers in Pluronic Lyotropic Liquid Crystals (LLCs). In particular, the mesophase thermal stability, polymerization kinetics, and physical properties have been examined. Mesophase thermal stability was enhanced in each of the polymer/Pluronic composites compared to the parent LLC mesophase. The mesophase thermal stability varied significantly with differences in polymer nanostructure and, in some cases, copolymer content. The compressive modulus of the polymer hydrogels also depends heavily on the polymer nanostructure evolved and copolymer content. Higher polymerization rates were observed in the inverse phases for the water-soluble monomer and in normal phases for the oil-soluble monomer.

10:15 ISOTHERMAL FRONTAL POLYMERIZATION: LIMITATIONS AND COMPARISON OF FRONT CHARACTERISTICS

Lydia Lee Lewis\* and John A. Pojman, Millsaps College, Jackson, MS 39120, and University of Southern Mississippi, Hattiesburg, MS 39406

Isothermal Frontal Polymerization (IFP) is a directional polymerization that occurs when monomer and thermal initiator diffuse into a polymer creating a viscous region. The rate of polymerization in this viscous region is higher than in solution of monomer and thermal initiator because of the Trommsdorff, or gel, effect, resulting in a propagating front. To better understand how various parameters affect IFP, systems of the monomer → polymer system of methyl methacrylate → poly(methyl methacrylate) were examined using poly(methyl methacrylate) seeds and the thermal initiator 2,2'-azobisisobutyronitrile. These systems were run at various initiator concentrations and temperature ranges to compare propagation distances and velocities. These times and velocities increased with increasing initiator concentration and/or temperature up to the limit of 0.03% initiator concentration (wt./V) at the temperature of 87°C. At these conditions, bulk polymerization of the monomer solution prohibited frontal polymerization. This concentration limit increased with decreasing temperature until it was discovered that propagation occurred for saturated solutions at temperatures below 50°C. For the conditions at which IFP occurred, the propagation distance was  $0.6 \pm 0.15$  cm regardless of initiator concentration and cure temperature.

11:00 Divisional Poster Session

**AN INVESTIGATION OF MONOMER TRANSPORT IN EMULSION POLYMERIZATION UTILIZING HYDROPHOBIC ACRYLIC MONOMERS**

Mary Rogers Moore\*, C. Todd Williams, and Shelby F. Thames, University of Southern Mississippi, Hattiesburg, MS 39406

Investigations into the emulsion polymerization of hydrophobic acrylic monomers, n-decyl to octadecyl acrylate/methacrylate, at ten weight percent have determined whether these monomers can be copolymerized into latex polymers. It was hypothesized that changing the shear rate during the pre-emulsion dispersion from 1,800 revolutions per minute (rpm) to 18,000 rpm would produce smaller monomer droplets as well as increase the number of monomer droplets within the system. This variation posed a strong possibility of polymerization occurring in both the micelles and the monomer droplets. Each monomer was characterized using reversed-phase high performance liquid chromatography. The resulting latex polymers were evaluated for particle size, polymer composition and thermal transitions. The evaluations confirmed that it is possible to incorporate hydrophobic acrylic monomers into latex polymers through this experimental method. Some of the resulting latex polymers contained crystalline domains indicating that a portion of the monomer was not sufficiently interacting to form random copolymers.

**THE DEVELOPMENT OF LASER LINE DEFLECTION TO MONITOR POLYMER FRONTS**

Lydia Lee Lewis<sup>1</sup>, Alford Perryman<sup>2\*</sup>, and John A. Pojman<sup>2</sup>, <sup>1</sup>Millsaps College, Jackson, MS 39120, and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39206

Propagating isothermal fronts contain vertical gradients (changes) in the concentrations of their components and thus, contain refractive index gradients. These gradients correspond to the region containing the reacting front, are on the order one centimeter to less than one millimeter, and are visibly indiscernable from the unreactive system. A technique has been developed to discern these small changes in refractive index using the theory of light deflection where incident light normal to the surface of interest is deflected by a change in refractive index. A five milliwatt line laser was used to monitor the isothermal frontal system of methyl methacrylate providing the most accurate data to date for isothermal frontal propagation. The experimental apparatus and the analysis method are discussed as well as their limitations, advantages, and experimental and analytical error.

**DETERMINATION OF COAL STRUCTURE UTILIZING WIDE ANGLE X-RAY SCATTERING: EFFECTS OF SOLVENT SWELLING**

Matt Myers\* and David L. Wertz, Delta State University, Cleveland, MS 38733, and University of Southern Mississippi, Hattiesburg, MS 39406

Wyodak-Anderson coal, a sub-bituminous coal, has been shown to swell in the presence of certain organic liquids, and even retain its swollen state after the liquid has evaporated. Seven different liquids were used in this study. Molecular-level structural models show interplaner distance between the polycyclic units of ca. 3.6 Å for Wyodak. Upon the addition of pyridine the distance increased to ca. 3.9 Å. This evidence shows that, although pyridine evaporated, the coal was still affected on a macromolecular scale.

**EFFECTS OF DIFFERING IRRIGATION WATER TYPES ON NITROGEN FIXATION IN RICE FIELDS**

Susan Towery<sup>1,2\*</sup>, Paul V. Zimba<sup>2</sup>, Robert Zablutowicz<sup>2</sup>, and Charles C. Mischke<sup>3</sup>, <sup>1</sup>Delta State University, Cleveland, MS 38733; <sup>2</sup>USDA/ARS, Stoneville, MS 38776; and <sup>3</sup>Mississippi State University, Stoneville, MS 38776

Little research has been published on how different water sources affect potential nitrogen fixation in Mississippi rice fields. Water samples were collected from two fields irrigated with different water sources (well water and surface water sources) and nutrient (N, P, Si) concentrations were determined. Replicate sediment samples were analyzed for algal pigments (HPLC) and for nitrogen fixation (acetylene reduction method, GC). Nutrient levels in the surface water were higher than those in the well water. The nitrogen fixation potential was spatially and temporally heterogeneous, with the rice field receiving surface water having higher nitrogen fixation rates than the field irrigated with well water. Surface waters appeared to support elevated cyanobacterial-mediated nitrogen fixation rates (63% increase in light dependant nitrogen fixation rates relative to well water irrigation). Bacterial nitrogen fixation rates were 250% higher in the field receiving well water relative to surface water irrigation. Nitrogen fixation normalized to algal biomass (chl *a*) was higher in the surface water irrigated field. HPLC analyses revealed the presence of chlorophytes, cyanobacteria, and bacillariophytes (diatoms). The seed population from surface waters may be an important source of nitrogen fixing organisms and irrigation management should consider the source of water used in irrigation of rice fields.

**LOW PRESSURE MICROCHIP CHROMATOGRAPHY**

DeGail Hadley\* and Charles S. Henry, Delta State University, Cleveland, MS 38733, and Mississippi State University, Starkville, MS 39762

This presentation examines the fabrication and utilization of microchip low pressure chromatography as an alternative tool for the determination of the school virial coefficient. This methodology is faster, simpler, less expensive, and more compact than the traditional methods

used to analyze protein-to-protein interaction. The capacity factor ( $k'$ ) was studied for lysozyme in varying experimental conditions such as crystallizing agent concentration, concentration of the protein, and varying flow rates. A very good correlation between the results of the static light scattering method and the microchip low pressure chromatography method was observed. This project thus proves that self-interaction chromatography can be miniaturized to an approximate column volume of 1.778 ml.

#### PREPARATION AND CRYSTAL STRUCTURE OF MELAMINE LEVULINATE MONOHYDRATE

Ramaiyer Venkatraman, Jackson State University, Jackson, MS 39217

Melamine levulinate monohydrate has been prepared and structurally characterized by room temperature X-ray diffraction technique. The crystals are monoclinic, space group  $P2(1)/c$ ,  $a = 10.538(2) \text{ \AA}$ ,  $b = 16.214(3) \text{ \AA}$ ,  $c = 7.1988(14) \text{ \AA}$ ,  $\alpha = 90^\circ$ ,  $\beta = 95.85(3)^\circ$ ,  $\gamma = 90^\circ$ ,  $V = 1223.6(4) \text{ \AA}^3$ ,  $Z = 4$ . The interesting features of the intermolecular hydrogen bonding interactions occurring between melaminium amino group and ring nitrogen with the carboxylate oxygen atom of levulinic acid and as well with water molecules will be presented.

#### PURIFICATION OF GLUTAMINYL CYCLASE

Neil Stowe<sup>1\*</sup>, Stephanie Misquitta<sup>2</sup>, and Robert Bateman<sup>2</sup>, <sup>1</sup>Delta State University, Cleveland, MS 38733, and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406

Glutaminyl Cyclase (QC) is an enzyme that catalyzes the conversion of N-terminal glutaminyl peptides to pyroglutamyl peptides. QC is found in plants and animals-particularly in the hypothalamus of mammals and in papaya latex. The conversion of glutaminyl peptides to pyroglutamyl peptides can occur without QC-high pH and high concentrations of phosphate ion allow for conversion, but the reaction is slow under physiological conditions, making QC a necessary enzyme. The reaction that QC catalyzes is known, and the structure of QC has been identified using bacteria and fruit flies that make QC protein from the cDNA. But, the complete structure of the native enzyme is not known. The goal of my summer research is to purify native QC (QC found in the natural cell) to allow its complete structure to be determined.

#### USE OF AN EXPERIMENTAL SPRAY CHAMBER TO ESTABLISH SPRAY CHARACTERISTICS OF HERBICIDES WITH ANALYSIS BY AA

April Robinson<sup>1\*</sup>, Jason Corbitt<sup>1</sup>, Andrew Steele<sup>1</sup>, Marcus Steele<sup>1</sup>, Phelesia Foster<sup>2</sup>, Dennis Elmore<sup>2</sup>, and Lowrey Smith<sup>2</sup>, <sup>1</sup>Delta State University, Cleveland, MS 38733, and <sup>2</sup>United States Department of Agriculture, Agricultural Research Services, Stoneville, MS 38776

The Environmental Protection Agency and

Mississippi Department Environmental Quality severely regulate the aerial application of two herbicides, glyphosate and glufosinate, due to potential damage to non-glyphosate resistant cotton and soybeans and non-glufosinate resistant rice and corn. This study examines the spray rate and herbicide spray composition to optimize the deposition of the herbicides and a tracer, rubidium, as they are applied in an experimental spray chamber. Spray droplets were collected at selected sampling sites on flat Mylar sheets, drinking straws, and cotton strings. The droplets were removed from each of these collection devices using HPLC grade ethanol or reverse osmosis water. Subsequently, the extracts were analyzed for tracer, Rb, by a Perkin Elmer 5000Z electrothermal atomic absorption spectrophotometer. A grid of the spray area and the effects of spray rate and composition will be presented.

#### AN INVESTIGATION OF THE EMULSIFYING CAPABILITIES OF AMPHIPATHIC TITANIUM DIOXIDE PARTICLES

Shelly R. Gallender\* and Robert Y. Lochhead, University of Southern Mississippi, Hattiesburg, MS 39406

The stabilization of emulsions by small amphipathic particles is of interest to cosmetic companies because it allows the use of surfactants to be reduced or eliminated in their products. Surfactants can interact with the skin to cause irritation that can be eliminated by the use of particle stabilized emulsions. US Patent 6440399 claims that titanium dioxide particles coated with alumina and dimethicone and having an average particle size of less than 200 nm stabilize emulsions by arranging themselves at the oil-water interface, thus preventing the coalescence of the dispersed phase. These particles have the trade name of Eusolex T-2000 from Merck. Titanium dioxide particles are also useful in the field of cosmetics because they act as a sunblock. The claims of the patent were investigated by using ternary phase diagrams to chart the regions of emulsion stability and instability. The oils used for the phase diagrams were silicon oil, mineral oil, and caprylic/capric triglyceride.

#### ANALYSIS OF TOTAL SUGAR IN THE HYDROLYZATE FROM SAWDUST WITH SELIWANOFF REAGENT

Ken Lee<sup>1</sup>, Sharon Hurley<sup>1\*</sup>, Omar Nava<sup>2</sup>, Centeria Cornelius<sup>1</sup>, and Esmeralda Fuentes<sup>3</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217; <sup>2</sup>Socorro High School, and <sup>3</sup>Brackenridge High School

In the project to produce ethanol from the sawdust via acid-hydrolysis and fermentation, the determination of concentration of total sugar and other organic components in the hydrolyzate is necessary for optimizing the process. The analysis with HPLC, however, is a long process, which is not suitable to be used as a part of quality control in the acid-hydrolysis. Therefore we use the Seliwanoff reagent for

determining of actual concentration of total sugar in the hydrolyzate. Since it gives dark red color after that resorcinol reacts with 5-hydroxymethylfurfural (HMF), which is the dehydration product of sugar, the calibration line has been made from the series of known concentrations of sugar. To make the calibration line based on known concentration of sugar two different spectrophotometers, UV Spectrophotometer and Spectronic 20, were used. The calibration lines from two experiments were almost same, so Spectronic 20 can be used in the process for the quick analysis. Total concentration of sugar of the hydrolyzate was determined from the line and 4.5% and 4.7%, which were obtained from two different experiments. This result was compared with the result, 4.2%, from the National Reusable Energy Laboratory at Golden, Colorado, using HPLC. This project is supported by DOE EPSCOR, Grant #DE-FG02-00ER45830, NASA Summer High School Apprenticeship Research Program (SHARP) Plus Program, and Science and Technology Access to Research Graduate Education (STARGE) from NSF.

#### ANALYSIS OF SUGARS AND ORGANIC ACIDS IN HYDROLYZATE FROM SAWDUST BY HPLC

Ken Lee<sup>1\*</sup>, Ruiz Raymond<sup>2</sup>, and Bonnie Hames<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>National Reusable Energy Laboratory, Golden, CO 80401

Four different hydrolyzates, the product of acid hydrolysis of sawdust, were analyzed by the method, which National Reusable Energy Laboratory (NREL) at Golden, Colorado, has established. Two HPLC instruments having a specified column and a reflective index as a detector were used. Pretreatment on the sample like dilution, titration and filtration were performed to adjust pH before actual analysis. Actual concentrations of sugars, glucose, xylose, galactose, arabinose, and mannose and total sugar concentration after complete hydrolysis were obtained. Contents of organic acids and furfurals including 5-hydroxymethylfurfural (HMF) were analyzed in the sample. Total sugar concentration varies from 2.8% to 4.2% including aldohexoses and aldopentoses, which are written in the table below. No organic acids and furfurals except acetic acid were detected. This experiment is suitable for analyzing the sugar contents as well as organic acids in the hydrolyzates from sawdust.

Sugar contents in the hydrolyzate (mg/ml) before second hydrolysis						
Sample Number	Glucose	Xylose	Galactose	Arabinose	Mannose	Total Sugar
A	26.65	4.48	2.78	1.40	6.70	42.01
P	6.90	7.52	3.33	3.90	6.96	28.61
S10	14.27	4.14	3.43	0.82	10.15	32.81
S06	15.92	5.62	3.74	1.12	11.21	37.61

#### INVESTIGATION OF THE STRUCTURE OF POLYELECTROLYTE-BASED COMPLEX COACERVATES

Lisa Huisinga\* and Robert Y. Lochhead, University of Southern Mississippi, Hattiesburg, MS 39406

Polyquaternium compounds are theorized to be useful in forming complex coacervates in the concentrated surfactant regime. A variety of anionic surfactants, such as sodium lauryl ether sulfate and sodium dodecyl sulfate, and cationic polymers were used to form these coacervates. The structure of the lyotropic association colloid within these complex coacervates was mapped using ternary phase diagrams. The structure of the lyotropic mesophase was identified by Polarized Light Microscopy (PLM). The concentrations of surfactant and polymer in each phase were measured using Fourier-Transform Infrared Spectroscopy (FTIR) and UV Spectroscopy. Hydrophobically modified cationic polymers were also studied with respect to the structure of the lyotropic association colloid within the complex coacervate.

#### PHOTOCHEMISTRY OF SELECTED NITRO-POLYCYCLIC AROMATIC HYDROCARBONS

Demarcio Reed\*, Generique Stewart, Yuguo Jiao, and Hongtao Yu, Jackson State University, Jackson, MS 39217

Nitro-substituted polycyclic aromatic hydrocarbons (nPAH) are produced either directly or indirectly from incomplete combustion of materials. It is found in automobile diesel exhaust and is linked to 30% of the mutagenicity of the exhaust gas toward *Salmonella typhimurium*. Upon entering the environment, nPAH are degraded biologically by bacteria or by photodegradation in the environment. The photodegradation rate of the nPAH depends on whether they are in the air, in sediment waters or in particulate matters. It has been found that the position of the nitro group is an important factor for genotoxicity. In this study of 4/5 ring n-PAH have been examined for photochemical reactions in aqueous media. It is found that both the photochemical degradation kinetics and photoproducts for 7-nitrobenz[a]anthracene (7NBA), 5-methyl-7-nitrobenz[a]anthracene (5M7NBA), 12-methyl-7-nitrobenzo[a]anthracene (12M7NBA), 7-nitrodibenzo[a,h]anthracene (7NDBA), 9-nitrodibenzo[a,h]anthracene (9NDBA) depended on the position of the nitro group and the surrounding ring structure. Upon light irradiation, both 7NBA and 5M7NBA yielded the respective 7, 12-quinones, while 12M7NBA yielded multiple products including 7, 12-quinone. A detailed mechanism for the formation of respective photoproducts is proposed. Acknowledgement: This research has been supported by generous grants NIH-SCORE S06GM08047 for research and NSF-STARGE for student support.

#### REAL-TIME MONITORING OF RING-OPENING BULK POLYMERIZATIONS OF $\epsilon$ -CAPROLACTONE USING

### FTIR SPECTROSCOPY

Eric McClendon\*, Jamie Messman, and Robson Storey, University of Southern Mississippi, Hattiesburg, MS 39406

The bulk polymerizations of  $\Delta$ -caprolactone (CL) were monitored via IR-spectroscopy. Each polymerization was conducted at 134°C. The initiators used were n-butanol (BuOH), ethylene glycol (EG), and 1,3-propane diol (PD). The amounts of initiator used varied according to the molecular weight targeted. The induction periods for EG and PD were observed and support the previous findings of our group. However, here we also see an induction period with BuOH. These induction periods were due to both heat transfer and the delayed formation of the stannous alkoxide. The data was supportive of the mechanism previously proposed by Penczek. This mechanism was previously confirmed by Sherman.

### CARGO DELIVERY—AN APPROACH WITH POTENTIAL FOR RADIO DIAGNOSTIC AND RADIO THERAPEUTIC AGENTS

Roshenia Johnson<sup>1\*</sup>, Fabio Gallazzi<sup>2</sup>, Jenny Green<sup>2</sup>, Rachel Reuther<sup>2</sup>, Catalina Arbelaez<sup>2</sup>, and Susan Lever<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn, MS 39096, and <sup>2</sup>University of Missouri-Columbia, Columbia, MO

From a biomedical stand point, permeating peptides act as carriers for radioactive isotopes, which are used in diagnosis of cancer or cancer therapy. In order for radio diagnostic and radio therapeutic peptides to enter cancer cells they must be able to pass through the cell membranes of target cells. In theory, this can be accomplished by having a disulfide bond instead of an amide bond to attach the permeating portion of the permeating peptide to the radio diagnostic and radio therapeutic agents. Two techniques for attaching Cys (Npys) to the control peptides GAYAYYA (1) and -DRRIFWWSLRSAGA (2) were tested. The first technique entailed coupling Boc-Cys (Npys)-OH using standard peptide synthesis. However, HATU was used instead of the usual HBTU. The results were analyzed via HPLC and Mass spectrometry. The results for the first technique revealed failure of the Boc-Cys (Npys) to attach to the peptides probably because Npys is not stable in HATU. The second technique entailed coupling Boc-Cys (Npys)-OH with the control peptides GAYAYYA (1) and -DRRIFWWSLRSAGA (2) with in situ activation reaction. The procedures followed for the second technique did not follow standard peptide synthesis. This reaction was synthesized manually from adding 150 mg of Boc-Cys (Npys)-OH and 110 mg of pentafluorophenol in 10 mL of dichloromethane to DCC in 10 mL of dichloromethane. The results were tested via TLC. TLC was done using a 3:1 solution of chloroform and methanol, as well as, with ethyl acetate. [R<sub>f</sub> = 0.65 (chloroform-methanol); R<sub>f</sub> = 0.92 (ethyl acetate)].

### GC-FID ANALYSIS OF WATER SOLUBLE FRACTION OF GASOLINES

William C. Mahone\* and Robert Clemmons, Mississippi Valley State University, Itta Bena, MS 38941

Gasoline in drinking water is a common problem resulting from wide spread use of metal underground storage tanks in previous decades. Many soil chemicals accelerate corrosion of the metal containers resulting in underground leaks. Once past the oxygen layer in the soil these chemicals follow the water trail to the underground aquifers. This mechanism has been responsible for many drinking water contamination events over the years. We have in the past developed GC-FID methods for the analysis of pure gasolines to develop fingerprint identification techniques. We are currently focused on analysis of the water-soluble fraction of various gasolines. Our efforts have focused on sampling and test preparation methods. In our current effort we use LLE and SPME to collect and pre-concentrate the water component of gasoline. The ultimate objective of our work is to develop GC-FID methods that will allow us to test for volatile and semi-volatile species in water from various sources at the concentration levels required by today's regulations. We have to date ran tests on the LLE extract and compared it to chromatograms on the diluted pure gasoline. We have ran chromatograms in on the water extract in the split and splitless modes and have collected a footprint. We believe that this footprint maybe as distinctive and the footprint for the pure sample enabling one to connect a contamination to a particular brand or refinery. The following presentation will chronicle our achievements to date.

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## FRIDAY AFTERNOON

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Exhibition Hall C

1:00 Divisional Business Meeting and Awards

### ECOLOGY AND EVOLUTIONARY BIOLOGY

Chair: Clifford Ochs, University of Mississippi  
Vicechair: David Beckett, University of Southern Mississippi

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## THURSDAY MORNING

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Lake View I

9:00 FERMENTATION ABILITY OF *SACCHAROMYCES CEREVISIAE* AND *ZYMOONAS MOBILIS* UTILIZING VARIOUS SUGARS

## PRESENT IN AN ACID HYDROLYZATE

Valerie O'Bannon\*, Yi Zhang, Kui Zeng, Ken Lee, Maria Begonia, and Huey-Min Hwang, Jackson State University, Jackson, MS 39217

An alternative energy source could be found in microbial fermentation of the sugars present in the acid stream derived from agricultural biomass treated with acid hydrolysis. The determining factor in the production of ethanol from biomass is finding a suitable microbe. The microorganism must be tolerant to acidic conditions and able to ferment various hexose and pentose sugars. *Saccharomyces cerevisiae* and *Zymomonas mobilis* are microbes that can ferment various sugars and survive in acidic conditions. The purpose of this study is to determine the ability of *Saccharomyces cerevisiae* and *Zymomonas mobilis* to ferment sugars present in an acid hydrolyzate achieved by treating southern pine sawdust with H<sub>2</sub>SO<sub>4</sub>. Five-day old cultures of *Saccharomyces cerevisiae* (ATCC #765) and *Zymomonas mobilis* (ATCC #31821) were added to fermentation media containing 0.5% of glucose, mannose, xylose or arabinose at 1:10 ratio. The samples were incubated at 30°C under anaerobic or aerobic conditions for 24 and 48 hours. Ethanol yield was measured by gas chromatography. Results showed that both *Saccharomyces cerevisiae* and *Zymomonas mobilis* could ferment glucose (0.3–0.5% ethanol yield) anaerobically or aerobically at virtually the same rate. *Saccharomyces cerevisiae* but not *Zymomonas mobilis* could ferment mannose under both anaerobic and aerobic conditions (0.3% ethanol yield). *Saccharomyces cerevisiae* and *Zymomonas mobilis* fermented xylose and arabinose with ethanol yield of 0.1%. This research was funded by DE-FG02-00ER45830 through DOE/EPSCoR program.

9:15 ALL YOU EVER WANTED TO KNOW ABOUT PIMPLEBACKS: AGE AND GROWTH IN A FRESHWATER MUSSEL

Erica Brantley\*, Ann Philippi, and Melvin Warren, University of Mississippi, University, MS 38677

Freshwater mussels can be found on every continent except Antarctica. There are over 300 species of freshwater mussels that occur in North America, the most diverse freshwater mussel fauna on Earth. The presence of freshwater mussels indicates a balanced ecosystem because mussels are longlived, sedentary, benthic (bottom-dwelling) filter feeders, and are dependent on particular fish species to complete their reproductive cycle. This paper discusses species diversity and the age and growth rates of the pimpleback mussels in the Little Tallahatchie River of Mississippi. My research is based upon pimpleback mussels that are < 5 years old. The purpose of this paper is to determine: (1) what species are present at two sites and does the species composition differ between sites; (2) does the age frequency distribution differ between sites, and (3) in mussels < 5

years old, how does growth rate differ between sites, and with age.

9:30 COMMUNITY COMPOSITION OF CHIRONOMIDS IN SANDY SUBSTRATES IN THREE BLACKWATER STREAMS IN SOUTHERN MISSISSIPPI

Robert C. Fitch\* and David C. Beckett, University of Southern Mississippi, Hattiesburg, MS 39406

The majority of streams in Mississippi have sand bottoms. In this study we investigated the larval chironomid (Diptera: Chironomidae) composition in the spring and summer in three sandy-bottomed blackwater streams located in southern Mississippi. The principal objective of this study was to describe how the chironomid communities in sand substrates varied among sites within a stream, as well as among streams. We were also interested in seasonal changes in chironomid communities. Most of the animal biomass collected from sandy substrates is in the form of relatively small invertebrates, including the chironomids. In all sites the most common chironomid larvae was *Rheosmittia* sp., which accounted for 50–90% of the chironomids collected. *Rheosmittia* sp. is a very small chironomid and is an obligate sand dweller in streams and rivers. The mean density of *Rheosmittia* sp. from the spring data in Black Creek is approximately 133,000 individuals/m<sup>2</sup> in sandy substrate. Based on evidence from our laboratory, this genus of chironomid dominates sand substrates from streams of the size investigated in this study up to and including the lower Mississippi River. Other chironomid taxa found in the present study included *Polypedilum scalaenum* group, *P. halterale* group, *Paracladopelma* sp., and *Stictochironomus* sp. In addition to characterizing the invertebrate fauna of sand substrates, we plan to determine if these communities will serve as indicators of pollutional disturbance.

9:45 FIXED ACTION PATTERNS IN THE COURTSHIP BEHAVIOR OF THE SALTICID SPIDER, *ZYGOBALLUS NERVOSUS* (PECKHAM) WITH AN EVALUATION OF CRANE'S HYPOTHESIS OF SIMULTANEOUS "FEAR" AND SEXUAL DRIVES IN THE COURTSHIP OF JUMPING SPIDERS

John D. Davis, St. Andrews Episcopal Middle School, 370 Old Agency Road Ridgeland, MS 39157

The Jumping Spiders (Salticidae) are a large and taxonomically-confused group of visually oriented spiders. Crane (1949) has suggested that the study of ritualized behavior patterns may be useful in establishing evolutionary relationships within this family. Crane also suggests that the complex courtship behaviors of jumping spiders arose from conflicting "fear" and sexual drives, resulting in an approach-avoidance gradient in the movements of courtship rituals. Using slow-motion 16 millimeter filming and frame

by frame analysis, complete courtships by five different pairs were broken down into fixed action patterns which were then statistically treated for variation. Quantitative descriptions of fixed action patterns and their variation have not been published for this species and are the first part of a detailed study of such behaviors in the genus *Zygoballus*. Comparison of the first and final ten fixed action components in five successful courtships do not support Crane's approach-avoidance gradient model of salticid courtship.

10:00 Break

10:15 ROOST FIDELITY OF RAFINESQUE'S BIG-EARED BAT, *CORYNORHINUS RAFINESQUII*, IN SOUTHERN MISSISSIPPI

Austin W. Trousdale\* and David C. Beckett, University of Southern Mississippi, Hattiesburg, MS 39406

We used banding and radiotelemetry to evaluate fidelity of Rafinesque's big-eared bat, *Corynorhinus rafinesquii*, to natural and manmade roosts. We captured bats that we had located during surveys of bridges and abandoned buildings in DeSoto National Forest in southeastern Mississippi. Of 104 bats banded between July 2000 and September 2002, 34 individuals were recaptured, most of them at their original site of capture. Twenty-one bats (7 males, 14 females) have thus far demonstrated long-term fidelity to specific roosts, that is, they were found at the same sites  $\geq 3$  months after their initial capture. Short-term fidelity (measured in days) was assessed for 14 radiotagged bats. Males tended to use manmade structures (e.g., abandoned houses) and exhibit high fidelity to these sites, whereas most females used trees and showed lower fidelity to their roosts. Although long-term fidelity to roosts was pronounced in some individuals, data suggest that roost lability is often practiced by the species (particularly so by females) during short term periods.

10:30 SURVEY OF SALAMANDERS IN MISSISSIPPI LIMESTONE CAVES

David C. Beckett\*, John G. Himes, and Austin W. Trousdale, University of Southern Mississippi, Hattiesburg, MS 39406

Mississippi's largest and best-developed limestone caves are in a rock unit called the Vicksburg Group (VG), which extends near the surface as a narrow belt east to west from Wayne County to Hinds County. The caves of Mississippi have received little scientific attention; the only comprehensive effort to survey caves in Mississippi took place in the early 1970s. During 2000–2002 we surveyed for salamanders in the larger limestone caves of Mississippi, all within the VG. We found a total of four species: *Plethodon mississippi* was the most abundant, followed by *Eurycea guttolineata*, *Eurycea cirrigera*, and *Desmognathus fuscus*.

Three species (*P. mississippi*, *E. cirrigera*, and *E. guttolineata*) were present in Pitts Cave, the largest known cave in Mississippi. We did not find *Pseudotriton montanus flavissimus* in any of the caves, and question the validity of an investigator's statement made ca. half a century ago, that "it is one of the most numerous salamanders in Miss. limestone caves." The composition of salamanders we found is similar to that found by investigators in the earlier survey, conducted almost thirty years ago.

10:45 A PRELIMINARY REPORT ON IDENTIFYING CNIDARIANS USING MOLECULAR TECHNIQUES

Brian R. Kreiser\*, Richard L. Darden, and Brian D. Ortman, University of Southern Mississippi, Hattiesburg, MS 39406

A challenge faced by many ecological studies in the marine environment is obtaining accurate identifications of morphologically cryptic species or their life-history stages. In this project, we are developing molecular markers to identify various cnidarian groups. The basic protocol involves using the polymerase chain reaction (PCR) to amplify a specific target gene. Identifications are made by screening these PCR products using a variety of techniques including size variation, restriction fragment length polymorphisms (RFLPs) and selective amplification by PCR. We are refining this approach with two goals in mind. First, we are using this technique to identify individual polyps. Second, we are optimizing these techniques for use in the identification and quantification of cnidarian species present in ballast water.

11:00 Divisional Business Meeting

11:15 Divisional Poster Session

A STUDY OF PHOTOINDUCED ECOTOXICITY OF 6-AMINOCHRYSENE TO MICROBIAL ASSEMBLAGES AND RECOVERY OF THEIR HETEROTROPHIC ACTIVITY

Baoying Zheng\*, Kui Zeng, Yi Zhang, Huey-Min Hwang, and Hongtao Yu, Jackson State University, Jackson, MS 39217

6-Aminochrysene (6-AC), a slightly water-soluble polycyclic aromatic hydrocarbon (PAH) compound, has been of great concern due to ecotoxicity caused by the parent compound and its photoproducts. Microbial assemblages in a river water sample were used to determine the ecotoxicity of 6-AC and its photoproducts. The microbial bioassay includes spread plate counting and microbial mineralization of  $^{14}\text{C}$ -D-glucose. In dark, at 6-AC concentration of 10  $\mu\text{M}$ , bacterial viability was not affected and heterotrophic activities were inhibited by 42% and 40% respectively after 36 and 120 min. Under sunlight, exposure to 6-AC photoproducts inhibited bacterial viability and

heterotrophic activities by 62%, 93%, and 74%, 74%, after 36 and 120 min respectively. Therefore, photoinduced toxicity of 6-AC to microbial assemblages was observed in this study. The same methods were used to study the recovery of heterotrophic activity of microbial assemblages in the river water after 36 min-exposure to 6-AC in sunlight. There was no obvious recovery of heterotrophic activities after two and four hours, and about 20% was recovered overnight. For the microbial assemblages viability test, in the dark about 12.6% and 100% were recovered after four hours and overnight respectively; under room light, about 3.5% and 71.8% were recovered correspondingly. This research was supported by: (1) NIH-RCMI 1G12RR12459-01 and NIH-SCORE S06GM08047 (to JSU); (2) U.S. Department of the Army #DAAD 19-01-1-0733 to JSU; and (3) U.S. Department of Energy #DE-FG02-00ER45830 with subcontract to JSU.

**PRODUCTION OF INDOLE-3-ACETIC ACID (IAA) IN FRESHWATER WETLANDS AND PHYLOGENETIC EVALUATION OF INDOLE-3-PYRUVATE DECARBOXYLASE (IPDC)**

Dinesh Talreja\* and Lydia Halda-Alija, University of Mississippi, University, MS 38677

Production of indole-3-acetic acid (IAA), a key physiological feature of heterotrophic and enteric plant growth-promoting (PGP) rhizosphere assemblages associated with freshwater macrophyte *Juncus effusus* L. was examined using classical microbiological methods over a period of three years. Up to 85% of PGP rhizobacteria produced IAA. The cultivated enteric bacteria as determined on MacConkey agar were an average  $3.2 \times 10^3$  CFU  $\text{gm}^{-1}$  dry soil in the vegetated sediments as compared to  $3.9 \times 10^1$  CFU  $\text{gm}^{-1}$  dry soil in the unvegetated sediments. Interestingly, enteric bacteria produced IAA even when tryptophan was not added to the medium. API20E and 16SrRNA sequencing assigned most of the enteric isolates to *Enterobacter cloacae*, *Enterobacter agglomerans*, and *Klebsiella oxytoca*. Indole-3-decarboxylase (IPDC) is a key enzyme in IAA synthesis in these bacteria. A ClustalX-generated sequence analysis showed the occurrence of similar sequences for IPDC in diverse microorganisms and plants like *Arabidopsis thaliana*, *Fragaria ananassa*, *Pisum sativum*, and *Zea mays*. A neighbor-joining (NJ) tree was created using the distance method. The phylogenetic tree of the IPDC sequences that originate from different plant and microbial species was supported by a very high bootstrap value (more than 98%). Our results indicate that the number of enteric bacteria was significantly higher ( $p < 0.05$ ) in vegetated sediments as compared to unvegetated sediments which was due to the rhizosphere effect ( $R/S = 82.1$ ).

**RECOVERY AND ENUMERATION OF BACTERIA**

**AND FUNGI FROM SOILS CONTAMINATED WITH LEAD AND CADMIUM**

Diahanna Hackett\*, Darla Gilliard\*, Ashley Davis\*, Bridgette Matthews\*, Afrachanna Butler, Maria Begonia, and Gregorio Begonia, Jackson State University, Jackson, MS 39217

Little is known about in situ microbial community responses to heavy metal stress. Such study is necessary before remediation of heavy metals can be effectively pursued. The primary objective of this study was to evaluate the effects of soil-applied lead (Pb), cadmium (Cd) and chelates on soil microbial populations. In this study, soils that were previously amended with various metal and chelate concentrations and planted with wheat for six weeks were used after they have been cleaned of debris, air-dried, and sieved to the desired particle size. An appropriate volume (0.1 ml) of each serially diluted soil sample was spread plated on tryptic soy agar for bacteria and on rose bengal Martin's agar for fungi. Results showed that both lead and cadmium differentially affected both soil bacterial and fungal populations. Generally, soil bacteria were tolerant to all levels of soil-applied Pb. Soil fungi were tolerant up to 1,000 mg Pb/kg, but were severely inhibited at 2,000 mg Pb/kg dry soil. Soil bacterial populations were severely reduced by Cd, especially at the two highest concentrations (1,000 and 2,000 mg Cd/kg dry soil) in combination with the highest EGTA treatment (5.0 mmol/kg dry soil). Soil fungi were tolerant to both Cd and EGTA as evidenced by their similar or higher numbers compared to those present in the control treatments. The resistance of the soil bacteria and fungi to soil-applied lead and cadmium indicates that these microorganisms have resistance mechanisms to deal with metal toxicity.

**GEOLOGY AND GEOGRAPHY**

Chair: Keil Schmid, Mississippi Office of Geology  
 Vicechair: Jack Moody, Mississippi Office of Geology

**FRIDAY MORNING**

Lamar I

**9:30 PLANS FOR AN ENTERPRISE GEOGRAPHIC INFORMATION SYSTEM FOR MISSISSIPPI**

Michael B.E. Bograd, Mississippi Office of Geology, Jackson, MS 39289

The State of Mississippi is planning an enterprise geographic information system (GIS) to include an enhanced clearinghouse of public remote sensing (RS) data



and a computer model of the state. The goals are to provide accurate, high-resolution, accessible data for all users via the Internet and support more efficient, less costly government services. In June 2002 Governor Musgrove established the Advisory Commission on Remote Sensing Technologies to make recommendations concerning a vision for coordination of RS/GIS activities in the state. One recommendation will be to establish a policy board with the authority to make the vision become a reality. The Legislature has charged the Mississippi Department of Environmental Quality with (1) developing a digital model of the state and (2) coordinating RS/GIS activities in the state. The Mississippi Digital Earth Model (MDEM) will consist of the seven framework layers (geodetic control, elevation, orthoimagery, hydrography, transportation, political boundaries, and cadastral). Funding for acquiring the high-resolution data (estimated \$75 million) will involve federal, state, and local entities over the next few years. The other components of the project—to coordinate GIS activities, design the architecture of the Web portal, and establish standards—should have little cost. Mississippi has the potential to become a leader in RS/GIS through coordination of the resources at all levels of government and by taking advantage of the research and education capabilities of its colleges, the existing communication network, and the facilities at the Stennis Space Center.

9:45 STATUS OF GEOLOGIC MAPPING IN MISSISSIPPI: A PROPOSAL TO ESTABLISH A STATEWIDE GEOLOGIC MAP MODEL

Stephen L. Ingram, Sr.<sup>1\*</sup>, Fazlay S. Faruque<sup>2</sup>, and Charles T. Swann<sup>3</sup>, <sup>1,3</sup>Mississippi Mineral Resources Institute, University, MS 38677, and <sup>2</sup>University of Mississippi, University, MS 38677

During the past decade, geologic mapping activities in Mississippi have been conducted at 1:24,000 scale by the Mississippi Mineral Resources Institute, Mississippi Office of Geology, Mississippi State University, University of Mississippi, and the University of Southern Mississippi. Coordination between these entities is important to ensure continuity in statewide map products. To aid coordination, an ad hoc stratigraphic committee composed of representatives from these organizations began meeting annually in 1998 to provide continuity and guidance on mapping issues for the state. To date, no “standard” has been established and the ad hoc oversight committee has not resolved current stratigraphic mapping problems; albeit, the committee has attempted to address these issues. We propose that a renewed effort be made by the oversight committee to develop a statewide geologic map model to: establish a comprehensive map standard for the state that complements the USGS national mapping initiative; address GIS format and metadata issues; specify minimum map components to be included in published geologic maps to

ensure product utility for the public domain; include “scientific peer review,” when needed, to address continuity issues. Statewide implementation of these elements should result in best-quality, defensible map products for the “public domain” that maintain the highest scientific standards, ensuring credibility and utility of the product.

10:00 FIRST LOOK AT MERGED 7.5-MINUTE GEOLOGIC QUADRANGLES IN MISSISSIPPI, A REGIONAL VIEW

David E. Thompson\*, Daniel W. Morse, Peter S. Hutchins, and Jeremy L. Hurley, Mississippi Office of Geology, Jackson, MS 39289

The Mississippi Office of Geology has been mapping the surface geology of 7.5-minute quadrangles since the early 1990s, predominantly in association with STATEMAP activities. Surface geologic mapping was initiated along the Mississippi/Alabama state line and concentrated on differentiation of the Upper Midway and Lower Wilcox Groups. The previously undifferentiated lower Wilcox Group was separated into the Tusahoma and Nanafalia Formations. The Nanafalia Formation was further divided into the Grampian Hills and Gravel Creek Sand Members. The Naheola Formation of the Midway Group was found to be continuous and unbroken along its outcrop and was separated into the Coal Bluff and Oak Hill Members. By 2001, surface mapping was largely completed along the outcrop belt northward to the Mississippi/Tennessee state line. A number of 7.5-minute geologic quadrangle maps were developed with Arc/Info and published as individual paper Open-File Reports. A primary focus of the surface mapping project is, ultimately, to update the 1:500,000-scale 1969 Geologic Map of Mississippi. Recently, the individual 7.5-minute quadrangle geology coverages were merged utilizing ArcMap GIS software, creating a seamless compilation of what were previously solitary geologic map products. This compilation of surface geologic maps provides a regional representation of updated surface geologic mapping, a medium for comparison with older large-scale geologic maps, and a vehicle for updating the 1969 Geologic Map of Mississippi.

10:15 GIS AND REMOTE SENSING TECHNIQUES AUGMENT SURFACE MAPPING IN NORTH MISSISSIPPI

Stephen L. Ingram, Sr.<sup>1\*</sup>, Greg Easson<sup>2</sup>, and Khaled Hasan<sup>2</sup>, <sup>1</sup>Mississippi Mineral Resources Institute, University, MS 38677, and <sup>2</sup>University of Mississippi, University, MS 38677

GIS and remote sensing techniques were used to develop a surface mapping method to augment geologic field mapping in a portion of the heavily vegetated terrain of north Mississippi. Four lithologic intervals were targeted: Loess; Preloess; Memphis Sand; and lower Wilcox.

Lithologic variation was assessed using Landsat imagery, National Elevation Dataset, and conventional field data. Land use information was extracted from satellite imagery, topographic parameters were derived from elevation data, and textural characteristics were generated from these datasets to provide a basis for surface mapping. Lithologic boundaries were then digitized and checked against available digital geologic maps, and a field check was conducted to determine continuity between spatial mapping and conventional field data. Results show that the following relationships exist between lithology, topography, and land use in north Mississippi: Correlation exists between the highly dissected outcrops of the Memphis Sand and forested areas due to the steep slopes which develop on these consolidated fine- to coarse-grained sediments; correlation also exists between Loess and highly developed agriculture because of the gradual slopes which characterize these younger, indurated fine-grained sediments; the unconsolidated Preloess deposits are regionally extensive, have variable slopes that appear hummocky in texture, and form a geomorphic terrace above the underlying Memphis Sand. This investigation shows that an integrated GIS-remote sensing technique can be used effectively to develop a more comprehensive geologic database to augment conventional geologic field studies conducted in the heavily vegetated terrain of north Mississippi.

10:30 GEOGRAPHIC DISTRIBUTION OF MISSISSIPPI'S PRE-SUBTITLED LANDFILLS: A GIS APPLICATION FOR ENVIRONMENTAL AWARENESS

Ross D. Williams\* and Fazlay S. Faruque, Mississippi Office of Pollution Control, Jackson, MS 39289, and University of Mississippi Medical Center, Jackson, MS 39216

Pre-subtitle D Landfills are serious concerns for potential groundwater pollution in the State of Mississippi. These landfills were operable before federal regulations were enacted in 1994 and were to close in response to Subtitle D. Siting of these landfills in Mississippi was performed without a thorough understanding of site-specific geology and hydrogeology. Many of these sites were operated without engineering controls to mitigate the release of contaminants into the subsurface. In addition, groundwater resources within the proximity of the vast majority of these sites are not monitored. The objectives of this project are: (1) to develop a GIS database to identify the location of these landfills, (2) to identify local water wells and groundwater resources that may be or have been impacted, and (3) to implement a risk-ranking system for these abandoned facilities based on available knowledge of the groundwater resources of the area. These landfill sites are visited, and location coordinates for each are obtained using GPS. Each facility was walked and anomalies noted.

This is an ongoing project and will address the findings of the first phase of the investigation, landfills south of Interstate 20.

11:00 Break

11:15 A LARGELY COMPLETE BASILOS SAURUS FIND IN THE UPPER YAZOO CLAY IN SCOTT COUNTY, MISSISSIPPI

David T. Dockery III<sup>1\*</sup>, James E. Starnes<sup>1</sup>, and Scott Peyton<sup>2</sup>, <sup>1</sup>Mississippi Office of Geology, Jackson, MS 39289, and <sup>2</sup>Mississippi Museum of Natural Science, Jackson, MS 39202

In August–September 2002, a largely complete skeleton of the archaeocete whale *Basilosaurus cetoides* was excavated from the Yazoo Clay in the Clearview Landfill in the SW/4, Sec. 34, 5 N., 9 E., Scott County, Mississippi. The bones rested on an ancient, shell-littered, iron-stained, sea-floor surface (SFS1) that separated as a bedding plane some 27 feet below the Yazoo/Forest Hill contact as exposed 800 feet north-northwest of the site. SFS1 was also marked by several flat-lying, ossified, vertebral disks. Correcting for regional dip, SFS1 was about 22 feet below the top of the Yazoo Clay, which has a total thickness at the site of about 320 feet. One measurement found a second sea-floor surface (SFS2) to overlie the bones and enclosing clay at 0.68 foot above SFS1. These surfaces rested some several feet above a foot-thick lime bed, probably the upper of two lime units seen in the upper Yazoo Clay on regional geophysical logs. The bones rested in an arc that stretched 64.3 feet from the left jaw and 4.5-foot-long skull at the east end to the last vertebra at the west end; the straight-line distance was 61.4 feet. The rarity of encrusting organisms, such as oysters, on bone surfaces indicated rapid burial.

11:30 PRELIMINARY OSTEOLOGY OF A *BASILOS SAURUS CETOIDES* FROM THE UPPER YAZOO CLAY IN SCOTT COUNTY, MISSISSIPPI

James E. Starnes\* and Scott Peyton, Mississippi Office of Geology, Jackson, MS 39289, and Mississippi Museum of Natural Science, Jackson, MS 39202

The nearly complete skeletal remains of an archaeocete whale *Basilosaurus cetoides* were excavated from the late Eocene sediments of the Yazoo Clay in the Clearview Landfill in southern Scott County. The delicate bone material was documented and removed in August and September 2002 under the direction of the Mississippi Office of Geology and the Mississippi Museum of Natural Science (MMNS). The bones were largely in place where the animal came to rest upside down on the sea floor some 34 million years ago. The skull and right jaw were present. All seven cervical vertebrae and 34 other vertebrae were recovered, though some tail vertebrae were missing. The

largest lumbar vertebra measured 17 $\frac{3}{4}$  inches in length; the shortest tail vertebra found was 4 $\frac{1}{2}$  inches in length. Several bony disks were preserved. Ossified rugose masses were paired to the five sternal segments, including a well preserved manubrium and xiphisternum. Other large bones included 34 ribs, both scapulae, both humeri, and parts of the radii and ulnae. The carpal elements and phalangeal bones were scattered, and it is not yet known how complete these are at present. No vestigial pelvic or hind limb bones were recovered. Preparation of the skeleton is ongoing at the MMNS.

#### 11:45 GEOLOGIC LICENSURE—A STATUS REPORT OF LICENSURE

Rick L. Ericksen, Mississippi State Board of Registered Professional Geologists, Jackson, MS 39225

Currently there are 28 states and 1 US territory with geologic licensure laws. States which have recently enacted licensure laws include Texas and Utah—both of which are currently in their “grandfathering” phase. Licensure initiatives are ongoing in New York State and activity for geologic licensure has been initiated in both Louisiana and Oklahoma. Initiatives in Canada defining professional practice and “qualified persons” has led to an increasing emphasis of the importance of licensure in the US. In Mississippi, the RPG Act of 1997 will shortly be entering into its 6<sup>th</sup> year of operation. The Mississippi State Board of Registered Professional Geologists (MSBRPG) has seen an increase in the number of formal complaints filed related to issues concerning the unlicensed practice of geology and as a result been more involved in enforcement issues. The MSBRPG has also been involved in other areas related to geologic practice including increased dialogue with other state regulatory agencies which require geologic input in compliance with their regulatory functions. The MSBRPG also continues with its Voluntary Continuing Education program which provides no cost to low cost continuing education opportunities for those desiring to further their geological careers and knowledge of geologic and regulatory information, concepts, and practices and it also continues with another important part of its regulatory function in its administration of geologic, qualifying exams on a semi-annual basis.

12:00 Divisional Poster Session

#### GEOLOGIC INTERPRETATION OF HIGH-RESOLUTION SEISMIC DATA WITH SUPPORTING CORE DATA FROM MISSISSIPPI CANYON 798

Carol B. Lutken<sup>1\*</sup>, Erika Geresi<sup>2</sup>, Charles T. Swann<sup>1</sup>, Andy Gossett<sup>1</sup>, and Thomas M. McGee<sup>1</sup>, <sup>1</sup>Mississippi Mineral Resources Institute and Center for Marine Resources and Environmental Technology, University, MS 38677, and <sup>2</sup>Stanford University, Stanford, CA 94305

Prior to the summer 2002 cruise of the R.V. “Marion Dufresne” in the Gulf of Mexico, the USGS solicited a request from the Center for Marine Resources and Environmental Technology (CMRET) for a core-site that would augment ongoing work in support of the establishment of a permanent sea floor monitoring station. During July, the R.V. “Marion Dufresne” collected a 28-meter core at the requested site in Mississippi Canyon. Density and P-wave velocity logs were acquired onboard. After the exact location of the core was known, the CMRET included the core-site as a target during their August 2002 geophysical cruise. Two orthogonal, 6-kilometer seismic profiles were run across the core-site using a surface source (80 in<sup>3</sup> watergun) and deep-towed receiver. The seismic profiles contain a section of uniformly bedded sediments, and apparently deep seated diapiric features. Detailed time-stratigraphic analysis of the core is pending. These new data provide an improved interpretation—including subdecimeter stratal resolution—of the geology of this area of the Gulf from which no prior shallow subsurface information had been available.

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### FRIDAY AFTERNOON

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Lamar I

#### 1:15 HURRICANE SEASON 2002—HANCOCK COUNTY BEACHES

Jack S. Moody\*, Keil Schmid, and Stephen Champlin, Mississippi Office of Geology, Jackson, MS 39289

The 2002 hurricane season resulted in back-to-back events on the Hancock County, Mississippi, beach. This artificial beach furnishes infrastructure protection and recreational opportunities. Due to the extensive data set gathered and maintained by the Mississippi Office of Geology, reliable storm damage to the costly county beach can be assessed. Sediment movement and volumes can be analyzed with an eye toward future damage prediction and engineered replenishment design. Isidore was the first of these storms to impact the beach. Early estimates suggest a median of 1.6 m (5 ft.) of shoreline retreat or 41,000 cubic yards of sand moved offshore. That is roughly twice the average annual rate. One week later Lili’s storm surge flooded low portions of the beach and beach roads. With Lili’s eye landing in western Louisiana, it was possible to observe the storm surge mechanics on the Hancock County beach in relative safety. The 2 to 3 foot wave heights and 3 to 4 second wave periods were not unlike those generated from non-hurricane events. The difference was that the storm surge wave energies (1700 #/cu.yd. of water) were expended inland of the submerged beach. The peak of the surge event was documented on video and still photography by filming every hour from common observation points.

1:30 DEER ISLAND, COASTAL MISSISSIPPI—A GEOLOGICAL AND HISTORICAL STORY

Keil Schmid and Ervin G. Otvos\*, Mississippi Office of Geology, Jackson, MS 39289, and, University of Southern Mississippi, Ocean Springs, MS 39566

Deer Island is a spindle-shaped, 5.7 km long island off Biloxi and Ocean Springs that was recently added to the Coastal Preserves Program. Prior to being utilized by European settlers, it was inhabited by Indians for possibly more than four thousand years. The island has one of the few remaining natural sandy shores on the Mississippi coast. Since 1850, rapid erosion has reduced the island area by about one-third. Vibracores and auger samples taken for a renourishment study revealed that the island, like the coastlines in Harrison County and part of Jackson County, is cored by late Pleistocene beach ridges. The Gulfport Formation ridges, in combination with estuarine Biloxi Formation and alluvial Prairie Formation deposits, form the islands geological framework. During the Wisconsin glacial lowstand these deposits formed bluffs on the incised Biloxi River valley. Overlying them, a series of Holocene fresh and brackish water sediments were deposited before and during the submergence of the river valley under steadily rising estuarine waters. Age dates suggest that sea-level rise slowed shortly after ca. 4650 14C yr B.P. The buried Pleistocene land surface slopes southeastward under the island and at lower elevations mud, sand, and intertidal marsh peat cover the Pleistocene units. Small textural changes in the surface deposits have a strong influence on shore retreat rates. Understanding how local geology impacts erosion rates is essential in designing beach renourishment and marsh reclamation projects.

1:45 DEER ISLAND: EVOLUTION AND MORPHOLOGY

Steven D. Sloan\* and Keil Schmid, Millsaps College, Jackson, MS 39210, and Mississippi Office of Geology, Jackson, MS 39289

Deer Island was acquired in May 2002 by the State of Mississippi and incorporated into the Mississippi Coastal Preserves Program. The 5.7 km long island is located just offshore of the entrance to Biloxi Bay in Harrison County, Mississippi. Since the 1850s the island has lost nearly one third of its area to erosion and is now being considered for beach renourishment and marsh restoration projects. Deer Island consists of Holocene sediments overlying a core of the Pleistocene Gulfport formation. In general, the Pleistocene outcrops in the west and Holocene surficial sediments are dominant to the east, which is the most severely eroded portion of the island. In an effort to determine the island's future retreat patterns the present beach morphology and historical shoreline change rates were used to model the island's evolution. The island's morphology was mapped in the field using eight different

morphology components and then grouped into six different shoreline classifications. The highest change rates occurred along shorelines with relict beach (Type 6) morphology classification; the lowest change rates occurred along shorelines with wooded beach (Type 5) morphology classification. An extrapolated shoreline has been created for the year 2050 by measuring and averaging the rates of change for both long (decades) and short-term (years) periods along the shoreline at the different morphology types and projecting that into the future. Based on this analysis, another 20–25% of the island may be lost in the next 50 years.

2:00 AN INVESTIGATION OF THE ORIGIN AND EXTENT OF A PERCHED WETLAND, MILLSAPS COLLEGE, JACKSON, MISSISSIPPI

Jeannie R. Bryson\* and Stan Galicki, Millsaps College, Jackson, MS 39210

The origin and extent of a perched wetland has been investigated using historical topographic maps, hydrologic data, and dendrochronological techniques. It has been previously determined that the area of study supports hydrophytic vegetation and has developed hydric soils; however, no investigations to date have determined the aerial extent or origin of the wetland area. A network of shallow piezometers and a central well were installed to monitor the water table in the wetland area. Daily measurements were made over several intervals throughout a 12-month period. The analysis of annual ring increments from post and red oak trees in the area were done to determine if there is a link between the death of several trees as a result of increased soil moisture related to the wetland. Based on successive topographic surveys conducted over the past 44 years the perched condition originated as result of the construction of a baseball field on campus. It is likely that groundwater flow from terrace deposits above the Yazoo Clay is localized in a former topographic depression that was filled during construction.

2:15 STEADY-STATE EVALUATIONS OF RECHARGE TRENCHES, ROCKY MOUNTAIN ARSENAL (RMA), COLORADO

Maureen K. Corcoran<sup>1\*</sup>, James H. May<sup>1</sup>, David M. Patrick<sup>2</sup>, and Neville Gaggiani<sup>3</sup>, <sup>1</sup>Engineer Research and Development Center, Vicksburg, MS 39180; <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406; and <sup>3</sup>U.S. Geological Survey, Denver, CO 80225

At RMA, the original recharge wells down-gradient of the 6740-ft long North Boundary Containment-Treatment System became unusable by microbial fouling after several years of service and were subsequently replaced by fifteen recharge trenches. The 160 to 400-ft long trenches have been in service for over ten years and are periodically evaluated in terms of their performance in delivering clean

water back to the shallow alluvial aquifer underlying the installation. Various methods have been used to evaluate trench performance; however, during the last seven years constant head, steady-state hydraulic conductivity testing has been used. The basis for such testing is that significant trench fouling would be evident from decreased hydraulic conductivity values. The tests are conducted after recharge is maintained at a constant, known rate over a period of several hours to assure steady-state conditions are met. Water levels are then measured in monitoring wells within and down-gradient of the trenches. From the monitoring well data, the hydraulic gradient and thickness (depth) of water in the trench-aquifer system can be calculated. Knowing these parameters plus trench-water area and recharge, the hydraulic conductivity may be calculated from Darcy's law. These hydraulic conductivity values are based upon several assumptions relative to aquifer thickness and flow direction and represent conditions of the aquifer as well as the trench. Periodic testing has yielded hydraulic conductivity values representative of well-sorted sand or gravel, indicating satisfactory trench-aquifer performance, and they have been found to deliver reliable, cost-effective information without interfering with recharge.

#### 2:30 OVERVIEW OF THE MERG-MMRI-UNIVERSITIES RESEARCH INITIATIVE

Stephen L. Ingram, Sr., Mississippi Mineral Resources Institute, University, MS 38677

The Mississippi Energy Research Group (MERG), Mississippi Mineral Resources Institute (MMRI), and the state's four research universities (JSU, MSU, UM, and USM) have formed a coalition to conduct focused energy research for the state. This joint research initiative was undertaken because applied research essentially has been abandoned by the energy industry. Over the past decade federal funding has been sharply curtailed and deep state budget cuts spanning the past three years have seriously impacted all state agencies. The result is the elimination of upstream energy research in all but MMRI and the state's four research universities. The academic-industry partnership provides a bridge to address these funding difficulties by pooling resources. MERG, as the industry coalition partner, provides guidance on energy research needed to support the natural resource industry. In keeping with its mission, MMRI coordinates energy resource research conducted by the state's universities. Both MMRI and the universities supply staff expertise and research facilities toward projects endorsed by MERG. This partnership represents the first concerted effort in more than twenty years to bring Mississippi's natural resource industry and academic communities together to focus on energy research within the state. Together, the coalition is addressing critical issues facing our state's energy supply and has begun to focus on potential "new plays" that could

have high economic impact for all stakeholders—public and private.

2:45 Break

#### 3:00 RAYLEIGH WAVE MEASUREMENT OF THE SOIL PROFILE

Wheeler Howard\*, Craig J. Hickey, and James M. Sabatier, University of Mississippi, University, MS 38677

Rayleigh waves are seismic waves that propagate at the boundary of an elastic solid and a free surface. These waves account for approximately 67% of the energy created by a point source mechanical disturbance of an elastic medium. The air-soil interface is an approximate free surface boundary due to the impedance mismatch between air and soil. Another characteristic of Rayleigh waves is their exponential decay of amplitude in the elastic medium as distance from the free surface increases. This attribute is used in the spectral analysis of surface waves (SASW) to study material properties and structures as a function of wavelength. The depth at which the Rayleigh wave samples the soil is approximately one-fifth of the wavelength, therefore; knowledge of the dispersion curve allows for measurements of soil properties as a function of depth. This work will present calculations of Rayleigh wave dispersion curves for depth dependent soils. Data from a Rayleigh wave survey conducted in North Mississippi will be compared with model calculations.

#### 3:15 SEISMIC INVESTIGATION OF SURFACE DEFORMATION ASSOCIATED WITH THE KILMICHAEL DOME, MONTGOMERY COUNTY, MISSISSIPPI

Steven D. Sloan\* and James B. Harris, Millsaps College, Jackson, MS 39210

The Kilmichael Dome, first identified 70 years ago, is a circular feature exposed in unconsolidated Paleocene and Eocene sediments of north-central Mississippi. The structural complexity of the area, including zones of intense faulting and uplifted strata, has led to several suggested origins for the formation of Kilmichael Dome, including meteorite impact and regional tectonics. A shallow shear-wave seismic reflection profile was collected over a complex zone of surface faults, the Salem Church Fault Zone (SCFZ) on the northern flank of the Kilmichael Dome, with the goal of imaging the subsurface expression of deformation associated with the SCFZ. Further research will explore the relationship between shear-wave anisotropy and near-surface structural deformation utilizing multicomponent reflection and downhole seismic data to investigate shallow deformation associated with the Kilmichael Dome. This data set will allow us to more accurately assess the seismic velocities of the shallow sediments and constrain any identifiable shear-wave

anisotropy. Recent field studies have identified surface deformation in the Kilmichael area that suggests high fluid pressures and sediment flow. If these features have a preferred alignment, our intent is to determine their orientations using multicomponent seismic methods. In addition to increased seismic resolution gained by using shear-waves in unconsolidated, water-saturated sediments, measurement of near-surface directional polarizations may provide valuable information for identifying neotectonic deformation, evaluating associated earthquake hazards, and guiding future paleoseismologic investigations.

3:30 THE COURTLAND AND CURTIS STATION EARTHQUAKES OF PANOLA COUNTY, MISSISSIPPI—A COMPARISON OF SIMILAR SEISMIC EVENTS

Charles T. Swann\* and Terry L. Panhorst, University of Mississippi, University, MS 38677

The Courtland and Curtis Station earthquakes occurred in Panola County, Mississippi, in 1999 and 2002, respectively. Both events had hypocentral depths of approximately three miles, similar magnitudes (a duration magnitude 2.7 for the Curtis Station event and 2.8 for the Courtland event), and epicenters less than 20 miles apart. Both of these earthquakes are assigned to the White River Fault Zone which trends northwesterly through Panola County and into Arkansas. With so many similarities, similar intensities and felt areas would also be expected. These characteristics are, however, markedly different. The Courtland event had an associated felt area of approximately 100 square miles while the Curtis Station event was felt over an area of only approximately four square miles. Intensities also differed with a maximum intensity value of IV in the Courtland event and an intensity value of only II associated with the Curtis Station event. As the Curtis Station epicenter was located within the Mississippi River flood plain, and the Courtland epicenter on the Tertiary highlands, we suggest these local differences are related to the differences in soil response to seismically-induced vibrations.

3:45 THE WHITE RIVER FAULT ZONE: A SOURCE OF SEISMIC CONCERN IN NORTHWEST MISSISSIPPI

Terry L. Panhorst\* and Charles T. Swann, University of Mississippi, University, MS 38677

The White River Fault Zone was first recognized by Fisk (1944) based upon topographic alignments and soil tonal changes visible on aerial photography. This feature extends from near Newport, Arkansas on the northwest end to about Grenada, Mississippi on the southeast end, a distance of 280 kilometers. In Arkansas this structural zone coincides with the orientation of the White River and the southern terminus of Crowley's Ridge. The Mississippi River bluff line in Panola County, Mississippi has the

common N40W orientation found elsewhere along the White River Fault Zone. Although lacking exact boundaries, this zone has generally been represented as about 15 kilometers wide. Geomorphic analyses of stream drainages along the White River Fault Zone fail to show preferred alignment or channel displacements indicative of active surficial faulting or regional tilting. In the past 25 years, however, at least 15 earthquakes have been recorded within the White River Fault Zone, most in the range of magnitude 1 to 3. The largest earthquake in the state of Mississippi, which occurred December 1931 with an estimated magnitude of 5, was along the White River Fault Zone near Charleston in Tallahatchie County. Although outside of the traditional limits of the New Madrid Seismic Zone, the White River Fault Zone appears to be a seismically active area that warrants serious seismic hazard assessment. Mitigation measures should be formulated for critical facilities such as hospitals, police and fire stations, and schools.

4:00 Divisional Business Meeting

**HEALTH SCIENCES**

Chair: Hamed Benghuzzi, University of Mississippi Medical Center

Vicechair: D. Olga McDaniel, University of Mississippi Medical Center

**THURSDAY MORNING**

Lake View II

8:10 Introduction

8:15 EXPRESSION OF TRANSFORMING TGF-B III SPARC-NULL

Nikeya Carter<sup>1\*</sup>, Gregory Copper<sup>2</sup>, Lynn Opperman<sup>2</sup>, and Joseph M. Wahome<sup>1</sup>, <sup>1</sup>Mississippi Valley State University, Itta Bena, MS 38941, and <sup>2</sup>Baylor College of Dentistry, Dallas, TX

Osteonectin or secreted protein acidic and rich in cysteine (SPARC) is a secreted Ca<sup>2+</sup> ion binding glycoprotein found in a variety of cell types including osteoblast, endothelial cells, ligament fibroblasts, pariental yolk sac cells and basement membrane tumors. Osteonectin is important in maintenance of bone mass in vertebrates and in growth of bone in sutures hence affecting cranial facial development. Postnatal mouse craniums at 15 d and 30 d with either wild type or SPARC Osteonectin (-/-) knockout genotypes were fixed, sectioned and stained. Staining was

scored from 1 to 3 and compared with the controls. The wild type interfrontal sutures had some TGF-B2 immunopositive fibroblasts at 15 d, which disappeared at 30 d. The knockout mouse sutures were negative. Minimal TGF-B2 immunostaining was noted within the interfrontal suture in the knockout compared to the wild type mice at 30 d. These data will be interpreted in light of cranial development.

8:30 GENOMIC MARKERS ASSOCIATED WITH ISCHEMIC CARDIOMYOPATHY AND THE OUTCOME OF CARDIAC TRANSPLANTATION

Vernetta Coleman<sup>1\*</sup>, Sani Yamout<sup>1</sup>, D. Perrin Roten<sup>1</sup>, Charles K. Moore<sup>1</sup>, Georgio Aru<sup>1</sup>, Maria E. Oropeza<sup>1</sup>, Joseph A. Cameron<sup>2</sup>, and D. Olga McDaniel<sup>1</sup>, <sup>1</sup>University of Mississippi Medical Center, Jackson, MS 39216, and <sup>2</sup>Jackson State University, Jackson, MS 39217

The effects of cytokine gene polymorphism were evaluated in African-American (AA) and Caucasian (CAU) patients that had undergone cardiac transplantation (CTx). It has been suggested that allograft rejection is mediated by cytokines. Our working hypothesis is that the clinical condition of recipients before CTx might affect the outcome of allograft function through pre-existing genetic factors that are unique to each individual. Genomic DNA samples from 19 AA and 46 CAU recipients were tested by either single or multiplex PCR. Frequency distributions of genotypes were analyzed in respect to pre-CTx clinical characterization including coronary artery disease (CAD) and non-ischemic cardiomyopathy. The rejections were scored based on endocardial biopsy and histopathological assessment: rejection grades were 1A, 2, 3A, or 3B and they were analyzed for cytokine genotype association. Overall, the IL-10 high producer genotype was present in all patients graded as 1A and the frequency was reduced significantly in grade 2, 3A, and 3B patients (28.6%,  $p = 0.02$ ; 23%,  $p = 0.001$ ; and 20%,  $p = 0.04$ , respectively). IFN- $\gamma$  A/A and IL-10 low producer genotypes were significantly increased in AA patients, compared to CAU patients with grade 3A rejection (47% vs 16.1%,  $p = 0.04$ ; 76.5% vs. 32.2%,  $p = 0.006$  respectively). There was a direct relationship between IFN- $\gamma$  T/T high producer and ischemic CAD as compared with IFN- $\gamma$  A/A low producer and non-ischemic cardiomyopathy, supporting the influence of immunological factors in coronary vasculopathy. These data might provide a valuable information regarding the cellular and molecular mechanisms of graft response and might predict the outcome of allograft function.

8:45 GROWTH FACTOR PRODUCTION IN EARLY STAGES OF BENIGN PROSTATIC HYPERPLASIA UPON EXPOSURE TO SUSTAINED DELIVERY OF ANDROGENS

Melanie C. Pollan<sup>\*</sup>, Hamed Benghuzzi, and Michelle Tucci,

University of Mississippi Medical Center, Jackson, MS 39216

Benign prostatic hyperplasia (BPH) is a condition that affects a significant population of older males, yet its pathogenesis is not clearly understood. This study was designed to give broader insight into the early development of BPH by looking at changes in growth factor production in the ventral prostate. To accomplish this, Sprague Dawley rats ( $n = 16$ , 250–300 g) were randomly divided into four equal groups. Three treatment groups were each implanted with ceramic drug delivery devices that were designed to deliver continuous physiologic doses of testosterone (T), dihydrotestosterone (DHT), and androstenedione (AED) for ninety-day duration. Immunohistochemical analysis for epidermal growth factor (EGF) and basic fibroblast growth factor (bFGF) indicated whether these growth factors were involved in early processes of BPH induced by the delivery of androgens. Histopathological evaluation demonstrated increased positive reactivity for both EGF and bFGF in all steroid treated animals compared to controls. A similar trend was observed in the vascular endothelium. This information could be helpful in developing new methods for early diagnosis of BPH, but more importantly this knowledge provides the literature with clues about the cellular responses encountered at the initiation of the disease process.

9:00 LDL OXIDATION BY THE EXPOSURE ANDROGENS USING MRC-5 CELL LINE AS A MODEL

Felicia Magee Tardy<sup>\*</sup>, Hamed Benghuzzi, and Michelle Tucci, University of Mississippi Medical Center, Jackson, MS 39216

The relationship between LDL oxidation and the development of atheroma has not been fully investigated. The objective of this study was to investigate the effect of androgens (testosterone, TE) on the intactness of LDL upon incubation with MRC-5 cells. A total of 72 tubes plated with MRC-5 fibroblasts (50,000) were divided into four equal groups. The four groups were treated with one of the following: serum only (control), low-dose LDL, high-dose LDL, and LDL + TE. The experiment was divided into 24, 48, and 72-hour periods. At the end of the incubation periods, representative samples from each group were used for the determination of LDL oxidation (Dow Corning units/lipoprotein kits). This was accomplished through lipoprotein electrophoresis procedure. Results of the lipoprotein electrophoresis indicate that LDL was slightly modified during the incubation periods with low-dose LDL, and high-dose LDL treatments. Extensive electrophoretic mobility was observed in the combination of DL and TE treatment. Results from this study suggest that MRC-5 cells are capable of modifying the native form of LDL. However, further investigation is needed to determine the exact

mechanism of LDL modification and the role of MRC-5 cells in its modification.

9:15 LOCALIZATION OF PROINFLAMMATORY CYTOKINES ON CARDIOVASCULAR TISSUES EXPOSED TO SUSTAINED DELIVERY OF ANDROGENIC STEROIDS IN RODENTS

Shontell Credit<sup>1\*</sup>, Hamed Benghuzzi<sup>2</sup>, Joseph A. Cameron<sup>2</sup>, Michelle Tucci<sup>2</sup>, and Audrey Tsao<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

Recent studies have shown that cytokines are over-expressed within heart failure cases. It is also well documented that various cytokines have an important role in biological processes such as inflammation, wound healing, and tumor progression. The objective of this study was to deliver continuous levels of testosterone (T), dihydrotestosterone (DHT), and androstenedione (AED) in a sustained manner using ceramic drug delivery systems and determine their role as risk factors for cardiovascular diseases. A total of 16 rats were subdivided into four equal groups. Groups 1–3 were implanted with TCPL capsules loaded with T, DHT, and AED respectively. Group 4 animals were untreated and served as control group. At the end of 90 days post treatment, heart tissue were harvested and subjected to H&E and immunohistochemistry procedures following standard lab protocols. The data obtained from this study demonstrated that IL-6 was the most prominent cytokine expressed in the tissue in group 2 animals compared to control and other experimental groups. No significant difference in IL-1 induction was observed among all groups. In the ventricular sleeve, T caused the most significant evidence of hypertrophy ( $p < 0.05$ ). In contrast, hypertrophy was prominent in the apical region in animals treated with AED compared to the control and T treated animals. The results of this investigation uncovered evidence that various regions of the heart have specific binding receptors for certain steroids to act upon.

9:30 TETRAHYDROPAPAVEROLINE *IN VIVO*: A POSSIBLE BIOCHEMICAL LINK TO ALCOHOLISM IN MAMMALS

Jacob C. Strawbridge\*, Kenneth D. McMurtrey, John G. McCoy, and Christopher P. Ward, University of Southern Mississippi, Hattiesburg, MS 39406

The role of tetrahydropapaveroline (THP), a condensation product of 3,4-dihydroxyphenyl-acetaldehyde with dopamine, in the regulation of alcohol consumption has been the subject of much debate among addiction researchers. In this paper, 31 adult male Sprague-Dawley rats received intraventricular injections of either racemic THP hydrobromide (0.65 or 1.3 mg/mL), R-(+)-THP hydrobromide (0.66 or 1.4 mg/mL), or an equal volume of

vehicle. The lower doses of both (±)-THP and (+)-THP significantly increased volitional alcohol intake. For animals treated with the racemic compound, the increase was significant at 7–13% (v/v % ethanol solution) concentrations. The R-(+)-enantiomer increased consumption at 4–11%, and 15–20% concentrations of ethanol. The higher doses of both compounds did not significantly alter alcohol preference. Whether or not endogenously formed THP participates in the etiology of alcohol addiction remains unclear. Nonetheless, there are few known compounds that induce a preference for unsweetened alcohol solutions over water in laboratory animals.

9:45 SPATIAL ANALYSIS OF PESTICIDE EXPOSURE AND RISK OF BREAST CANCER MORTALITY IN MISSISSIPPI

Mohamed H. Abdulla\*, Mary Lou Gutierrez-Mohamed, and Ibrahim O. Farah, Jackson State University, Jackson, MS 39217

Breast Cancer is the most common form of cancer in women and its incidence increase with age. Established risk factors include advancing age, early menarche, late menopause, positive first relative, late age at first birth and socioeconomic status. Mississippi as state has a combination of risk factors making it a suitable candidate for elucidating the pathways of breast cancer etiology. The purpose of this study was to analyze pesticide exposure and the risk of breast cancer mortality in Mississippi. Data comprised county-level, state economic areas (SEA), breast cancer mortality data from NCI and pesticide use data from USDA (1970–1994). Methods included descriptive statistics, unit analysis at the county level, and geospatial analysis (GIS). Results showed significant correlation for three SEA's including Yazoo, Vicksburg and Cornith, Total acres planted vs. female cancer mortality showed Spearman values (P-value) of 0.674 (0.030) in Yazoo, 0.604 (0.0062) in Vicksburg for acreage/white females, and 0.667 (0.049) in Cornith for acreage/black females. We conclude that there are moderate statistically significant associations between number of acres planted crops in Mississippi and the mortality rate of breast cancer, the association varies by economic area, race, and crop planted, Spatial analysis using GIS will demonstrate a better estimate for this correlation through visual display of topography, crops, and mortality rates.

10:00 Break

10:30 Divisional Poster Session

A NOVEL TREATMENT FOR EARLY STAGES OF AVASCULAR NECROSIS

Audrey Tsao\*, James H. Hughes, and Ruth Ann Buckhalter,



University of Mississippi Medical Center, Jackson, MS 39216

This study is to investigate a novel surgical implant to treat early femoral head Avascular Necrosis (AVN). Methods: Patients between the ages of 18 to 75 with Stage I or II AVN as classified by Steinberg/UPenn system are entered into one of three groups (FDA approved IDE #G990234). Group I with unilateral disease are randomized with core decompressions. Groups II and III with bilateral disease receive the implant; Group II having both hips eligible for the procedure. Group III, the contralateral hip is excluded. The AVN Implant is made of a porous tantalum with elasticity similar to bone and evidence of osteoconductive, osteoinductive and vascular invasion properties. Clinical outcomes are measured by Harris Hip Scores (HHS), SF-12 and/or radiological studies completed at pre-op, three, six, twelve, and twenty-four months, and then annually. Results: University of Mississippi Medical Center has enrolled seventeen patients, with seventeen implants, and one core decompression. One patient dropped secondary to non-compliance. One year follow-up for five hips, six month follow-up for thirteen hips reveal an increase in the HHS, function, and a decrease in pain and no radiographic progression of disease, except in two cases. The core decompression has experienced a similar outcome. Discussion: Preliminary data appears promising, with no progression of the disease, a decrease in pain and an increase in function for the majority of cases. Patients will be monitored for five years.

#### ADMINISTRATION OF DIOSGENIN TO OVARECTOMIZED RATS PROTECTS KIDNEY FUNCTIONS

Anita Winfield<sup>1\*</sup>, Hamed Benghuzzi<sup>2</sup>, Michelle Tucci<sup>2</sup>, and Joseph A. Cameron<sup>1</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

The use of over the counter progesterone creams is on the rise and is thought to be a safe and effective means for controlling menopausal symptoms. The active ingredient in these preparations is the compound diosgenin. Diosgenin, which is synthetically derived from wild yams, is converted to human progesterone through a series of enzymatic steps. The efficacy and safety of these products has not been fully investigated *in vivo*. The objective of this study was to supplement ovariectomized rats with sustained release of diosgenin for 47 days and evaluate its effect on kidney structure. A total of 15 animals were randomly divided into three equal groups. Animals in group I served as intact control, animals in groups II were ovariectomized and animals in group III were ovariectomized and supplemented with a TCPL capsule containing 500 mg of diosgenin. Blood and body weights were recorded weekly and at the end of 47 days kidneys were collected and analyzed morphometrically. The results indicated significant increases

( $p < 0.05$ ) in the body weight of ovariectomized animals compared to control and diosgenin treated animals. Significant increases were observed in the kidney wet weights of ovariectomized animals. Further analysis of the kidneys showed remarkable changes in both the glomerular length and area in ovariectomized animals. The results suggest that diosgenin was able to protect the kidney from morphological changes associated with ovariectomy. The mechanism is most likely responsible for this protection is the conversion of diosgenin to progesterone.

#### APOPTOSIS: CINNAMON EXTRACTS AND BUCCAL EPITHELIAL CELLS

Ayesha Alam<sup>1\*</sup>, Hamed Benghuzzi<sup>2</sup>, and Michelle Tucci<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

Buccal epithelial cells line the oral cavity, and are the first cells to encounter cinnamon compounds in food upon ingestion. Previous experiments have shown ETOH and H<sub>2</sub>O extracts of cinnamon to cause increase in cell death. However, mechanisms for the observed cell death have not been identified. Potential mechanisms for cell death have not been identified. Potential mechanisms for cell death include cellular lysis due to buffer interaction with cells (hypertonic/hypotonic) and/or apoptosis (programmed cell death). The nature of suspension buffer was dismissed as a possible means for cellular death in this series of experiments because vehicle treated cells did not undergo either cellular death or lysis. The object of the work was to identify whether extracted cinnamon compounds caused higher incidence of apoptosis in isolated human buccal epithelial cells challenged with ETOH, ETOH + Cinnamon, H<sub>2</sub>O, and H<sub>2</sub>O + Cinnamon for 15 and 60 minute periods. Results indicated that heat soluble and ETOH soluble compounds of cinnamon induce greater degree of apoptosis in cells compared to cells treated with ETOH or PBS. Various fractions from cinnamon extracts are currently being isolated based on liquid chromatography. (Supported by grant from the Howard Hughes Medical Institute).

#### BIOLOGICAL IMPLICATIONS OF SYNTHESIS OF CALCIUM PHOSPHATE

Kenisha DeLoach<sup>1\*</sup>, Jason Ritchie<sup>2</sup>, and Joseph M. Wahome<sup>1</sup>, <sup>1</sup>Mississippi Valley State University, Itta Bena, MS 38941, and <sup>2</sup>University of Mississippi, University, MS 38677

Calcium Phosphate is an important component of bone and teeth matrix. An artificial method of synthesizing bone and teeth component may serve as a source of replacement of natural parts in situations where biological synthesis is deficient. Calcium phosphate was synthesized by converting the hydroxyl group in monomethylpolyethyleneglycol (MPEG) to an alkyl chlorine using thionyl chloride and pyridines. The resultant MPEG-C1 was

converted to the alkyl phosphonate precursor MPEG-P+(OEt)<sub>3</sub> hydrolyzed to MPEG-PO<sub>3</sub>H<sub>2</sub> using an ion exchange chromatography. The resulting porous material can serve as a matrix for bone to grow around forming living bone tissue. The application of this research will be discussed.

#### BONE SPARING SURGICAL OPTIONS FOR TOTAL HIP REPLACEMENT

Audrey Tsao\*, Tracy Pesut, Charity Peacock, and Ruth Ann Buckhalter, University of Mississippi Medical Center, Jackson, MS 39216

This study is to investigate a new Conservative Hip Prosthesis designed for younger patients with a primary diagnosis of Avascular Necrosis (AVN). This prosthesis is designed to spare bone and make revisions easier. Methods: Patients between the ages of 18 to 60 with the primary diagnosis of AVN are considered prime candidates for this prosthesis. However, young patients with other diagnosis will be considered for this prosthesis. The Mayo Conservative Hip Prosthesis is made of Tivanium®To-6Al-4V Alloy, with a dual-plane taper. Clinical outcomes are measured by pre-operative Charnley Scores, and Harris Hip Scores (HHS), SF36, and/or radiographic studies completed pre-operatively and post-operatively at three, six, twelve months, and annually thereafter for a minimum of five years. Results: University of Mississippi Medical Center has presently enrolled thirty patients, with thirty-six implants, six being bilateral. Post-operative follow-ups include three patients at three years, four patients at two years, eighteen patients at one year, and eleven at various other stages ranging from six weeks to near one year. All follow-ups reveal an increase in HHS, increase in quality of life, and a decrease in pain. Discussion: Data shows the patients increase in function, decrease in pain, and an overall improved quality of life. No revisions have been required to date, but should the need arise we hope to prove that this hip prosthesis will allow for easier revisions and more bone stock to prolong the hip function as the patient matures.

CLONING OF *pspA/EF3296* FOR USE AS A DNA VACCINE AGAINST *STREPTOCOCCUS PNEUMONIAE*  
 Urseline A. Hawkins<sup>1\*</sup>, Quincy Moore<sup>2</sup>, and Larry S. McDaniel<sup>2</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174, and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

The prevention of pneumococcal infection is currently a topic of great medical interest because of the significant morbidity and mortality associated with *Streptococcus pneumoniae* (pneumococcus). The current polysaccharide vaccine is limited in its coverage and is ineffective in the elderly and children less than two years of age. One of the alternatives being considered, is the formulation of a genetic vaccine using pneumococcal

surface protein A (PspA). PspA is an effective antigen because it is present on all pneumococci, and it is required for full pneumococcal virulence. Based on sequence analysis, PspA can be grouped into six clades. We have previously demonstrated that *pspA* from clade 2 or clade 4 can elicit protection when used in a mouse pneumococcal sepsis model. It has been hypothesized that a mixture of PspA from clades 2, 3, and 4 would protect against > 90% of all pneumococcal infections. Therefore, the main goal of this study was to clone *pspA/EF3296*, which is a prototypic clade 3 PspA. We cloned *pspA/EF3296* into pNGVL3, a eukaryotic expression vector, for use in mouse immunization studies.

#### COMPARISON OF HIGH FAT, CARBOHYDRATE, AND PROTEIN DIETS REGARDING RELEASE OF CYTOKINES IN INTESTINAL TISSUE AND BLOOD SERUM OF RATS

Kim Parker\* and A. Kurt Thaw, Millsaps College, Jackson, MS 39120

Blood serum and intestinal tissue from rats given one of four diets, consisting of 60% fat, 60% carbohydrate, 60% protein, and standard rat chow were examined to determine the release of cytokines produced by each type of diet. The samples were examined using ELISA kits designed to determine the concentration of cytokines interleukins (IL-1 $\beta$ , IL-6) and Tumor Necrosis Factor  $\alpha$  (TNF- $\alpha$ ). There was a clear release of cytokines in response to ingested nutrients. IL-1 $\beta$  and TNF- $\alpha$  were released in larger quantities, while the release of IL-6 was minimal, yet still present. The current research is applicable to future medical and nutritional studies because of the information known regarding the release of cytokines and control of appetite. Though the release of numerous factors have been reported in response to ingested nutrients, this is the first report on the effect of specific nutrients on cytokine release.

#### COMPARISON OF NPR EXPRESSION WITH NP1 AND NARP IN ADULT RAT BRAIN

Deidra Jones\*, Richard Cho, Radhika Reddy, and Paul Worley, Johns Hopkins University, School of Medicine, Baltimore, MD 21287

Pentraxins are a functionally diverse group of secreted calcium dependent lectins originally named for their ability to form pentamers of five non-covalently bound subunits (Gewurz et al. 1995; Goodman et al. 1996). The two subfamilies of pentraxins are the classic short pentraxins and the relatively long pentraxins which Narp, NP1 and NPR are members. Neuronal activity-regulated pentraxin (Narp) is a secreted immediate early gene regulated by synaptic activity in the brain (O'Brien et al. 1999); Neuronal pentraxin 1 (NP1) is also a secreted protein but is constitutively expressed in some regions of the brain (Hopf et al. 2002). Neuronal Pentraxin Receptor (NPR), a

494 amino acid protein, has properties that are unique to Narp and NP1 that may confer special function. Evidence suggests that these two proteins may be synaptogenic factors. The goal of my project was to broadly characterize NPR expression in rat brain and compare it to Narp/NP1 expression. In addition, NPR expression regulation during development was also examined. Sprague-Dawley rats were sacrificed at various postnatal time points during development. Cortices and hippocampi were collected for a western blot analysis of pentraxin expression *in vivo*. The co-expression of long form pentraxins during development and in regions of adult rat brain hippocampi support our hypothesis that pentraxins co-function in their ability to modulate synapses formation by clustering AMPA receptors.

#### CYTOKINE ANTIBODIES (ANTI-IL-1 $\beta$ , ANTI-IL-6, AND ANTI-TNF $\alpha$ ) INCREASE APPETITE IN FREE-FEEDING RATS

Kim Parker\* and A. Kurt Thaw, Millsaps College, Jackson, MS 39120

Recently, investigators have become interested in the immune systems' role as a regulator of physiological processes such as sleep and appetite. Data revealing a specific lengthening of the interval between meals related to the administration of excess cytokines has already been established. When the cytokines interleukin-1beta (IL-1 $\beta$ ), tumor necrosis factor alpha (TNF $\alpha$ ), or interleukin-6 (IL-6) are given to a rat immediately following a meal the subject will wait an average of 50% longer before eating the next meal (compared to control injections). Thus, the se 3 cytokines appear to be playing a role in regulating the feelings of fullness or satiety between meals. The current research administered three concentrations of antibodies for each cytokine to rats during their first nocturnal meal. The amount of time elapsed between that first meal and the initiation of a second meal and the size of each meal measured in time spent eating were recorded. The effect of the antibodies on the interval between meals as well as the relationship between the size of the first meal and the interval between meals (satiety ratio) was able to be calculated. Results indicate cytokine antibodies increase total food intake as well as decreasing the amount of time between meals.

#### DELAYED APOPTOSIS UPON THE TREATMENT OF HEP-2 CELLS WITH BS

Charla Corder\*, Hamed Benghuzzi, Michelle Tucci, and Zelma Cason, University of Mississippi Medical Center, Jackson, MS 39216

*Nigella sativa* (Black seed, BS) has been used to promote health and fight disease for centuries. The objectives of this investigation were: (1) to study whether agents such as cortisol and LPS alone or in combination

induce cellular (HEp-2, laryngeal carcinoma) damage with time in culture (24, 48, and 72 hours) using apoptosis as a marker, (2) to determine if an immune stimulant such as BS, can protect HEp-2 cells from insult and ultimately thwart the programmed cell death mechanism. A total of 54 HEp-2 cell/tubes (50,000 cells per tube) were divided into six equal groups. Group one served as untreated control, while groups 2-6 were treated with either cortisol (10 ng/ml), LPS (10  $\mu$ g/ml), BS (25  $\mu$ g/ml), or a combination of LPS and cortisol and cortisol plus LPS plus BS, respectively. At the end of each phase the cells were harvested, heat fixed and stained with H&E to evaluate morphological changes. Immunohistochemistry, using antibodies against caspase-3 to evaluate cells undergoing apoptosis was conducted in all groups. The results of this study showed evidence of cells undergoing apoptosis at different magnitudes in all groups. However, the most dramatic change was seen in groups containing cortisol and LPS alone or in combination. This was supported by the fact that there were several adaptive responses observed in all phases. In addition, the exposure of BS to cells pretreated with cortisol and LPS showed evidence of protection against the progressive apoptosis.

#### DOWN REGULATION OF CD14 EXPRESSION THROUGH PRETREATMENT WITH GLUCOCORTICOIDS

Randee K. Ivy\*, Michelle Tucci, Hamed Benghuzzi, and Zelma Cason, University of Mississippi Medical Center, Jackson, MS 39216

Glucocorticoids such as cortisol are potent immunosuppressive agents that act on many cells of the body, including macrophages. Macrophages express CD14 in response to lipopolysaccharides (LPS) extracted from bacterial coats. The objectives of this study were: (1) to determine if pretreatment of macrophages with cortisol for 30 minutes prior to challenging the cells with endotoxin results in increased cell loss, cell damage (MDA), and suppression of CD14 receptors; and (2) to determine if CD14 receptor expression is able to recover with time. An experimental design incorporating RAW 264.7 cells (RAW) was used in order to evaluate our objectives. The cells were plated on 24 well plates and subsequently divided into four groups. The first group was untreated and served as the control. Group two was treated with LPS, group 3 with 10  $\mu$ l of cortisol, and a combination of LPS and cortisol was used in the treatment of the fourth group. The cells were recovered at 24, 48, and 72 hours. Results showed that there was a significant decrease in the proliferation rate in RAW cells exposed to cortisol and LPS either alone or in combination when compared to the untreated cells. Cell damage was also increased in the treated cells. LPS caused increased receptor expression at all time points. CD14 expression was down regulated at 48 hours in cells pretreated with cortisol, however, this suppression was no

longer evident at 72 hours.

#### EFFECTS OF RIBOFLAVIN AND/OR ASCORBIC ACID SUPPLEMENTATION ON PLASMA, LEUCOCYTE AND URINARY ASCORBIC ACID IN UNIVERSITY STUDENTS

Felix Adah\*, and O.A. Ajayi, University of Mississippi Medical Center, Jackson, MS 39216, and University of Ibadan, Nigeria

A study was carried out to observe the effects of riboflavin and/or ascorbic acid supplementation on plasma, leukocyte and urinary ascorbic acid in healthy young volunteers. A total of 36 students were assigned for this study (age ranges between 23–33 years) and further divided into three equal groups (random selection). A base line for ascorbic acid (AA) levels in the plasma, leukocytes, and urine were established. Each volunteer in groups I, II, and III was given orally riboflavin (5 mg/day), AA (100 mg/day), and a combination of AA (100 mg/day) plus riboflavin (5 mg/day), respectively. At the end of experimental phase (10 weeks post supplementation), blood and urine were collected and processed for AA levels in plasma, leukocytes and urine following standard procedures. Data obtained demonstrated that (I) riboflavin supplementation resulted in no significant change in AA in the urine and plasma ( $p > 0.05$ ). In contrast, AA levels in leukocytes were increased ( $p < 0.01$ ), (II) the supplementation of AA alone or in combination with riboflavin resulted in a remarkable increase in AA at the plasma, urine and leukocytes levels. In conclusion, results of this study revealed that the supplementation of riboflavin provided stimulatory pathway of AA production and this could be helpful in promoting the immune system and preventing the development of symptoms of AA deficiency.

#### FACTORS INFLUENCING BREAST AND CERVICAL CANCER SCREENING AMONG AFRICAN AMERICAN WOMEN

Ina Chapman<sup>1</sup>, Thelma Hurd<sup>1</sup>, Courtnei Newsome<sup>2\*</sup>, and Sharita Womack<sup>3</sup>, <sup>1</sup>Roswell Park Cancer Institute, Buffalo, NY 14263; <sup>2</sup>Tougaloo College, Tougaloo, MS 39174; and <sup>3</sup>State University of New York at Buffalo, Buffalo, NY 14260

Breast and cervical cancer are major public health issues that are gaining significant importance in the field of research. Studies have shown that minority women are less likely to undergo screening than Caucasian women and are frequently diagnosed with more advanced disease. This could be due to differences in the attitudes of women of various ethnic groups and other factors. These differences and factors have caused minority women to have a higher mortality rate than Caucasian women, although the number of Caucasian women who get cancer of the breast and/or cervix is higher than minority women. The goal of this

project was to evaluate the relationship between socioeconomic factors, the perceived attitudes of health care providers, and mammography and cervical cancer screening utilization by minority women. A 62 item telephone survey containing questions about socioeconomic factors, attitudes, and breast and cervical cancer screening utilization was administered to 59 African American women participating in the Witness Project of Buffalo. Participants' responses were entered into a database and analyzed using SPSS and chi square analysis. The data indicate that the level of education completed and regular church attendance positively correlated with both breast and cervical cancer screening. Cervical screening, but not mammography, was positively associated with peer group support.

#### *IN VIVO* ANTIMUSCARINIC ACTIONS OF THE ANTI-HISTAMINERGIC AGENT, DESLORATADINE

LaShondra Powell<sup>1\*</sup>, Trey Howell<sup>1</sup>, Jamekia Holloway<sup>2</sup>, Colibri Jenkins<sup>2</sup>, Brandon Lineberry<sup>1</sup>, David Yokum<sup>1</sup>, and Rob Rockhold<sup>1</sup>, <sup>1</sup>University of Mississippi Medical Center, Jackson, MS 39216, and <sup>2</sup>Tougaloo College, Tougaloo, MS 39174

Desloratadine (DES), a metabolite of the antihistamine, loratadine (Claritin<sup>®</sup>), is marketed as Clarinex<sup>®</sup>, for management of seasonal rhinitis. In vitro tests indicate that DES can block muscarinic receptors and possibly contribute to adverse effects, such as dry mouth or tachycardia. Two murine and one rat model were used to evaluate antimuscarinic actions of DES *in vivo*. In the pithed rat, DES (1 mg/kg, i.v.) inhibited negative inotropic (left ventricular dp/dt) and chronotropic effects caused by oxotremorine, a nonselective muscarinic agonist ( $p < 0.05$ ). Urethane-anesthetized (1.5 g/kg, i.p.) male ICR mice (25–35 g) were pretreated i.p. with vehicle, DES (1, 5 mg/kg) or a muscarinic antagonist, either atropine (AT; 0.5 mg/kg), atropine methyl nitrate (AMN; 0.5 mg/kg), diphenhydramine (1 mg/kg), methoctramine (0.5 mg/kg), or 4-DAMP (1 mg/kg). Oxotremorine (0.5 mg/kg, i.p.) was given 15 min. later and salivation evaluated for 30 min. Only AT and 4-DAMP inhibited salivation. In conscious mice, oxotremorine (0.5 mg/kg, s.c.) was given 15 min. following pretreatments and tremor, salivation and lacrimation evaluated. Only AMN and DES (at doses below 5 mg/kg) were ineffective at moderating tremor, while only AT, AMN and 4-DAMP inhibited salivation and lacrimation. DES exerts significant antimuscarinic actions in the heart, but not on salivation, lacrimation or tremor. (Supported by Aventis Pharmaceuticals).

#### MORPHOLOGICAL EVALUATION OF MRC-5 FIBROBLASTS AFTER STIMULATION WITH STATIC MAGNETIC FIELD AND PULSATING ELECTROMAGNETIC FIELD

Kimberly Pate\*, Hamed Benghuzzi, Michelle Tucci, and Zelma Cason, University of Mississippi Medical Center, Jackson, MS 39216

The quality of tissue repair and the speed with which that repair can be accomplished are the two major variables in the healing of any injury. Today, magnetic field exposure to traumatized areas has shown to be a promising tool in the healing process. The exact mode of action by which radiating and unchanging magnetic fields still has to be elucidated. The objective of this study was to evaluate the morphology of MRC-5 fibroblasts after stimulation with static and pulsating magnetic fields. Under sterile environment, a total of 24 wells were loaded with 50,000 MRC-5 cells each and further divided into three groups. Groups 1 and 2 were exposed to magnetic fields, static and pulsating respectively. Group 3 wells were unexposed and served as the control group. The cells were monitored at 0, 24, 48, and 72 hours and representative views were captured using digital analysis techniques. The live cells were screened for cellular mobility, cell distribution, and cellular morphology (size, shape, lysis, and background). After 72 hours, the supernatants and cells of all three groups were collected and MDA analysis was performed to determine possible cellular damage. Group 1 cells continued to grow at a reasonable rate, but there was substantial cell membrane damage (high MDA levels,  $p < 0.05$ ). Group 2 cells, appeared to be very stressed under these conditions especially at the initial phase (24 hours). In conclusion, the use of pulsating magnetic stimulation can be beneficial in the healing process of soft tissues.

#### MORPHOMETRIC ANALYSIS OF MRC-5 FIBROBLAST LIKE CELLS EXPOSED TO INTERMITTENT UV RADIATION

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The goal of this study was to develop a tissue culture model with and without cellular protection (anti-oxidants) in an attempt to prevent or treat squamous damage as a result of free radical generation. The specific aim was to evaluate the morphological responses of MRC-5 fibroblast cells exposed to UV-radiation and vitamin E supplementation. The criteria for the morphological evaluation was as follows; cell and nucleus shapes, size, N/C ratio, nucleus pleomorphism, hydropic swelling, as well as other features or characteristics of membrane and cytoplasmic alterations. The experimental design was divided into two phases. In the first phase the cells were exposed to radiation for 30, 45, and 60-minute intervals, the morphological evaluation was

assessed using Image Pro Digital Analysis technique. In the second phase, vitamin E was administered to the cells before and after exposure to 45 min of radiation. Data obtained demonstrated that, 45 minutes of radiation exposure caused traumatic stress to the cells, swelling, cellular debris and fragmentation. However, treatment with vitamin E pre and post exposure provided protection for the cells. Vitamin E treatment resulted in less cellular aggregation, more abundant eosinophilic cytoplasm and an overall healthy appearance. The data suggest that the use of vitamin E may minimize skin damage by protecting the integrity of the fibroblast cells for up to 72 hours in culture.

#### MORPHOMETRIC EVALUATION OF OVARIAN TISSUE EXPOSED TO PCB CONVENTIONALLY AND IN A SUSTAINED MANNER

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Most natural estrogens are short-lived, do not accumulate in tissue and are easily broken down in the liver. In contrast to natural estrogens, estrogenic drugs such as ethynylestradiol, diethylstilbestrol, synthetic environmental estrogens such as beta-hexachlorocyclohexane, polychlorinated biphenyls (PCBs), and phytoestrogens, are more stable and remain in the body longer than natural estrogens. Because most of these compounds are lipophilic, they tend to accumulate within the fat and tissue of animals and humans. Thus, depending on the natural estrogen levels, environmental estrogens may have different influences (mimicking, or blocking estrogen's effects) on estrogen activities. A total of 14 adult female rats were divided randomly into three groups. Animals in group I ( $n = 4$ ) served as control. Animals in group II ( $n = 5$ ) were injected with PCBs, and animals in group III ( $n = 5$ ) were implanted with TCPL capsules containing PCBs. Pap smears were obtained daily, and at the end of the experimental phase the animals were sacrificed and vital organs as well as reproductive organs were obtained and wet weights were recorded. Significant reductions in ovarian wet weights were found in all animals treated with either sustained release of PCBs or injection of PCBs. Ovarian tissue was further analyzed histologically to determine the effects of PCBs. Histomorphometric data revealed significant reduction ( $p < 0.05$ ) in the total ovarian area of animals treated with PCBs. Measurements of cross-sectional lengths confirmed the reduction seen in the area. Overall, the data suggest that PCB pollutants have produced detrimental effects on endocrine function as well as fertility regardless of the route of administration.

#### POOR PHYSICAL ACTIVITY IN RENAL TRANSPLANT RECIPIENTS: IS THERE A LINK TO CARDIOVASCULAR DISEASE?

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In the end stage renal disease (ESRD) population, cardiovascular disease (CVD) tends to occur at an increased rate compared to the general population. Physical inactivity is a common cause of muscle atrophy and may be related to muscle abnormalities and reduced functional state of the dialysis population. Information about physical activity levels could be important for identifying patients in need of physical therapy or other interventions designed to increase mobility. This multi-center prospective cohort study is concerned with the level of physical activity in RTR prior to, six months, and one year after transplantation. Physical activity levels are assessed using Physical Activity Survey for the Elderly (PASE), a brief, valid, self-report of physical activity during a one-week recall period. The control group for this study consists of "healthy" (free from renal disease and other chronic illnesses) individuals whose level of physical activity is measured against the activity of RTR. We hypothesize that the physical activity in renal transplant recipients is lower than that of their healthy counterparts. The control group did indeed have increased physical activity compared to RTR. Physical activity promotes good health and helps to prevent or fight against many chronic illnesses such as CVD. Physical activity programs should be encouraged in every population, and also as a part of post transplant care.

#### SINGLE CASE REPORT OF THE EFFECTS OF REFLEXOLOGY ON BLOOD PRESSURE, HEART RATE, CORTISOL, AND IMMUNOGLOBIN

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Eastern and Western philosophies of medicine and science have caused a controversy over effectiveness and appropriateness of using complementary and alternative therapies with Western treatments. More research has been done on reflexology in Asian countries. This case-based study of reflexology on a normal healthy adult involved a series of measures of the subject's blood pressure, heart rate, and collection of two saliva samples each workday afternoon at 3:30 for 20 days. Biochemical markers such as total protein, IgG, and cortisol levels were measured following standard lab protocols. On days two, four, seven, nine, twelve, fourteen, seventeen, and nineteen, a trained reflexologist administered approximately 40 minutes of foot massage before the measurements were taken. The results of this study demonstrated that blood pressure, heart rate, stress level proteins, and immunology are affected by reflexology. There was no significant difference in the cortisol levels during and after the treatment period.

#### THE CONSTRUCTION OF A CHANNEL CATFISH

INSULIN-LIKE GROWTH FACTOR HORMONE, IGF-1  
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Channel catfish production, which has excellent growth compared to other catfish currently being used by producers and is recommended for food production, has become an emerging commercial industry in the Mississippi Delta. Commercial producers are seeking various ways to increase growth production and yield. This is done primarily through studies of growth performance, carcass composition, and fillet yield. Of particular interest are serum hormone levels such as the insulin-like growth hormone IGF-1. Isolation and/or the construction of a DNA probe of the gene can provide an important tool which can be used to improve techniques for the selection of superior growing lines of channel catfish for the aquaculture industry. Using the polymerase chain reaction and manipulations of the process, we created a small construct of an insulin-like growth factor hormone of channel catfish, IGF-1. This construct was designed using cDNA made from mRNA extracted from channel catfish's liver and a bacterial artificial chromosome library of channel catfish. The construct was prepared using primers which correlated to the insulin-like growth factor hormone sequence which had previously been reported in literature and several created in house. The created construct consisted of the mature protein cloned into a TOPO TA vector. Implications of these findings will be discussed.

#### THE DESIGN AND EVALUATION OF A PROGRAM TO ASSESS THE ACCURACY OF CYTOTECHNOLOGISTS IN TRAINING IN THE DIAGNOSIS OF CERVICAL/VAGINAL SMEARS

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The purpose of this study was to design a program to improve the competency of cytotechnology students in assessing cervicovaginal smears using kappa statistic to evaluate inter-rater agreement among cytotechnology students. Kappa statistic used as a measurement of agreement, training programs can employ a more accurate measure of assessing student performance. Study Design: Cervicovaginal smears (n = 3,075) were randomized for evaluation by eight cytotechnology students (Fall, 2000). The students were instructed to evaluate and apply standard cytologic criteria. Following evaluation, students were instructed to assign one of the five-targeted diagnoses according to the Bethesda System classification. In addition, students determined smear adequacy and the presence of pathologic organisms. The final results were analyzed using SPSS and Stata statistical software. Results: The kappa, false positive

(FP), and false negative (FN) rates for the students' evaluations were generated, as well as smear adequacy and the detection of pathologic organisms. The kappa for the first grouped session was  $0.07 \pm 0.08$  to  $0.49 \pm 0.31$  (class average  $0.23 \pm 0.08$ ) and for the last grouped session was  $0.43 \pm 0.22$  to  $0.69 \pm 0.18$  (class average  $0.57 \pm 0.07$ ). The average weighted kappa for the grouped sessions were  $0.25 \pm 0.07$  to  $0.56 \pm 0.05$ . As expected, the values are lower than the unweighted kappa due consideration of the closeness to the targeted diagnosis. Conclusions: The results can assist in selecting appropriate corrective action when student's competency falls below acceptable levels. Consequently, these observations can improve a cytotechnology student's competency, leading to improved health outcomes for patients and improved cost effectiveness in healthcare organizations.  
\*Graduate Student in CHS

#### THE EFFECT OF EXERCISE ON THE RELAXATION RESPONSE

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It is now widely accepted that exercise is a valid way to alleviate many of the effects of environmental and emotional stress. Various studies have shown dissipation of stress chemicals after exercise. We also know that exercise stimulates growth and repair processes by stimulating the release of certain chemicals. It is also known that exercise causes the release of brain chemicals called endorphins that tend to make one relax. In this research effort we attempt to document a linear connection between simple exercises and relaxation markers like the galvanic skin response GSR. The results of our research in this area will be presented. We have preliminary data indicating that people who exercise regularly can relax more easily than someone who leads a purely sedentary life style. In other these tests we tested subjects prior to exercise then had them do mild exercise then re-tested them immediately following the exercise. These tests indicate that mild to moderate exercise can have an immediate effect on the relaxation response.

#### THE EFFECT OF VARIOUS CORTISOL CONCENTRATIONS ON THE MITOTIC ABILITY OF MRC-5 CELL LINE

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Fibroblast cells are an essential component of the acute inflammatory process and ultimately wound healing. Fibroblasts in normal metabolic conditions constitute a simple cellular model for the study of anti-inflammatory drugs in culture, and for this reason this model was selected to investigate the effects of cortisol dosage on an established fibroblast cell line. MRC-5 cells were obtained in culture

tubes plated with 50,000 cells per tube. Tubes were divided into four groups and each group was further divided into 5 tubes per time phase (24, 48, and 72 hours). Group 1 cells were treated with 10  $\mu$ L of vehicle, cells in group II-IV were treated with 1, 10, and 50  $\mu$ g cortisol; respectively. At the end of 24, 48, and 72 hours, live cellular images were captured before the cells were harvested for cell number and cell metabolic profile determinations (protein determinations and markers of cellular damage). An immediate depression of the rate of cell proliferation occurred upon addition of glucocorticosteroids to cultures of fibroblasts in the early growth stages. High dose administration caused the most significant level of cellular suppression. Surviving cells at 72 hours began to show signs of cellular proliferation and recovery. In conclusion, cortisol suppresses the cellular proliferation of MRC-5 fibroblast cells after 24 hours and the cellular recovery seen at 72 hours is most likely caused by the metabolism of the cortisol into an inactive metabolite.

#### THE EFFICACY OF TCPL AS E PLUS P REPLACEMENT THERAPY MODEL USING OVARIECTOMIZED RATS AS A MODEL

Zelma Cason<sup>1\*</sup>, Hamed Benghuzzi<sup>1</sup>, Michelle Tucci<sup>1</sup>, and Barry England<sup>2</sup>, <sup>1</sup>University of Mississippi Medical Center, Jackson, MS 39216, and <sup>2</sup>University of Michigan Medical Center, Ann Arbor, MI 48109

Tricalcium phosphate lysine (TCPL) delivery system was used to deliver various organic compounds at sustained levels in many different models. The specific aim of this investigation was to utilize TCPL delivery system as a model for estrogen (E) plus progesterone (P) replacement therapy in post-ovariectomized adult rats mimicking a postmenopausal condition. A total of 13 adult female rats were used in this study. The animals were randomly divided into four different groups: groups 1, 2, and 3 were ovariectomized (OVX), OVX plus E (20 mg loaded TCPL), and OVX plus E (TCPL, 20 mg) plus P (TCPL, 60 mg) treatment. Group 4 animals (n = 4) served as intact control group. Blood samples were collected biweekly for 33 days. Vaginal smears were taken and screened daily during the entire investigation. The total serum levels of E, P, luteinizing hormone (LH), and follicle stimulating hormone (FSH) were measured by means of radioimmunoassay procedure. Data obtained from this investigation suggest the following: (I) OVX resulted in an increase in total serum levels of LH and FSH within 2 days post-ovariectomy, (II) TCPL were capable of releasing sustained levels of E (10–40 pg/ml) and P (2.30–3.75 ng/ml) at the end of second day and continued until the 33<sup>rd</sup> day, (III) the sustained levels of E plus P were able to suppress the post ovariectomy rise of LH and FSH to almost undetectable levels, (IV) sustained delivery of E resulted in maturation of vaginal epithelium and the smears exhibited the estrus phase throughout the investigational period (V) E + P treatment induced no estrus and the

epithelial changes resembled the OVX group. \*Graduate Student in CHS

#### THE PATHOPHYSIOLOGY OF DIOSGENIN REPLACEMENT THERAPY

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Diosgenin is a steroidal saponin, which is extracted from the root of wild yam (*Dioscorea villosa*). It has been reported to have tremendous medical applications and as an herbal extract appears to be free of any major adverse effects. Recently, wild yam has been used to alleviate post-menopausal symptoms and is sold unregulated over the counter at a variety of pharmacy and health food stores. The specific objectives of this study were to continuously deliver diosgenin to adult ovariectomized female rats for 45 days and follow changes in body weight, organ weight and histopathological changes in the adrenal gland. Adult female Sprague Dawley rats were divided into three equal groups. Rats in group I served as the control group, animals in group II were ovariectomized and animals in group III were ovariectomized and supplemented with tricalcium phosphate (TCP) drug delivery system loaded with 500 mg diosgenin. Serum analysis of animals supplemented with diosgenin showed levels ranging between 3.98–5.31 ng/ml diosgenin. The results indicated that ovariectomized animals had a significant increase in body weight and spleen weights. Slight increases in wet adrenal weights were observed in the ovariectomized group compared to the control animals. Histopathological evaluation of the adrenal gland revealed an increase in the cortical and medullary adrenal areas of the ovariectomized group and a significant decrease in area in the diosgenin treated animals ( $p < 0.001$ ). The information is important because reduction in adrenal mass poses a potential risk for major endocrinological complications.

#### THE ROLE OF BLACK SEED IN THE PROLIFERATION AND BIOCHEMICAL MARKER LEVELS OF HEP-2 CELLS

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For centuries, people in the Middle East and Southeast Asia have used *Nigella sativa*, also known as black seed (BS), for its homeopathic effects. The objective of this study was to investigate the role BS might have on the metabolic biomarkers of the Hep-2 cell line. The experimental design entailed six groups of five wells each (50,000 cells). Groups II through VI were treated with BS, lipopolysaccharide (LPS), cortisol, LPS + cortisol, and BS + LPS + cortisol, respectively. Group I was the untreated control group. At the end of 24, 48, and 72 hours, the total cell count, protein and MDA levels were measured by

following standard lab protocols. Data collected from this study revealed that Hep-2 cells exposed to LPS and cortisol (group V) resulted in a decrease in cell proliferation compared to the control. BS treatment induced a higher proliferation rate than group V. Similar trends were observed in the metabolic behavior of Hep-2 cells as evidenced by the total protein and MDA levels. The exposure of BS showed a shift in the metabolic pathways. In conclusion, this study showed that exposure to LPS resulted in an alteration in the metabolic function and this phenomenon was further escalated under stressful conditions (increased cortisol exposure). In addition, the use of BS reversed the traumatic condition.

#### USE OF THE PAP STAIN VERSUS THE DQ STAIN ON THE DISTINCTION OF CELLULAR PATTERNS UPON EXPOSURE TO ESTROGEN

Learnesto R. Vassar\*, Hamed Benghuzzi, Michelle Tucci, and Zelma Cason, University of Mississippi Medical Center, Jackson, MS 39216

The literature is lacking on the exact distribution of cornified cells during the estrus cycle upon exposure to E in adult fertile female rats. The specific objectives of this study were to investigate the effects of E on the cyclic activity of adult female rats, and to compare the use of the Papanicolaou (PAP) stain versus the Diff Quik (DQ) stain on the distinction of cellular behavior upon exposure to E for three days. Six different laboratory rats (three control and three experimental) were labeled from 1–6 (R1–R6). Cyclic activity (2, 4, 8, 12, 24, 36, 48, 72 hours) was assessed by using 0.5 ml Hank's solution unloaded in the vaginal canal for few seconds followed by gentle pipet suction. This mixture was then smeared onto microscopic slides and stained using PAP and DQ stains. Once the slides were screened, it was found that the PAP stain proved to be a better staining technique than the DQ stain in both nuclear and cytoplasmic details. In the second stage of this experiment, the rats labeled R1–R3 were used as controls, whereas lab rats R4–R6 had estrogen administered (2 mg/ml) to them for three days. The results showed a significant increase in the proliferation of degenerative cells in the E treated rats compared to control animals.

#### VASCULARIZED FIBULAR GRAFT

Audrey Tsao\*, William Lineaweaver, Sheila Lindley, Vipul Sud, Kye Higdon, Javad Tavassoli, Ruth Ann Buckhalter, and Charity Peacock, University of Mississippi Medical Center, Jackson, MS 39216

This study is to investigate the success of Vascular Fibular Grafts (VFG), a standard care option for the treatment of Avascular Necrosis (AVN). Methods: Patients with a minimum age of 18, with AVN in Stage II or above based on Steinberg/UPenn system are considered for this procedure. Patients are offered a variety of surgical options



depending upon the progression of their disease and what best will suit their lifestyle. The VFG utilizes a piece of fibular bone, including the attached blood vessels, inserted into a core decompression of the femoral head. The harvested vessels are then anastomosed to the hip area vessels, hence improving blood flow to the femoral head. Clinical outcomes are measured by Harris Hip Scores (HHS), SF36, and/or radiographic evaluations pre- and post-operatively at six weeks, three, six, and twelve months and annually thereafter. Results: The University of Mississippi Medical Center has presently enrolled eleven patients with twelve procedures. At present, there has been no progression of disease, increased HHS, increased quality of life, and a decrease in pain. Discussion: The improvement in HHS correlates well with radiographic vascularization of the femoral head and patients returning to normal activities of daily living (ADL). We hope to prove this procedure will decrease the need for future total hip replacements.

#### DELTA OPIOID AGONIST IMPROVES SURVIVAL FOLLOWING HEMORRHAGE IN RATS

R. Sumrall\*, J. Penton, A. Smitherman, and D. Hildebrandt, University of Mississippi Medical Center, Jackson, MS 39216

Mortality from hemorrhage is due to ischemic end-organ damage. Therapy is aimed at increasing systemic oxygen delivery; few studies have addressed reducing demand. This study was designed to determine if the delta-opioid agonist DADLE (D-ALA2-LEU5-enkephalin), which reduces metabolism and increases survival of ischemic tissues, increases survival in a rat shock model. Experiments were done in conscious rats (300–350 g) with catheters in a femoral artery for blood removal and measuring arterial pressure (AP) and heart rate (HR), and in a femoral vein for drug infusion. Following control measurements, 3.25 ml/100 g body weight of blood was removed over 20 minutes, followed by i.v. DADLE (1 mg/kg), saline or norepinephrine (7 µg/kg; NOR) in a 200 µl bolus. None of the saline rats (n = 3), but 4 of 5 NOR and 6 of 7 DADLE rats lived 180 minutes post-hemorrhage. Mean AP before (124±4 mmHg NOR; 121±3 DADLE) and following hemorrhage (94±4 mmHg NOR; 94±5 DADLE) were similar in the surviving groups, as were HR before (277±9 bpm NOR; 261±4 DADLE) and after (260±19 bpm NOR; 247±10 DADLE). Plasma lactate, the most sensitive measure of tissue ischemia, increased in NOR (1.1±0.3 to 4.5±2.7 mmol/L) but not in DADLE (0.8±0.2 to 1.0±0.3). Thus, DADLE increased survival similar to NOR, a common treatment, but without the metabolic cost of increased lactate, which should improve long-term survival. Therefore, DADLE could be a clinical treatment for hemorrhagic shock.

#### INCREASED SKIN TRANSPLANT SURVIVAL WITH

#### DELTA OPIOID AGONIST

J. Penton\*, A. Smitherman, R. Sumrall, D. Hildebrandt, University of Mississippi Medical Center, Jackson, MS 39216

A major cause of failure of transplanted or transposed tissue is ischemia from inadequate blood supply. Most treatments focus on increasing blood supply, little has been done on decreasing demand. This study was designed to determine if the delta-opioid agonist DADLE (D-ALA2-LEU5-enkephalin), which reduces metabolism of tissues, increases survival of muscle-skin flaps. Pedicled rectus abdominus muscle-skin (TRAM) flaps were created in rats. All rats received 1 ml total of saline, with or without DADLE (1 mg/kg flap weight), injected into the underside of the flap. Rats were examined daily and the extent of necrosis estimated to the nearest quartile for each of 4 zones (Z). None of the DADLE rats (n = 9), but 4 of the control (CON; n = 9) rats developed Z4 necrosis (Z4N) on day 1, one of these also developed Z3N. By day 3 all CON had necrosis, greater than 25% in Z4 in 6 animals; 4 also with Z3N. Only 7 DADLE rats had necrosis, 1 greater than 25% Z4N, only 2 of these also Z3N. By day 6 all rats in each group had Z4N, 7 greater than 50% Z4N in CON, and these 7 also Z3N. Only 5 DADLE had Z3N, and only 3 greater than 50% Z4N. Even a single treatment with DADLE improved TRAM flap survival compared with saline, noticeable even out to 6 days post-surgery. Thus, DADLE may prove to be a valuable treatment option for increasing survival of pedicled flaps for reconstructive surgery.

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### THURSDAY AFTERNOON

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#### Lake View II

#### 2:00 RENAL FUNCTION CURVE IN NORMOTENSIVE AND DOCA-SALT HYPERTENSIVE RATS DURING CHRONIC MINOXIDIL TREATMENT

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This study tested the hypothesis that the chronic-salt loading pressure-natriuresis curve determines the level of arterial blood pressure in both normotensive and DOCA-salt hypertensive rats during chronic minoxidil treatment. The rats were divided into 8 groups: control, minoxidil, salt, salt-minoxidil, DOCA, DOCA-minoxidil, DOCA-salt and DOCA-salt minoxidil. DOCA-pellets (75 mg) were implanted subcutaneously in the DOCA animals. Minoxidil, 3 mg/day, was given orally to the rats in the minoxidil groups. The rats in the salt groups drank saline while the rats in the non-salt groups drank tap water. Sodium intake was measured every 24 hours. Mean arterial blood pressure was measured at the end of 6 weeks. There were no significant

differences in salt intake among any of the non-salt groups. Minoxidil treatment did not significantly change salt intake in any of the tap water or saline animals. Arterial pressures were  $119 \pm 4$  mmHg (control),  $117 \pm 4$  mmHg (minoxidil),  $111 \pm 3$  mmHg (salt),  $111 \pm 3$  mmHg (salt minoxidil),  $139 \pm 8$  (DOCA),  $133 \pm 4$  (DOCA minoxidil),  $160 \pm 5$  (DOCA-salt),  $146 \pm 9$  (DOCA-salt minoxidil). There was a significant effect of DOCA and an interaction between DOCA and salt treatment to result in a significant increase in MAP. However, neither saline nor minoxidil treatment alone had a significant effect on MAP. Chronic minoxidil treatment did not shift the chronic salt-loading pressure-natriuresis curve in either normotensive or hypertensive rats. These results indicate that chronic salt-loading pressure natriuresis curve plays a central role in long term control of arterial blood pressure and the development of DOCA-salt hypertension.

#### 2:15 COMPARISON OF TEN TUMOR ANTIGENS FOR THE SERODIAGNOSIS OF PANCREATIC CANCER

Margot Hall<sup>1\*</sup>, Sabrina Bryant<sup>1</sup>, Margaret Jackson<sup>1</sup>, James T. Johnson<sup>1</sup>, Harold Schultze<sup>1</sup>, Shawn Clinton<sup>1</sup>, Kevin Beason<sup>1</sup>, Cynthia Wilson<sup>2</sup>, Debbie Fortenberry<sup>1</sup>, Cynthia Bright<sup>1</sup>, Helen Hua<sup>1</sup>, Jiarong Ying<sup>1</sup>, Paul Sykes<sup>1</sup>, Kay Hollifield<sup>3</sup>, and Charlton Vincent<sup>3</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406; <sup>2</sup>University Medical Center, Jackson, MS 39216; and <sup>3</sup>Laurel Clinic for Women, Laurel, MS 39442

Pancreatic cancer (CA) is a serious health problem. Due to its non-specific early symptoms, pancreatic cancer is frequently not diagnosed until late stage disease when the prognosis is poor. A noninvasive early detection method is sought. In this study, sera from 554 patients (16 pancreatic CA, 128 other GI CA, 216 other CA, and 195 non-CA) were assayed for the presence of tumor antigens and the results correlated with diagnoses established pathologically. Immunoassay test kits from Hybritech (CEA, CA195), Centocor/Fujirebio Diagnostics (CA125, CA19-9, CA72-4, CA15-3, CA27.29, Cyfra21-1), CIS Bio International (CA50), and Abbott (AFP) were used to test for the concentration of these antigens. Using the manufacturer's decision values the following diagnostic sensitivities were obtained for pancreatic cancer: CA195 100.0%, CA19-9 66.7%, CA50 66.7%, CA125 40.0%, CA 27.29 40.0%, CEA 37.5%, CA72-4 31.3%, Cyfra21-1 26.7%, CA15-3 26.7%, and AFP 18.2%. Diagnostic specificities were above 75%. Nine/sixteen pancreatic CA patients had a CA195 concentration  $> 50x$  the upper limit of normal (ULN). Two patients had CA195 concentrations  $> 1000x$  ULN prior to their diagnosis by conventional methods (imaging and biopsy). We conclude that CA195, CA19-9, and CA50 were especially useful in the diagnosis of pancreatic CA.

#### 2:30 THE EFFECTS OF METABOLESS AND OXIDATIVE STRESS ON THE SURVIVAL OF MCF-7 BREAST CANCER CELLS

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Metaboless is available as over the counter nutritional supplement. It contains many antioxidants and is used for weight control. There have been no studies done with regards to its protective/adverse effects on breast cancer. Our objective therefore was to expose MCF-7 breast cancer cells to its extracts (alcohol and water) and monitor their survival under various concentrations and also in combination with  $H_2O_2$  as an oxidative stressor. Using standard cell culture techniques, exposure protocols in 96 well plates and an Accent fluoroscan, percent survival was computed from the data comprising three replicates of three different experiments. Contrary to our expectations, the results showed that the alcohol extract alone or in combination with  $H_2O_2$  caused adverse effects to these cells. The effective concentrations ranged from 1.95 to 1000 ppm. At the range of 500–1000 ppm, alcohol extract and its combination with  $H_2O_2$  were able to completely inactivate these cells. Water extract of this product was not found to be as effective in inactivating MCF-7 cells even at the highest concentration of 1000 ppm. The combination of both extracts and  $H_2O_2$  was found to be as effective as  $H_2O_2$  alone in inactivating these cells defying the protective theory of antioxidants with regards to breast cancer (no antagonism or synergism). In conclusion, Metaboless as a diet pill showed adverse effects on the survival of MCF-7 cells. Metaboless extracts applied alone or in combination with oxidative stress showed a potential preventive role in breast cancer, a finding that warrants further studies.

#### 2:45 USING GEOGRAPHIC INFORMATION SYSTEMS (GIS) TO CORRELATE LOCATION OF MAINSTREAM MEDICAL PRACTITIONERS WITH COMPLEMENTARY AND ALTERNATIVE THERAPY PROVIDERS

Margaret Drake\* and Fazlay S. Faruque, University of Mississippi Medical Center, Jackson, MS 39216

As complementary and alternative medicine (CAM) providers increase in number and acceptability to the mainstream American healthcare users, it is important to be able to compare the practice locations of CAM practitioners and traditional physicians. This is valuable for healthcare planning and economics, as well as for those attempting to pinpoint areas of service deficit. A nationwide survey reports a 40% increase of CAM customers between 1991 and 1997 without any increased acceptability of CAMs among the physician group. In an attempt to fill the void of studies conducted on CAM practitioners in Mississippi, this pilot was taken from an insurance company database. This company insures over 100,000 workers in Mississippi. The

study mapped both alternative providers and mainstream medical practitioners. Identified were areas with a high concentration of CAM and traditional practitioners. The demography of those areas was analyzed for correlation with practitioner locations. Most patients do not inform their physicians about using CAMs; in addition, most physicians do not ask patients about CAM use. This study will help the physicians to be aware of CAM practitioners in the vicinity of their practice locations and the probability of their patients being CAM users.

3:00 SPATIAL ANALYSIS OF TOXIC EXPOSURE SURVEILLANCE SYSTEM DATA OF PCC, UMMC, MS

Fazlay S. Faruque\*, Harpal Singh, Michael P. Hughes, and Frederick B. Carlton, Jr., University of Mississippi Medical Center, Jackson, MS 39216

This study analyzes the spatial distribution of the callers to the state's Poison Control Center (PCC) using Geographic Information Systems (GIS). Inappropriate use of chemical substances can have ill effects, which may range from mild to the most severe outcomes, even leading to death depending on the amount and type. Since 1978, the PCC at the University of Medical Center has been rendering prompt advice to the public and health care providers on matters of exposure to toxic substances, thereby helping in reducing not only morbidity and mortality but also in saving considerable time and money, which otherwise would have incurred in providing ambulance services and emergency room visits. Based on the geographic distribution and pattern of calls from different locations in the state, a community-based comprehensive plan could be undertaken for proper resource allocation to reduce potential dangers. This study analyzes one full year of data to identify geographic areas that are statistically significant in making calls related to toxic exposures and also generates hypotheses to explain the significant differences in number of calls.

3:15 STUDENTS' PERCEPTIONS AND USAGE PATTERNS OF DIETARY SUPPLEMENTS

Emily S. Dix\*, James K. Glisson, Jay Pitcock, Rob Rockhold, and Warren May, University of Mississippi Medical Center, Jackson, MS 39216

Medical, nursing, and pharmacy schools across the country have begun to integrate courses or lectures on alternative therapies including herbals and dietary supplements. However, a survey of student perceptions regarding these supplements is yet to be published. This study examined baseline usage patterns, attitudes, and knowledge levels of dietary supplements and herbal products among first year medical and pharmacy students at the University of Mississippi; this same cohort will be studied longitudinally through graduation (August 2003,

May 2003, April 2005) to monitor changes in usage patterns and/or knowledge levels throughout their course of study. Baseline assessments were conducted in September of 2002 using self-administered questionnaires in classroom settings. Ninety-six medical (58.5%) and 68 pharmacy (41.5%) students completed the survey. Fifty-four percent of medical students reported the use of dietary supplements either daily or at least once a week, compared to 47% of pharmacy students. When asked if "Dietary supplements can be unsafe during pregnancy," nearly 20% all students responded that they "don't know." Approximately 80% of medical students agreed that "It is possible for dietary supplements to contain plants/chemicals that are not intended to be in them," compared to 69% of pharmacy students. These preliminary findings suggest that pharmacy and medical students should receive detailed lectures on appropriate uses of dietary supplements as well as their regulation and approval processes.

3:45 Divisional Business Meeting

**HISTORY AND PHILOSOPHY  
OF SCIENCE**

Chair: Maritza Abril, University of Southern Mississippi

Vicechair: S. Kant Vajpayee, University of Southern Mississippi

**FRIDAY MORNING**

Lake View I

8:30 IS SPECIES REALISM A PHILOSOPHICALLY TENABLE POSITION?

Jason R. Busch, University of Southern Mississippi, Hattiesburg, MS 39402

Most philosophers of biology seem to treat species taxa as if they are ontologically real entities, and thus, are species realists. Realists claim that universals, such as justice, greenness or species, have a real, objective existence. In the philosophy of biology, the issue is whether the name 'species' designates a universal thing, namely a species taxon, or designates particular organisms that resemble one another in certain relevant respects. Nominalists, on the other hand, maintain that only particular objects exist and that only the names are universal. Thus, names designate particular objects or objects taken collectively, as in a set, but do not refer to universal things. This historical debate between realism and nominalism is relevant today in the recent literature in philosophy of

biology with regard to species. I will investigate the viability of species realism versus species nominalism for philosophy of biology.

9:00 HORIZONTAL AND VERTICAL DIMENSIONS OF THE ONTOLOGY OF SPECIES TAXA

Kenneth J. Curry\* and Paula J. Smithka, University of Southern Mississippi, Hattiesburg, MS 39406

The concept of species embodies two broad components. The species taxon is that group of individual organisms with sufficient cohesion to name the group (e.g., *Homo sapiens*); the species category is the rank to which we assign species taxa in our hierarchical model of evolution. The species taxon is the ontological component of species, while the species category is the epistemological component. The ontological component can be decomposed into two dimensions, horizontal and vertical, which is our focus here. The horizontal dimension of species comprises those properties instantiated in individuals by which we recognize a cohesive group, the species taxon. These properties, interpreted without an historical component, inform us of a cohesive, ontological structure, albeit without relationship to other taxa. The vertical dimension of species addresses causal relationships among species, and therefore its investigation must embrace several taxa. Causal relationships inform us of the relative importance with respect to inter-taxon relationships of properties recognized horizontally and provide logical ground for judging the ontological structure of a given taxon among other taxa. Both the horizontal and vertical dimensions of a taxon are necessary components of taxon ontology. Species concepts may reflect more strongly the vertical dimension (e.g., cladistic species, species-as-individuals) or the horizontal dimension (the biological species concept, ecological species) which leads to incomplete and confused ontology.

9:30 Break

9:45 THE PROBLEM OF SPECIES PERSISTENCE: SOME POSITIONS REGARDING CONTEMPORARY METAPHYSICS OF SPACE-TIME

Paula J. Smithka\* and Kenneth J. Curry, University of Southern Mississippi, Hattiesburg, MS 39406

We commonly say, “species exist” and “species go extinct,” thus, species (however they are defined) persist for some period of time. The issue of species persistence through time is investigated using two opposing views: endurantism and perdurantism. Endurantists argue that objects exist wholly and completely at different times. Perdurantists, on the other hand, argue that time is literally a “proper part” of objects. On this view, objects have temporal as well as spatial parts. These two different metaphysical views of the persistence of objects over time,

also adopt very different perspectives regarding the nature of time. Endurantists tend to be presentists, i.e., that whatever “really” exists, exists only in the present. The present time is privileged because it is what is here and now. This view takes tenses used in a language to be significant. Thus, when we understand tenses properly, we see the privileged position of the present tense. For example, what once existed but does not now exist, presently existed at some past time. Perdurantists, on the other hand, tend to be eternalists with respect to time. They argue that all times are equally “real,” so there is nothing “special” or privileged about the present time. The ramifications of these views for the issue of species persistence are explored.

10:15 GEORGE AND ELIZABETH PECKHAM: PIONEERING AMERICAN FIGURES IN ETHOLOGY, EVOLUTIONARY STUDIES, TAXONOMY AND SCIENCE EDUCATION

John D. Davis, St. Andrews Episcopal Middle School, Ridgeland, MS 39157

Accomplishments of the nineteenth century husband and wife team of George and Elizabeth Peckham have mostly gone unnoticed because their work is in the entomological literature. In fact, the Peckhams publications on the behavior and classification of jumping spiders and behavior of solitary wasps were crucial in supporting the theory of sexual selection and pioneered many of the techniques and concepts associated with ethologists of the mid twentieth century! In 1880 George Peckham organized the first American biological laboratory program in any high school at the Eastern High School in Milwaukee. He married his coworker, Mary Gifford, one of the first science graduates from Vassar. They set to work introducing Darwinian concepts into education and began their studies on the taxonomy and behavior of jumping spiders, a large group of visually oriented spiders. They were among the very first taxonomists to emphasize the value of behavior in classification. In 1889 they published one of the first studies on sexual selection, supporting Darwin’s concept against Wallace’s alternative explanation of courtship behavior. In 1898 they produced *On the Instincts and Habits of Solitary Wasps*—a literary as well as scientific classic. Unlike the later work of Fabre, which stressed the “perfection” of insect behavior, the Peckhams identified chained behaviors subject to natural selection. The Peckhams were inseparable researchers and educators.

10:45 Divisional Business Meeting

11:00 SCIENTISTS—THE BRAHMINS OF THE MATERIAL WORLD

S. Kant Vajpayee, University of Southern Mississippi, Hattiesburg, MS 39406

Scientists are the Brahmins of the modern world,

which is driven by our focus on the material life. By creating a separation between religion and state, we have carved out for them a secluded arena so that they are not disturbed by the hobnobbing of the spiritual issues. This enables them to concentrate on what is materially useful to us and not waste time on anything spiritual. They create for us the knowledge essential for increasing our gross domestic products (GDPs) and enhancing our standards of material living. We treat them as Brahmins by showing them some respect and never paying too much—else they fall prey to the habit of conspicuous consumption. Of all the kinds of Brahmins today such as teachers, engineers, lawyers, professors, doctors, and other professionals, scientists are undoubtedly at the top, since only they create new knowledge—others are active in simply disseminating and/or applying that knowledge. Scientists and researchers based at the institutions of higher learning are the keystones of the hierarchical structure of modern Brahmins. There is one difference, however. Unlike the past, we don't offer them the perk by accepting their sons also as Brahmins. Their children have to earn that title themselves, based on merit. Were religious leaders and philosophers to claim that they are the true Brahmins, scientists may accept the term Material Brahmins.

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## FRIDAY AFTERNOON

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### Lake View I

#### 1:30 THE LEGACY OF ALFRED RUSSEL WALLACE

Maritza Abril, University of Southern Mississippi, Hattiesburg, MS 39406

Alfred Russel Wallace is remembered as the man who almost got credit for the theory of evolution, but he was also a prolific field naturalist, geographer, biogeographer, anthropologist and philosopher with accomplishments substantial in their own right. This presentation focuses on his contribution to zoogeography, as he is considered to have invented it. Wallace introduced a new interpretation of the concept of the geography of animals as he was the first one to base animal distribution on the theory of evolution. Wallace embraced the concept of zoogeography not only as collecting facts about animals, classifying and comparing them but also as the study of the history of animals, their evolution, their changes through geological times, and the history of the continents of the world. His realization of the impossibility to understand geographical distribution of animals without taking into consideration all the possible changes which may have taken place in the distribution of land and masses and water converged in the formulation of Wallace's Line, a definite boundary in the Malay Archipelago. This line of demarcation derives from Wal-

lace's observations of the fauna of the islands and their geological history as they resemble the Indian or the Australian regions.

#### 2:00 A HISTORY OF ECOLOGY

Robert G. Hamilton, Mississippi College, Clinton, MS 39058

Ecology originated from studies of natural histories and species distributions in the nineteenth century. The science of ecology began to take shape as researchers investigated the relationships among organisms and the relationships between organisms and the environment. Modern ecology is a broad multidisciplinary highly quantitative science with its own philosophical approaches to science. Ecology is not, however, in any sense a political movement, nor are ecologists in any sense necessarily affiliated with any particular political movement.

#### 2:30 Break

#### 2:45 MINORITIES AND AIDS RESEARCH: THE DILEMMAS OF BALANCING ETHICS

Hellen Ransom, University of Southern Mississippi, Hattiesburg, MS 39406

In recent years there has been a crisis growing in epidemic proportions, the calamity of acquired immune deficiency syndrome (AIDS). AIDS is a disease that does not discriminate on the basis of color, gender, religion, nationality or socio-economic background. Since its discovery, those who have contracted AIDS have been subjected to undeserved inequity. Isolation, increase in healthcare costs, and a lack of effective treatment are just some of the problems that AIDS victims have to endure. Frederic G. Reamer lists the critical ethical choices that face those in the midst of the AIDS crisis as those related to "privacy, mandatory screening, civil liberties, health care financing, research on human subjects, AIDS activism, treatment, and obligations of professionals" (AIDS and Ethics 3). Under ideal circumstances, AIDS victims would receive the best in health care and the support necessary for dealing with such a devastating illness. However, the value that is placed upon AIDS victims is very little. This presentation will specifically address the inadequate medical and ethical treatment that minorities with AIDS receive.

#### 3:15 METAPHORS AND THE FOUNDATION OF SCIENCE

Robert Waltzer, Belhaven College, Jackson, MS 39202

Apparent design is acknowledged within biology and is communicated by metaphor. Design as a metaphor *per se* is legitimate, but the concepts imported covertly with it lead to difficulties. This presentation will characterize the difficulties with both the use of the design metaphor and the removal of the designer. Structure-function relationships are

described in the same way in biology as they are in engineering, in which actual design is accepted. Without an accepted designer for biology, application of such thinking is metaphorical. Terms related to this metaphor include function and role, and can be referred to as design-related. In a structure understood as due to natural processes, such as a broken tree trunk upon which someone fell, would one say that the function of the trunk was to impale someone? No. It should be equally inappropriate to say that the function of, for instance, the kidney, is excretion. In analysis of actual design, the first assumption made is that there is a designer. Further assumptions are based upon that and include the following: that each part has a function; that each part somehow contributes to the overall function; and that we are able to detect this. In removing the designer, the subsequent assumptions make no sense. But such is done in biology. To keep the subsequent assumptions the designer must be kept or the design-related terms justified. If one avoids *a priori* commitments and evaluates the evidence and logic, one solution might be to admit the possibility of a designer.

**MARINE AND ATMOSPHERIC SCIENCES**

Chair: Patricia M. Biesiot, University of Southern Mississippi  
Vicechair: Chet Rakocinski, University of Southern Mississippi

**THURSDAY MORNING**

Forrest II

8:50 Introduction

9:00 RECRUITMENT OF EARLY BLUE CRAB STAGES AS AN INDICATOR OF NURSERY HABITAT VALUE AT FIVE INSHORE LOCATIONS

Chet F. Rakocinski\* and Donna M. Drury, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39566

Different types of nursery habitat presumably contribute disproportionately to the stock-recruitment relationship of blue crab (*Callinectes* spp.). Although seagrass is known to be an important blue crab nursery habitat, recruitment dynamics for other inshore habitats are less well-known. Using suction sampling, we compared nursery habitat value for early stages of blue crab among five inshore locations in Mississippi waters. Seven sites distributed among the five locations represented various

types of nursery habitat, including up-estuary submerged aquatic vegetation, flooded *Spartina* marsh-edge, and unvegetated subtidal sediment. Site-specific variation in abundances and size distributions of early juvenile blue crabs reflected effects of important habitat and hydrological features on blue crab recruitment. The highest densities of early blue-crab stages were observed at the mouth of Old Fort Bayou from habitat defined as flooded *Spartina* with mixed shell/detritus substrate. Densities of small (post-settlement) (< 6 mm CW) and large (> 6 mm CW) crabs varied differently among sites; densities of small crabs varied temporally, reflecting two monthly pulses of peak settlement over the 6 week study period. Overall, densities of large crabs did not vary temporally; however, temporal coupling between small and large stages occurred at some sites. Currents as well as active movements of early stages likely play important roles in blue crab recruitment dynamics.

9:15 EFFECTS OF DISSOLVED OXYGEN CONCENTRATION ON BUDDING OF *AURELIA AURITA* AND *DRYMONEMA DALMATINUM* SCYPHISTOMAE

Brian D. Ortman<sup>1\*</sup>, W. Monty Graham<sup>2</sup>, Harriet M. Perry<sup>3</sup>, and Patricia M. Biesiot<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406; <sup>2</sup>Dauphin Island Sea Lab, Dauphin Island, AL 36528; and <sup>3</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39566

The effect of dissolved oxygen concentration ([DO]) on budding of *Aurelia aurita* and *Drymonema dalmatinum* was investigated as part of a project to examine the effects of environmental variables on scyphozoan asexual reproduction. Laboratory raised polyps were placed individually into separate wells of a six-well tissue culture plate. Groups of five replicate plates, for a total of 30 polyps per treatment, were immersed in airtight containers that were bubbled with nitrogen gas to achieve low [DO]. The experimental levels were 3.5, 2.5, 1.5, and 0.5 mg/l; the control [DO] was air saturated (~6.3 mg/l at ~24–25°C). In a previous study, we found that salinities > 25 ppt and temperatures > 20°C with a frequent (three times per week) feeding regime resulted in successful budding in both species. Therefore, scyphistomae in the present study were kept at 35 ppt, 24–25°C, and fed 48 h-old *Artemia* nauplii three times per week. Newly budded polyps were counted three times per week for the duration of the two-week experimental period. The [DO] was monitored every 8 h to ensure that the appropriate levels were maintained. Results are incomplete; however, the rate of successful budding appears to decrease with decreasing [DO].

9:30 APPLICATION OF NON-STATIONARY TIME SERIES ANALYSIS TECHNIQUES TO

## MISSISSIPPI SOUND DATA

Catherine R. Edwards\* and Cheryl Ann Blain, Naval Research Laboratory, Stennis Space Center, MS 39529

Harmonic analysis methods have dominated time series analysis in oceanography. However, physical processes analyzed using Fourier methods are rarely both linear and stationary, conditions for proper application. Alternate spectral analysis tools must be used in data analysis of nonlinear or non-stationary signals. Two newer methods are explored with respect to processes in the Mississippi Sound: the continuous wavelet transform (CWT) and the Huang-Hilbert transform (HHT). Wavelet analysis is based on a convolution of the signal with a mother wavelet into frequency space. Power spectra of the wavelet transform provide the time-varying frequency analysis desired of non-stationary processes. Huang-Hilbert analysis decomposes the signal first through a process known as Empirical Mode Decomposition (EMD). Application of the Hilbert transform to the resultant components yields the energy-frequency-time distribution. Time series of instantaneous frequency from either method allows more complete study of transient signals, which serves to clarify the dynamics involved in non-stationary and nonlinear processes. Both methods are applied to coastal circulation processes in the Mississippi Sound, the utility of both techniques are evaluated using statistical significance tests, and the underlying dynamic processes are examined.

9:45 CARBON INCORPORATION PATTERNS IN VERTICALLY MIGRATING POPULATIONS OF THE RED TIDE DINOFLAGELLATE, *KARENIA BREVIS*

Xuemei Bai<sup>1\*</sup>, Steven E. Lohrenz<sup>1</sup>, Donald G. Redalje<sup>1</sup>, and Gary J. Kirkpatrick<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Stennis Space Center, MS 39529, and <sup>2</sup>Mote Marine Lab, Sarasota, FL 34236

Prior laboratory studies and modeling have provided evidence that the migratory behavior of the red tide dinoflagellate, *Karenia brevis*, is strongly influenced by cellular biochemical fluxes. Here, we report results of measurements of the incorporation of photosynthetically fixed inorganic <sup>14</sup>C into major subcellular end products in migrating populations of *K. brevis* during bloom events in Florida coastal water in 2000 and 2001. Samples were incubated with bicarbonate in simulated *in situ* conditions on board ship, and determinations were made of <sup>14</sup>C-incorporation into low molecular weight materials (LMW), lipid, carbohydrate + nucleic acids, and protein. Measurements were also made of incorporation of <sup>14</sup>C into the nitrogen transport amino acids, glutamine and glutamate. Carbon flux showed systematically higher proportion in carbohydrate + nucleic acids and lower proportion in protein in surface samples compared to that in deep samples. Responses to nutrient-enrichment exhibited enhanced

protein incorporation in both surface and deep populations and decreased incorporation into carbohydrate + nucleic acids. Therefore the ratio of protein/carbohydrate + nucleic acids appeared to provide an index of population physiological state. Carbon flux into glutamate and glutamine exhibited higher relative incorporation in deep populations as compared to surface populations. Our results support arguments that vertical migration behavior can be influenced by variations in cellular biochemical state.

10:00 Break

10:15 DEVELOPMENT OF RAPID, SENSITIVE BIOMARKERS FOR ASSESSING IMPACT OF CHEMICALS IN COASTAL ESTUARIES

Julia S. Lytle\* and Thomas F. Lytle, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39566

Rapid municipal and industrial growth along the nation's coastlines has resulted in degradation of coastal ecosystems. Environmental toxicants from municipal and industrial wastes, runoff from agricultural and recreational activities, and intense development activities are responsible for the degradation of these ecosystems. Often degradation of these ecosystems is not recognized early in the degradation process resulting in loss of integrity and function. Development of biomarkers that indicate exposure to toxic chemicals at the lower levels of biological organization have been developed using primarily animal test species. Use of estuarine plants as test species is very limited due to the lack of development and difficulties in their culturing. This paper reports the development and use of several good test species that can be used for monitoring estuarine health including a screening process for evaluating estuarine sediments. Estuaries are recipients of a wide range of herbicides which make the use of plant test species a more sensitive indicator than an animal species.

10:30 CHEMICAL ANALYSIS OF AQUARIUMS

Marcus Hennis<sup>1\*</sup>, Sara Pelleteri<sup>2</sup>, and Howard Walters<sup>2</sup>, <sup>1</sup>Cooperative Intern Program, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and <sup>2</sup>University of Southern Mississippi, J.L. Scott Marine Education Center and Aquarium, Biloxi, MS 39530

This project was to test the water quality in the tanks in the J.L. Scott Marine Education Center and Aquarium. The parameters included: pH, salinity, oxygen content, and temperature to determine the optimal range for marine life. An oxygen meter was used to find the levels of oxygen that is present in the water. A pH meter was used to determine the pH and the temperature. A pH meter tests the level of hydrogen ions that are present within the water. Each week tests were administered on the tanks to determine changes in pH, oxygen content, salinity, and temperature.

These data were then recorded each week on a chart for analysis.

10:45 COMPARATIVE LIPID ANALYSIS OF MYSIDS *AMERICAMYSIS BAHIA* AND *A. ALLENI* FROM TIDAL MARSHES OF THE MISSISSIPPI SOUND

J. Michelle Melnick<sup>1\*</sup>, Patricia M. Biesiot<sup>1</sup>, and Richard W. Heard<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39566

The mysids *Americamysis* (= *Mysidopsis*) *bahia* and *Americamysis alleni* are common demersal inhabitants of shallow tidal marshes along the Mississippi Sound. Because these two species co-occur in some areas, we believe that they compete for the same food resources. To test whether they have the same pattern of lipid storage, we performed lipid analysis of different life history stages for both species, including juveniles, males, non-gravid females, and gravid females. Specimens were collected during high tide in August 2002; water depth was ~0.7 m, salinity was ~25 ppt, and temperature was ~28°C. For each sample, we typically pooled 4–6 individuals and extracted the total lipids using standard methods. In general, *A. bahia* is slightly larger than *A. alleni* in terms of wet weight and has more total lipid per individual. However, when lipid content is normalized on the basis of wet weight, juvenile and male *A. alleni* had more lipids than those of *A. bahia*. This study must be repeated seasonally to confirm whether or not these observations hold true year round.

11:00 AN OVERVIEW OF SPECTRAL ANALYSIS WITH APPLICATIONS TO THE SEASONAL SIGNAL IN THE FLORIDA CURRENT

Kevin McKone<sup>1\*</sup>, Vladimir Kamenkovich<sup>1</sup>, Harley Hurlburt<sup>2</sup>, and Tammy Townsend<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Stennis Space Center, MS 39529, and <sup>2</sup>Naval Research Laboratory, Stennis Space Center, MS 39529

The written history of the Florida Current dates back almost 500 years. Ponce de Leon wrote that the current was so swift, his ships were unable to stem it. Explorers, sailors, and scientists have spent a good portion of these last 500 years trying to understand the flow in the Florida Current. One prominent feature that has been extensively studied in recent years is the seasonal signal in the Florida Current. Up to this date, no satisfactory explanation for the forcing of this seasonal signal has been found. It is only recently that computer models have been able to produce time series of sufficient length to allow the study of annual features in ocean currents. The Naval Research Labs (NRL) Layered Ocean Model (NLOM), a global 1/32 degree model, is one model that is able to produce transport time series that allow the study of annual signals. Using 25 year volume transport time series from different areas in the Intra-Americas Sea, and spectral analysis, I will talk about a possible explanation for this seasonal signal. A large part of this research entails the use and understanding of spectral analysis, which I will also briefly address.

11:15 Divisional Business Meeting

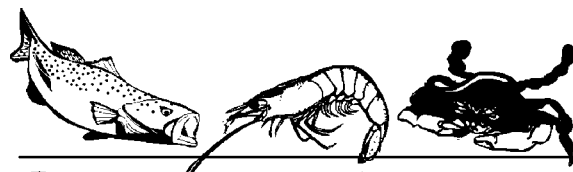


## We Need Your Help!

### MARINE FAUNAL INVENTORY

The *Center for Fisheries Research and Development* is creating a baseline faunal inventory for marine waters of Mississippi. The list will include *all species* collected from waters below Interstate 10 southward into the Gulf, three miles past the barrier islands. The Center is compiling the list at the Gulf Coast Research Laboratory.

We ask all scientists and educators to forward any records of occurrence with appropriate documentation. For questions or additional information please contact the Center.



**CENTER FOR FISHERIES**  
*Research and Development*

The University of Southern Mississippi

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Center for Fisheries R & D  
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AA/EOE/ADA

Funding: Coastal Impact Assistance Program

### THURSDAY AFTERNOON

Forrest II

1:00 COMPARATIVE BIOCHEMISTRY OF THE STOMATOPODS *SQUILLA EMPUSA* AND *SQUILLA CHYDAEA*: OVARIAN COMPOSITION

Julie A. Kamp<sup>1\*</sup>, Patricia M. Biesiot<sup>1</sup>, and Harriet M. Perry<sup>2</sup>,  
<sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39566

Studying the changes that female crustaceans undergo before spawning is an effective way to define reproductive health and gonadal development. In the present study, we examined the morphological and biochemical changes that occur in ovaries of the mantis shrimps *Squilla empusa* and *Squilla chydrea*; these species co-occur in several regions of the Gulf of Mexico. Although reproductive behavior and anatomy have been studied in *S. empusa*, nothing is known about *S. chydrea*. The specimens

used in the present study were collected off the coast of Texas during June 2002. They were frozen aboard ship and kept frozen until analyzed in the lab. Ovarian development in *Squilla* is divided into three easily identifiable stages: I, no development; II, developing ovaries in the thorax and abdomen; III, ripe ovaries fused at the telson. These stages can be assessed externally by color changes along the dorsal surfaces of the abdomen and the ventral surface of the telson. We measured the biochemical composition (total lipid, protein, and carbohydrate) of stage II and stage III ovaries from *S. empusa* and *S. chydrea* to determine if both species showed similar patterns of biochemical composition during ovarian development. Preliminary analysis of the data indicates some species-specific differences.

1:15 PROGRESSION OF FISH THROUGH A TIDAL MARSH IN THE MISSISSIPPI SOUND OVER A ONE-YEAR PERIOD

Michelle Branson<sup>1\*</sup>, Ryan McCoy<sup>1\*</sup>, Tiffany Smith<sup>1</sup>, Harriet M. Perry<sup>2</sup>, and Kirsten Larsen<sup>2</sup>, <sup>1</sup>Cooperative Intern Program, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553, and <sup>2</sup>University of Southern Mississippi, Gulf Coast Research

Laboratory, Ocean Springs, MS 39566

Marshes provide essential habitat for a wide variety of fish species. They are a source of both food and protection for the fish. Some fish are permanent residents of the marsh while others are transient visitors. For this study the progression of fish species using the marsh edge was documented over a one-year period. The marsh site used for this study was comprised of two plant species, *Spartina alterniflora* and *Juncus roemerianus*. Twice monthly a beam plankton trawl was pulled 100 meters along the marsh edge. The samples were brought back to the lab and preserved in a 10% formalin solution for a minimum of 24 hours. All fish were removed from the sample, identified, measured ( $\pm 1$  mm), and weighed ( $\pm 0.1$  g). Resident versus transient fish species and seasonal recruitment of larval and juvenile fishes were determined.

1:30 INDUSTRIAL AND AGRICULTURAL HEAVY METAL THREATS TO BELIZE CORAL REEFS

Thomas F. Lytle\* and Julia S. Lytle, University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39566

Belize has the world's second largest coral reef and is a primary tourist attraction. There is fear that development in coastal regions may threaten these sensitive biological communities. A study of impact of man on this reef began in 2001 to identify regions of pollutants that could be transported offshore to the reefs. Agriculture, industries, location of population centers and sewage treatment networks revealed 29 sites in Belize that could pose some eventual threat threats. The first group of analyses included the heavy metals: Co, Ag, Cu, Fe, Ni, Mn, Pb, Zn, and Cd. Haulover Creek, with its industries in the largest city, Belize City, contained Cu four times that found at other sites except in Rio Hondo near the Mexican industrial city of Chetumal where Cu exceeded other sites by 20-fold. These two sites had values of Zn far exceeding other sites. A site near an abandoned sugar refinery on New River had the highest levels of Ni and it along with estuarine sediments near Chetumal had excessive levels of Pb. There was little evidence of major transport of metal loads across coastal bays to the barrier islands and to the coral reefs from this initial study, however future analyses of petroleum residues and pesticides may suggest more caution than metal data.

1:45 ANALYSIS OF SWIMMING BEHAVIOR BY GELATINOUS ZOOPLANKTON IN ALTERED GRAVITY CONDITIONS: CTENOPHORE AND CNIDARIAN MEDUSA

Christina Watters\*, Brian Robinson, Brittney Hemba, Michael Dodge, Jennifer Anderson, Brian D. Ortman, and Patricia M. Biesiot, University of Southern Mississippi, Hattiesburg, MS 39406

We studied the swimming behavior of two species

of gelatinous zooplankton, a comb jelly *Mnemiopsis mccradyi* (Phylum Ctenophora) and a hydrozoan jellyfish medusa *Nemopsis bachei* (Phylum Cnidaria), under the altered gravity conditions generated aboard NASA's KC-135 aircraft. Both species use a statocyst to detect changes in gravity (geotaxis) and a photoreceptor to detect changes in light (phototaxis). Previous studies by other scientists have investigated the function of these sensory organs under normal gravity conditions on Earth (1-g). However, nothing was known about the relationship between these organs in providing orientation cues during periods of altered gravity. We investigated the effects of both microgravity ( $\sim 0$ -g) and hypergravity ( $\sim 2$ -g) conditions in combination with ambient cabin lighting and with a brighter, directed light source. Both species tended to move upward during the periods of microgravity and downward during the periods of hypergravity. The directed light source appeared to provide a directional cue that aided in orientation and movement for both species in microgravity but only for *Mnemiopsis* in hypergravity. This supports our hypothesis that light cues can be used for orientation when the statocyst does not function properly. Although we believe that the observed behaviors were active rather than passive responses, further studies are planned to confirm this hypothesis.

2:00 Break

2:15 Divisional Poster Session

WATER QUALITY CHARACTERIZATION AT THREE SITES IN THE DAVIS BAYOU WATERSHED, JACKSON COUNTY, MISSISSIPPI

Amanda Bowman<sup>1\*</sup>, Christine Trigg<sup>2</sup>, Faye Mallette<sup>2</sup>, and Harriet M. Perry<sup>2</sup>, <sup>1</sup>Cooperative Intern Program, Mississippi Gulf Coast Community College–Jackson County Campus, Gautier, MS 39553, and <sup>2</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39566

This study characterized the quality of the water at three sites in the Davis Bayou watershed in Jackson County. Within this small water body, there is the potential for localized enrichment due to industrial and aquacultural activities. For this study, water quality was examined weekly at each of the three sites during the fall and winter of 2002. Water temperature, salinity, and dissolved oxygen were measured in the field using a YSI dissolved oxygen meter. Water samples for chemical analysis were collected using a 2.5 L Niskin bottle. Water quality parameters examined included pH, ammonia, nitrite, nitrate, orthophosphate, and total phosphate. Concentrations were measured in the laboratory using standard methods of chemical analyses. Concentrations of each water quality parameter at the three areas were statistically analyzed to determine if there were significant differences in the water

quality among the three sites.

#### A COMPARATIVE STUDY OF BLOCKING HIGH INDEX AND AIR-SEA INTERACTIONS DURING CONTRASTING HURRICANE SEASONS OVER THE GULF OF MEXICO

Roberto Cancel III and R.S. Reddy, Jackson State University, Jackson, MS 39217

This study undertakes the task to relate the Blocking High Index (BHI) and Heat Flux to the amount of tropical activity in the Gulf of Mexico during the hurricane seasons of 1995, with strong activity, and 2002, with low to moderate activity. In this study, we utilized standard meteorological data, such as air temperature, water temperature, barometric pressure, and wind speed, from the National Data Buoy Center in order to calculate the Blocking High Index and Heat Flux. The data was collected from three strategically located buoys, buoy 42001, 42002, and 42003, in the Gulf of Mexico for May through November of 1995 and 2002. In calculating the Blocking High Index, we subtracted the average pressure reading from the observed pressure,  $BHI = (PO - P)$ . The Heat Flux was calculated with  $HF = (CPCD\{(TS-TA)\}U$  as the formula. By analyzing the collected data and the calculations from the study, we hypothesize that the higher the Blocking High Index, the more likely the tropical activity will be suppressed and vice versa. The study also supports the previous hypothesis (Reddy et al. 1999) that the higher the Heat Flux, the more likely the tropical activity will develop and vice versa.

#### PREDICTION AND DIAGNOSTICS OF STRUCTURE AND DYNAMICS OF HURRICANE ISIDORE 2002 OVER THE GULF OF MEXICO REGION USING A MESOSCALE NUMERICAL MODEL FOR STORM SIMULATION AND AIR-SEA INTERACTION EQUATIONS

Suseela R. Reddy and Alexander Schwartz\*, Jackson State University, Jackson, MS 39217

Previous studies by Reddy et al. (1999 & 2001) suggested that the air-sea interactions, including heat, momentum, and latent heat fluxes play a significant role in the birth and growth of tropical cyclones/hurricanes, Hurricane Opal and Hurricane Roxanne 1995, over the Gulf of Mexico. They have identified that sea surface temperature is one of the factors for the hurricane intensification. In the present study, we investigate air-sea interactions for a selected hurricane over the Gulf of Mexico, Hurricane Isidore 2002, using numerical modeling with Penn State/NCAR MM5. This modeling system is a useful research tool that is used for diagnostics on hurricane structure, movement, and prediction. Deadly winds, storm surges, and floods are all natural foes of human inhabitation. Although modern technology has been a great helping-hand

in tracking hurricanes, predicting the formation, movement, and strength of a hurricane has never been an easy task. Several computational models have been developed for this reason, yet it is merely a guess. Meteorologists rely on models to simulate and predict the weather circulation patterns as close to reality as possible, and along the way corroborate time and space efficiency issues. Predicting a hurricane's strength and its track could provide early warnings that could save life and property. The authors gratefully acknowledge support from the NASA/FAR Program, Grant—NAS13-99012, and the NASA/HBCU Renewal Energy and Technology Utilization Project, Grant—NAG5-12021.

#### PROGRESSION OF PENAEID SHRIMP THROUGH A TIDAL MARSH IN THE MISSISSIPPI SOUND OVER A ONE-YEAR PERIOD

Tiffany Smith<sup>1\*</sup>, Michelle Branson<sup>1</sup>, Ryan McCoy<sup>1</sup>, Harriet M. Perry<sup>2</sup>, and Kirsten Larsen<sup>2</sup>, <sup>1</sup>Cooperative Intern Program, Mississippi Gulf Coast Community College—Jackson County Campus, Gautier, MS 39553, and <sup>2</sup>University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39566

Larval penaeid shrimp hatch in the open Gulf and recruit into estuaries during their post-larval stages. Marshes are a source of both food and protection for these small shrimp. Shrimp remain in the marsh until their late juvenile stage, when they begin to move back into open waters. There are three commercial penaeid shrimp species in the Mississippi Sound: brown (*Farfantepenaeus aztecus*), pink (*Farfantepenaeus duorarum*), and white (*Litopenaeus setiferus*). For this study the recruitment of the three shrimp species to the marsh edge was documented over a one-year period. The marsh site used for this study was comprised of two plant species, *Spartina alterniflora* and *Juncus roemerianus*. Twice monthly, a beam plankton trawl was pulled 100 meters along the marsh edge. The samples were brought back to the lab and preserved in a 10% formalin solution for a minimum of 24 hours. Penaeid shrimp were removed from the sample, identified, measured ( $\pm 1$  mm), and weighed ( $\pm 0.1$  g). Seasonal recruitment to the marsh edge and length frequency distributions for the three shrimp species were compared.

#### MATHEMATICS, COMPUTER SCIENCE AND STATISTICS

Chair: Walter Brehm, Keesler Air Force Base

Vicechair: Ravinder Kumar, Alcorn State University

THURSDAY MORNING

## Conference Room

8:50 Introduction

## 9:00 A RAPIDLY RELOCATABLE PREDICTION SYSTEM

Germana Peggion\* and Daniel N. Fox, University of Southern Mississippi, Stennis Space Center, MS 39529, and Naval Research Laboratory, Stennis Space Center, MS 39529

MODAS-NRLPOM is a scalable, portable, and rapidly relocatable system for nowcasting and short-term (2-day) forecasting in support of real-time naval operations. The Modular Ocean Data Assimilation System (MODAS) combines remote sensed data (altimetry and sea surface temperature) with in situ measurements to produce an analysis of the ocean that can be considerably more accurate than conventional climatology. Data from several datasets and internet sites are gathered at NRL in an almost fully-automated fashion. The MODAS nowcast field provides initial and boundary condition for NRLPOM, a version of the Princeton Ocean Model (POM), implemented at the Naval Research Laboratory (NRL). The principal attributes of NRLPOM are a user-friendly interface, the inclusion of tidal flow, and options for several initialization procedures and boundary condition algorithms. The system also has the capability of one-way coupling with other real-time operational models or 1-way nesting (NRLPOM to NRLPOM). The real-time simulations are forced by the operational winds available for a given area. The system has been designed and implemented so that no data are ingested and assimilated during the forecasting simulations. Forecast predictions are usually available within 6 hours of the initial MODAS nowcast.

## 9:20 QUANTUM CHEMICAL INVESTIGATIONS OF EXCITED STATE PROPERTIES OF HYPOXANTHINE

M.K. Shukla\* and Jerzy Leszczynski, Jackson State University, Jackson, MS 39217

Hypoxanthine is a purine metabolic intermediate in living systems. Structurally it is close to guanine and can be formed by the deamination of guanine. It is also found as a minor purine base in transfer RNA. It shows keto-enol and N9H-N7H tautomerism. However, under aqueous environment the keto-N9H form dominates. The CASSCF, TDDFT and CIS levels of theories were used to study electronically excited singlet state properties of hypoxanthine. The ground state geometries were optimized at the MP2, B3LYP, and HF levels using 6-311++G(d,p) basis set. Excited state geometries were optimized at the CIS/6-311++G(d,p) level. The nature of potential energy surface was ascertained using the harmonic vibrational

frequency analysis. The accuracy of different methods in explaining the experimental transition energies and change in features of molecular electrostatic potential maps in going from the ground state to different excited states are discussed.

## 9:40 UNINTERRUPTED DATA PROCESSING ACROSS NETWORKED PLATFORMS UTILIZING AUTOMATIC AUTHENTICATION OF ADVANCE GENERATED KERBEROS TICKETS

Deborah S. Franklin, Planning Systems Incorporated at the Naval Oceanographic Office, Stennis Space Center, MS 39529

Many sites incorporate the Massachusetts Institute of Technology (MIT) Kerberos network authentication protocol verification software to validate identity across unsecured network connections. While the software provides necessary security using encrypted ticket information, it requires intervention of manual ticket generation if the tickets are not renewed within a specific timeframe set by the users authentication Key Distribution Center (KDC). Therefore maintenance or network interrupts between the primary processing system and the KDC can cause remote processing to fail until manual intervention occurs to replace the obsolete ticket. However, a wrapper code around specific options within the basic Kerberos commands can create tickets with future timestamps for utilization during off hours creating seamless resumption of processing without human intervention. For our group, advance Kerberos ticket generation increased efficiency of operational processing, continuing a supply of timely products to customers immediately after lengthy downtime without any further delays. With renewed focus regarding security issues at computer sites regardless of orientation, implementation of procedures to augment autonomy without compromising security is an increasing concern for all individuals within the computing industry. This procedure works within the rules of the security while promoting automation.

10:00 Break

## 10:20 STUDY OF TWO DIFFERENT APPROACHES TO PARALLELIZING A SIMPLE NUMERICAL CODE

Moinuddin K. Shalam<sup>1\*</sup>, Chandra Narayanan<sup>2</sup>, and Matthew Bettencourt<sup>2</sup>, <sup>1</sup>Mississippi State University, Stennis Space Center, MS 39529, and <sup>2</sup>Center for Higher Learning, Stennis Space Center, MS 39529

Parallel computing has made a tremendous impact on many areas of computer application, especially in the areas of scientific computing like weather prediction, ocean modeling etc. Different approaches for parallelizing

numerical models are available. We look at two of the available choices using a simple 2-D advection code as a test case. The first approach is to use MPI, a message-passing library specification widely used on distributed memory parallel machines. The other is to use the parallel computing framework provided by the Weather Research and Forecasting (WRF) model. The two approaches are compared for performance metrics like speedup and efficiency, and for characteristics like scalability and portability across different computer architectures. One limitation of this study is the use of a small code as a test case. Useful inferences can be derived when many test cases of varying sizes and complexities are analyzed.

10:40 VISUAL ANALYSIS OF PHASE SEPARATION AND FLOW IN A MULTI-COMPONENT DRIVEN SYSTEM

Ray Seyfarth<sup>1\*</sup>, R.B. Pandey<sup>1,2</sup>, and Joe F. Gettrust<sup>2</sup>,  
<sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Naval Research Laboratory, Stennis Space Center, MS 39529

Computer simulations are performed to study flow and phase separation in an interacting lattice gas of a multi-component system. We consider a three dimensional lattice with as much as four components: two fluid constituents, sediments, and pores characterizing the effective host medium. Bottom of the lattice is connected to a source of fluid mixture consisting of constituents A and B with different masses; the top end is open. Nearest neighbor interactions among the particles are considered. Driving fields are concentration gradient, gravity, hydrostatic pressure, etc. Using an OpenGL visualization package, *animp*, we analyze the motion of individual particles, their collective (center of mass) motion, density profiles, phase separation etc.

11:00 AUTOMATED IMAGE REGISTRATION BY MATCHING EDGE-ENHANCED IMAGES

Hong Zhou\* and Ray Seyfarth, University of Southern Mississippi, Hattiesburg, MS 39406

We present a method for performing automatic geographical registration of aircraft-acquired images based on matching the aircraft images with previously georeferenced images from the USGS (DOQQs). The process uses edge-enhancement based on areal standard deviation values to produce images which are less sensitive to temporal variation. The base data is repeatedly mapped to the warp data with differing mapping coefficients. For each such mapping a measure of fit is computed (dot product) and the best mapping coefficients are kept. This process continues until the fit is good enough and then the warp image is mapped to the base and processing continues to a new file. We consider affine and quadratic mappings and a variety of optimization strategies.

11:20 Break

11:40 VISUAL ANALYSIS OF GROWTH AND ROUGHNESS IN ELECTROPHORETIC DEPOSITION OF POLYMER CHAINS

R.B. Pandey\* and Ray Seyfarth, University of Southern Mississippi, Hattiesburg, MS 39406

Monte Carlo method is used to simulate the interface growth and roughness in an electrophoretic deposition of polymer chains. We consider coarse-grained model of polymer chains on a discrete lattice. Polymer chains are driven by an electrophoretic field toward an impenetrable substrate. Short range interactions among polymers (repulsive) and between polymer and substrate are considered. Using an OpenGL visualization tool (*animp*), animations are prepared to show the dynamics of individual chains, and their collective densities and resulting interface. Visualization of a tracer chain, is presented to show the dynamics and conformation of chains from interface to bulk.

12:00 PICKING GEOREFERENCE CONTROL POINTS INTERACTIVELY USING IMAGE BLENDING

Arunkumar Rajendran\* and Ray Seyfarth, University of Southern Mississippi, Hattiesburg, MS 39406

We present a method for picking control points for georeferencing using image blending to allow the image analyst to match areas visually. The typical control point picking process involves having an image analyst select a matching pixel from the base and warp images. We contend that this process does not adequately utilize the immense visual processing capabilities of the human picking the point. Our process involves interactively translating, rotating and scaling one image against the other while presenting the analyst with a combination of the two images. In this fashion it is possible to match areas rather than individual pixels and it is possible to obtain fractional pixel coordinates. A variety of blending and user interface techniques are considered in an effort to make this process more effective and intuitive.

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THURSDAY AFTERNOON

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Conference Room

2:00 MISSISSIPPI CENTER FOR SUPERCOMPUTING RESEARCH (MCSR) USER ADVISORY GROUP MEETING

David G. Roach\* and Germana Peggion, University of Mississippi, University, MS 38677 and University of Southern Mississippi, Stennis Space Center, MS 39522

The Mississippi Center for Supercomputing Research was established in 1987 by the Mississippi

Legislature and the Institutions of Higher Learning (IHL) in order to provide high performance supercomputing (HPC) support for research and instruction at all state universities. The Mississippi Supercomputer User Advisory Committee (MSUAG) was established by the IHL Research Consortium to provide user input and advice to MCSR management and technical staff on policies and procedures for the Center's operations. It includes member representatives from all IHL institutions. The Advisory Group will meet at this MAS conference. Mr. David G. Roach, Director of the MCSR, and Dr. Germana Peggion, MSUAG Chair and Professor at USM Stennis, will conduct the meeting. The agenda includes an update on MCSR HPC facilities and services, introduction of new MCSR staff members, and site reports and ongoing research updates by MSUAG representatives. A Special Subsession of the Mathematics, Computer Science and Statistics Division, sponsored by the MCSR, will also be held to serve as a forum on supercomputing in which faculty and graduate student researchers will have the opportunity to describe their research projects that involve HPC, Internet2, Grid Computing, Visualization, Network Security, Computer Systems Administration, and the use of MCSR resources. IHL faculty and graduate students, with an interest in HPC and/or MCSR facilities and services, are also invited to attend.

#### 2:30 Divisional Poster Session

THE MOLECULAR STRUCTURES AND NATURE OF INTERACTIONS IN  $N_2H^+-He_n$  ( $n = 1 - 12$ ) COMPLEXES Yinghong Sheng<sup>1\*</sup>, Szczepan Roszak<sup>2</sup>, and Jerzy Leszczynski<sup>1</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217, and <sup>2</sup>Wroclaw University of Technology, Wyb. Wyspianskiego 27, 50-370 Wroclaw, Poland

The  $N_2H^+-He_n$  complexes were investigated for  $n$  up to 12. The molecular structures were optimized without any structural constraint using the second-order Møller-Plesset (MP2) perturbation level of theory. The harmonic vibrational frequencies were obtained at the same level of theory. The  $N_2H^+-He$  dimer has a linear proton-bound structure, and further He ligands fill two equatorial solvation rings around the linear dimer core, each of them containing up to five He ligands. The first solvation shell is completed when the 12<sup>th</sup> helium atom is attached at the nitrogen end of  $N_2H^+$ . The variation of the calculated dissociation energies, and vibrational frequencies is related to the increasing size of the studied complexes. The nature of interactions is discussed by analyzing the charge distribution and the energy decomposition scheme.

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### FRIDAY MORNING

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Conference Room

#### 8:20 Introduction

#### 8:30 A PATTERN RECOGNITION SOFTWARE TOOL DEVELOPED USING MATLAB FOR THE CLASSIFICATION OF REMOTE SENSING SPECTRAL REFLECTANCE DATA OF STRESSED SOYBEAN LEAF

Abdullah Faruque\*, Raj Bahadur, and Gregory A. Carter, Southern Polytechnic State University, Marietta, GA 30060; Mississippi Valley State University, Itta Bena, MS 38941; and Earth System Science Office, NASA, Stennis Space Center, MS 39529

This paper describes the implementation of LIP (Leaf Identification Program), a pattern recognition software tool intended to classify remote sensing spectral reflectance data of stressed soybean leaves by using neural network and other statistical pattern recognition techniques. Various data preprocessing techniques necessary to support the pattern recognition techniques are also provided. Data visualization tools are also provided to permit visual assessment of the spectral reflectance data patterns and their relationships. The development of this software system takes advantage of the high performance computational and visualization routines of the MATLAB programming environment. Data analysis component of LIP includes: principal component analysis, fisher and variance weight calculations and feature selection. Using MATLAB's graphics routines, 2-dimensional or 3-dimensional plots of the principal components can be displayed. Classification methods in LIP include both neural network and statistical pattern recognition techniques. Neural network methods include the back propagation neural network (BPN) and radial basis function (RBF) neural network. Statistical pattern recognition component of LIP includes linear discriminant analysis (LDA), quadratic discriminant analysis (QDA), regularized discriminant analysis (RDA), soft independent modeling of class analogy (SIMCA) and discriminant analysis with shrunken covariance (DASCO). The objective of this study funded by National Aeronautics Space Administration (NASA) at Stennis Space Center was to record and classify the spectral reflectance differences of leaf stress caused by drought, fungal disease, and lead contamination of the soil. LIP software tool has been used successfully to classify the different classes of stressed leaves from their spectral signature.

#### 8:50 INTEGRATING BORLAND C++ WITH MICROSOFT ACCESS

April Butler\* and Joan Palmer, Tougaloo College, Tougaloo, MS 39174, and National Oceanic and Atmospheric Administration, Woods Hole, MA 02543

The purpose of my research was to open a printable Microsoft Access database report using Borland C++

Builder 5. Borland C++ Builder 5 is one of the most powerful and complete ANSI C++ integrated development environment that allows the user to develop, deploy, integrate, and access various software applications. With Borland, I was able to access Microsoft Office programs and interfaces, document and document formats, use task automation, and embed office applications into the C++ Builder form. Task automation allowed me to prepare specific operations to carry out, choose certain files, and execute the operation. In order to successfully complete my project, I had to access Borland newsgroups, and translate Visual Basic syntax into C++ in order to open a specific file in the database report. With the proper code, I was able to open Microsoft Access, the correct database, and report by clicking the button on the C++ Builder form. In addition, this research was added to the Database Management Systems department library of tools software applications at the National Marine Fisheries Service.

9:10 EFFECT OF RANDOM VARIATION IN THE PARAMETER OF A DISCRETE LIFE TIME DISTRIBUTION ON VARIOUS RELIABILITY CHARACTERISTICS

Hari Sharma\* and K.K. Sharma, East Mississippi Community College, Mayhew, MS 39753, and C.C.S. University, Meerut, India

Prior distributions represent random variations in the parameters of lifetime distributions. This prior knowledge is updated by using experimental data in the Bayesian framework. However, updating the basic lifetime distribution in respect of these parametric variations is another important aspect to be considered in reliability analysis. The present study deals with the analysis of the reliability characteristics of a discrete lifetime distribution updated in respect of variations on its parameter. Reference of a k-out-of-m system is included as an example.

9:30 Break

9:45 THE AFRICAN AMERICAN WOMAN AND MATHEMATICS: A CRITICAL ANALYSIS

LaTrese Davis, Alcorn State University, Alcorn State, MS 39069

Why are minorities underrepresented in Professional Mathematics? Several researchers like Dr. Scott Williams, a professor of Mathematics at University of New York-Buffalo, Dr. William H. Tucker, an associate professor of psychology at Rutgers University, Dr. Susan Chipman, of the National Institute of Education, co-authored Women's Participation in Mathematics, and others have questioned the low involvement of minorities, especially African-American women. This research examines the African American female demographics of the Mathematics profession.

10:05 AN INTERACTIVE DERIVATIVE PRIMER WITH ONLINE CAPABILITIES

Ravinder Kumar, Alcorn State University, Alcorn State, MS 39069

MathWright is a powerful mathematics authoring software. It creates microworlds that can be easily put on the web and downloaded from there or can be viewed in the browser with all dynamism and interactivity intact. We have developed a primer for derivatives that explains the theory as well as skills. The user can customize problems and examples or use thousands of randomly generated examples and exercises. Historical notes attempt to put the development of the concept in the right perspective. The primer is class-tested and is on the prestigious mathwright library. It provides an effective teaching/learning tool. A CD containing the primer with a document on reading it will be distributed free. If you are interested in viewing online, please go to either of the following URL's. [www.math.metrostate.edu /welcome](http://www.math.metrostate.edu/~welcome) <http://canufly.net/~rkumar>

10:25 GEOCODING: QUANTITATIVE RESEARCH ON THE MATCHING RATE AND ACCURACY OF STREET ADDRESS MATCHING STRATEGY

Lixin Yu, Alcorn State University, Alcorn State, MS 39069

Street address geocoding is the process of converting text version of street addresses into geographic coordinates. The process requires matching each street address with street addresses stored in an authority file that contains the geographic coordinates. One important issue in this process is how to deal with the imperfect data—various errors exist in both the address file to be processed and the authority file. Therefore, an approximate matching is required to raise the matching rate. In practice, a weighted matching process is widely used to compare the street name, prefix, street type, and zipcode separately. The system decides whether a match happens based on the weighted matching result. This research studies the impact of different weight settings to the matching rate and accuracy of the result. It uses third party data as an authority file to determine the correctness of the matching. Three hundred street addresses were geocoded 625 times to test the result of possible strategies. A program was made to analyze the result and generate the summary. The study further analyzed some interesting patterns of the data and suggested the best strategy to get the maximum matching rate or the maximum accuracy in the geocoding process.

10:45 STATISTICAL DESIGN FOR TWO-CHANNEL MICROARRAY EXPERIMENTS

Carolyn Boyle, Mississippi State University, Starkville, MS 39762

Microarray experiments are widely used to study

gene expression profiles. For example, the pattern of genes expressed in tumors that respond to chemotherapy could be compared to the pattern in those that do not respond. A microarray is a grid of “spots” attached to a glass slide. Each spot consists of a known DNA sequence from a gene library and each slide can contain many thousands of sequences. Messenger RNA (mRNA) from each experimental sample is reverse-transcribed into a complementary DNA (cDNA) sample and labeled with a fluorescent dye. With a two-channel system, one cDNA sample is mixed with “red” dye and another with “green” dye. The two labeled cDNA samples are then combined, placed on the array, and allowed to hybridize to the spots. Finally, the array is scanned with a laser and fluorescence intensity measurements are made for each dye at each spot. The ratio of the intensities is related to the quantity of mRNA in the experimental samples. The main statistical design problems are determining which samples should be hybridized together on the same slide and the amount of replication. Those issues involve the research objectives, sources of variation between and within slides, the amount of mRNA available, and the cost of the procedure. This presentation will give examples of some designs that are appropriate for the most common research objectives.

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## FRIDAY AFTERNOON

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### Conference Room

#### 1:40 CUBIC SPLINE AND GRAPHICS

Mikhail Korablin\* and Oleg Bestseny, Alcorn State University, Alcorn State, MS 39069

The method of cubic splines is a very useful and efficient method of interpolating numerical data. In this paper, we have developed a Visual C++ program that will demonstrate how graphics can be obtained by using method of cubic splines. In the course of work we have developed the algorithms for solving the matrix set up for third degree polynomials representing the various splines.

#### 2:00 APPLICATION OF MATH IN ENGINEERING—A CASE STUDY

David Loflin\* and S. Kant Vajpayee, University of Southern Mississippi, Hattiesburg, MS 39406

Engineering and engineering technology programs heavily rely on the fundamental principles of mathematics. At the University of Southern Mississippi, those pursuing BS degrees in engineering technology take 15 semester hours of mathematics, comprising college algebra (MAT 101), trigonometry (MAT 103), applied calculus (MAT 136 & 137), and statistical methods (CSS 211). College algebra covers topics such as linear and quadratic equations, functions, and graphing. Trigonometry covers trigonometric

functions, identities and equations, and common geometric shapes. Applied Calculus I (MAT 136) covers differentiation and integration techniques and their applications. Applied Calculus II (MAT 137) continues with advanced differentiation and integration techniques with applications to areas, centroids, and moments of inertia. CSS 211 covers measures of central tendency and dispersion, sampling and their distributions, and hypothesis testing. Several engineering technology courses at USM illustrate the application of mathematics. For example, Vector Statics (ENT 260) applies topics from college algebra, trigonometry, and calculus. These topics include solving equations and triangles, using trigonometric identities, and integration. Industrial Quality Control (IET 302) relies on statistical principles such as measures of dispersion, central tendency, and sampling distributions. Engineering Graphics (ENT 100) and Computer-Aided Drafting and Design (ENT 320) require a clear understanding of the Cartesian coordinate system, which is introduced in college algebra. A more detailed discussion based on the first author’s experience, who is pursuing a BS degree in industrial engineering technology, will be presented.

#### 2:20 CHARACTERIZATION OF VEHICLE TEST COURSES BY POWER SPECTRUMS

Andrew W. Harrell, Engineer Research and Development Center, Vicksburg, MS 39180

In the last several years smaller robotic vehicles and all-terrain vehicles have introduced a need to reevaluate some of the previous vehicle testing methodology that we use to test vehicles. The mobility branch of the Geotechnical and Structures Laboratory has several vehicle ride courses used to evaluate the dynamic vibrational effect of different types of terrain on vehicles. This talk will explain ways we characterize terrain for vehicle testing and generate performance analysis. Mathematical formulas have been derived for the characterizing the terrain in terms of the dimension of its power spectral density curve. Also, the slope of the line relating the elevation profile detrending length to some power of the detrended root mean squared (RMS) value is used. The talk will present the plots of some courses and their power spectral density curves and then consider several different detrending values in order to illustrate the application of the formulas. Then it will give a short discussion of how the mathematical theory of wavelets is related to the RMS averaging and detrending kernels.

#### 2:40 AN INTERACTIVE MATHWRIGHT MICRO-WORLD FOR FUNCTIONAL SYMMETRIES

Kanchan Manaktala, Alcorn State University, Alcorn State, MS 39069

Symmetry of a function is a significant characteristic of a function which the students in college algebra and precalculus courses must learn. They should



also be able to relate the symmetries to even and odd functions. We have used mathwright authoring software to develop an interactive microworld to explore symmetries of functions and graphs defined by parametric equations. This microworld can easily be read off the web also, and therefore used for distance learning.

3:00 Divisional Business Meeting

### PHYSICS AND ENGINEERING

Chair: T.M. Parchure, US Army Engineers, WES  
Vicechair: Atef Elsherbeni, University of Mississippi

## FRIDAY MORNING

Forrest II

### 8:30 ANALYSIS AND DESIGN OF THE TRANSITION REGION BETWEEN A COPLANAR WAVEGUIDE AND A MICROSTRIP LINE FEEDING MECHANISMS

Abdelnasser A. Eldek\*, Atef Z. Elsherbeni, and Charles E. Smith, University of Mississippi, University, MS 38677

Transitions between different configurations of planar transmission lines are investigated to improve the efficiency of both the feed circuit and the antenna element of an antenna system. Different types of transition or coupling configurations are considered. These configurations provide a smooth transition from one feeding or excitation configuration to another in order to minimize the abrupt changes in the field structure leading to better transition match. Optimal design parameters for these transitions with special attention to matching across the operating bandwidth of both the feed circuit and the antenna are considered for coplanar waveguide and microstrip line configurations. Simulation results based on the finite difference time domain technique show that the return loss of the coplanar waveguide to microstrip transition is less than 20 dB for X-band operation.

### 8:45 PERFORMANCE ANALYSIS OF A NON-UNIFORM 3-D FINITE DIFFERENCE ELECTROMAGNETICS SIMULATION CODE

R. Christopher-Lee Riley\* and Atef Z. Elsherbeni, University of Mississippi, University MS 38677

The finite difference (FD) technique is one of the simplest and most straight-forward simulation methods in the field of electromagnetics. FD is used to simulate static, or non time-varying, electromagnetic situations. The object to be simulated, for example a section of a microstrip line,

is discretized into a 3-D grid. The physical equations governing electrostatics are then applied, resulting in the potential distribution throughout the 3-D grid. Other quantities such as the electric field distribution and characteristic impedance can be computed from the potential distribution. The simplest grid is one that is uniformly discretized in each direction. However, the discretization must be fine enough to correctly model the smallest dimension of the object. This usually results in a large number of points at which the potential distribution must be calculated. If nonuniform discretization is used the number of points can be drastically reduced; however, the electrostatic equations become more complicated. The question is raised whether performance of the code, in terms of accuracy and execution time, is better for uniform discretization with a large number of points or with a much smaller number of points but more complicated equations. The outcomes of this research indicate that the use of the non-uniform discretization with careful programming leads to a significant reduction in execution time while maintaining the desired accuracy of the computed field values.

### 9:00 ANTENNA DESIGN AND RADIATION PATTERN VISUALIZATION

Atef Z. Elsherbeni, Matthew J. Inman\*, and R. Christopher-Lee Riley, University of Mississippi, University, MS 38677

Characteristics and radiation patterns for many antenna geometries and antenna arrays can be evaluated but not easily visualized. This paper presents a software package that has been developed to allow for 2D and 3D visualization of the radiation patterns for many different types of antennas and antenna arrays. The package allows the user to visualize the field patterns for a given type of antenna, and to display the constituent parameters (input impedance, directivity, gain, etc). The user may inspect the field pattern for a single element of many different types of antennas (such as dipole, loop, aperture) or for arrays of common elements. The parameters for these antennas or arrays may be varied manually or via an automated swept parameter menu. This allows a parameter to be automatically varied within a range with animated results. The program allows for the design and analysis of diverse antenna arrays. Common types of 1-D, 2-D, and 3-D arrays are available, as well as a builder for an arbitrary system of elements with options to aid in the design of antenna elements or arrays. Synthesis and simulation tools are also integrated into the package to allow for automatically determining the best configuration for an array or an element to meet predetermined radiation characteristics.

### 9:15 ELECTROMAGNETIC SCATTERING FROM CHIRAL CYLINDERS

Atef Z. Elsherbeni<sup>1</sup>, Mohamed H. Al Sharkawy<sup>1\*</sup>, and Samir

F. Mahmoud<sup>2</sup>, <sup>1</sup>University of Mississippi, University, MS 38677, and <sup>2</sup>Kuwait University, Kuwait

A rigorous boundary value solution to the scattering of an incident electromagnetic plane wave on a number of parallel cylinders is developed. The cylinders are parallel to the z-axis and are of arbitrary circular cross-section. Both transverse electric and transverse magnetic types of polarization of the incident field are considered. The solution is based on the application of the boundary conditions on the surface of each cylinder in terms of the local coordinates system of each individual cylinder. The scattered field from each cylinder is, therefore, represented in terms of the coordinates system of each individual cylinder using the additional theorem of Hankel function. The application of the boundary conditions on the surface of all cylinders leads to an infinite matrix equation. This matrix equation is truncated for numerically evaluating the expansion coefficients required for the evaluation of the near and far field components. Validation of the numerical results is performed by comparing with published data for special cases. This technique is used to predict the radar cross-section of composite two-dimensional structures when composed of dielectric, conducting and chiral material.

9:30 Break

9:45 THE GAMMA-RAY BACKGROUND FOR FREGATE, A NEW SPACE-BORNE DETECTOR

Brad N. Barlow<sup>1\*</sup>, John Lestrade<sup>1</sup>, and Jean-Luc Atteia<sup>2</sup>, <sup>1</sup>Mississippi State University, Starkville, MS 39762, and <sup>2</sup>Observatoire Midi-Pyrénées, Toulouse, France

The HETE-2 satellite, launched in 2000, is the latest in a series of international space missions whose primary goal is the study of gamma-ray bursts, the largest explosions in space since the Big Bang. This satellite carries a gamma-ray telescope, FREGATE, which was designed and built in, and currently is managed from, Toulouse, France. We present a description of the FREGATE high-energy detectors and a regression analysis of the average observed gamma-ray background in four energy bands: 7–40 keV, 7–80 keV, 30–400 keV, and > 400 keV.

10:00 NATURAL MODES OF CYLINDRICAL DIELECTRIC AND COMPLEX-MEDIA WAVEGUIDES

Samatha Parupalli\*, Alexander B. Yakovlev, and Ahmed A. Kishk, University of Mississippi, University, MS 38677

Emerging technologies of microwave and millimeter-wave integrated circuits and antennas have initiated an extensive theoretical and experimental research in the area of low-loss dielectric and complex-media materials. These materials are used as feed networks, interconnections, optical fiber waveguides, and dielectric resonator antennas to provide high efficiency of power

transmission at higher frequencies. This is in contrast to traditionally used metal-dielectric guided-wave structures (microstrip-like structures), which experience high conduction losses at millimeter waves. The material presented in this paper concerns the analysis of hybrid natural modes propagating in cylindrical dielectric and complex-media waveguides. Different wave phenomena are investigated, including proper bound propagating and leaky-mode radiating regimes. The method of analysis is based on the field representation in material media matched across the interface, resulting in the characteristic determinant for the complex wave number (propagation constant) of bound and leaky modes. Numerical solution is obtained for a discrete set of propagating and radiating modes of cylindrical dielectric waveguides. The method is extended for the analysis of multi-dielectric coated cylindrical waveguides and complex-media waveguides with negative permeability and permittivity material parameters.

10:15 THE EQUIVALENT TEM MODE THEORY FOR SIMPLE CLOSED-FORM SOLUTIONS TO PROBLEMS OF NULL STEERING AND ELIMINATION OF BACKSCATTERING FROM STRAIGHT WIRES

Islam A. Eshrah\* and Mostafa N. Fahmy, University of Mississippi, University, MS 38677, Cairo University, Giza 12211, Egypt

Thin straight wires are the oldest and simplest structures employed either as transmitting antennas or as loaded or unloaded scatterers. Many attempts have been made to give expressions for the current distribution on such structures, but no simple closedform solutions have as yet been achieved. Here simple closed-form expressions will be given for the current distribution and hence the radiated or scattered fields from thin straight wires with arbitrary feeding and/or loading. For this purpose, a new conception referred to as “the equivalent TEM mode theory” is introduced and a fictitious transmission line model is adopted. The proposed model yielded simple expressions that exhibit very good agreement with results obtained using the sophisticated numerical techniques. The proposed model and resulting expressions proved quite useful, not only in giving better understanding to the radiation and scattering properties, but also in achieving simple closed-form solutions to a number of problems including elimination of backscattering and null steering. This work was fully done by the authors at Cairo University, Egypt.

10:30 FLOW AND PROFILES IN A MULTI-COMPONENT DRIVEN SYSTEM

Luis Cueva-Parra<sup>1\*</sup>, R.B. Pandey<sup>1</sup>, Joe F. Gettrust<sup>2</sup>, and Ray Seyfarth<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Naval Research Laboratory, Stennis Space Center, MS 39529

Using interacting lattice gas computer simulations, we study the flow response and density profile in a driven system on a three dimensional lattice. Bottom of the lattice is connected to a source of fluid mixture consisting of constituents A and B with different masses; the top end is open. Particles interact with a repulsive interaction between dissimilar particles and attractive interaction between similar particles. Apart from gravity and concentration gradient, a hydrostatic pressure is also considered to drive the constituents. Steady-state density profiles (longitudinal and transverse) are examined in detail. Resulting phase separation and phase changes will be presented.

10:45 Break

11:00 COLLECTION OF FIELD DATA FOR COASTAL ENGINEERING SEDIMENT STUDIES

T.M. Parchure, U.S. Army Engineer Research and Development Center, Vicksburg, MS, 39180

Sediment studies are important for many civil engineering projects related to dams, canals, intake structures, navigation locks, outfall structures, bridges, flood control works and so on. Particularly in coastal engineering, sediment studies consist of prediction of shoaling in harbors and navigation channels, estimation of bank erosion caused by waves and currents, selection of suitable sites for placement of dredged material, and design of bank protection works. These studies require understanding of physical, geotechnical and transportation properties of sediments at the specific site under investigation. Sediment properties and their transportation characteristics are governed by field parameters. Hence data on several field parameters is an essential requirement for every sediment study. Sediments are eroded and transported by waves and currents, which are functions of river flow, wave height and tidal range. Hence data on current (strength and direction), waves (height, period and direction), tidal range and river discharge are needed. Bed sediment samples are collected and analyzed to determine particle size distribution, bed density, shear strength, and organic contents, which influence erodibility. Flocculation and settling characteristics of cohesive sediments are influenced by salinity. Water samples are collected at several elevations throughout the water column and analyzed for determining water quality parameters such as dissolved oxygen, salinity, suspended sediment concentration, and settling velocity of suspended sediment particles. Bathymetry data are used for formulating numerical models. Results of field data analysis are essential for selecting boundary conditions and verification of numerical hydrodynamic and sediment models before they could be used for offering engineering solutions and making predictions. Examples of engineering projects studied at ERDC where field data have been used will be presented.

11:15 STRAIN ANALYSIS OF THE MECHANICAL PROPERTIES OF MATERIALS

Henry Phillips III\* and H.A. Whitworth, Tougaloo College, Tougaloo, MS 39174, and Howard University, Washington D.C. 20059

The mechanical behavior of materials has been a long and ongoing study since the beginning of time. Different materials have different properties that show their effectiveness under various loading conditions. By axially loading sample specimens in a Universal Testing Systems, key properties of materials can be determined. A number of mechanical properties of a material can be obtained through analysis of a simple force versus deformation. These plots show the relationship between load and deformation in a given structure. In order to truly measure deformation special devices such as strain gages or extensometers must be used. A strain gage measures strain at a given point while extensometers measure strain over a given gage length. A test program was initiated to evaluate the mechanical properties of selected metallic and polymeric materials. Tests were performed using a programmable MTI 10K Universal Testing Machine. Axial tests were performed using both strain gages and extensometers. The test program automatically generates a stress versus strain curve from which a number of test material properties can be evaluated. Properties of interest in this analysis include modulus of elasticity, secant modulus, 2% yield stress and strain, peak stress, breaking stress, maximum force and deflection, maximum strain, resilience, and toughness. From this analysis a comparison of the various strain measuring sensors was performed by comparison of the experimentally derived material properties with the known material properties. In general, the properties obtained using the strain gages were in better agreement with the expected results.

11:30 ANTENNA SIMULATION FROM INFINITESIMAL DIPOLES USING GENETIC ALGORITHMS

Taninder S. Sijher\* and Ahmed A. Kishk, University of Mississippi, University, MS 38677

A method for the simulation of antennas or radiating sources from near-field measurements is presented. The method is based on the substitution of an original radiating source with an equivalent set of infinitesimal electric and magnetic dipoles that would produce the near field of original antenna and thus the same far field. These equivalent sets of dipoles are generated using a rigorous optimization technique. Here we have used Genetic Algorithm. The optimization method would determine the equivalent infinitesimal dipoles, which produce the near field of the actual antenna. Once the equivalent dipole positions and moments are determined, the far field can be obtained. Also the equivalent dipoles can be used to replace

some complicated antennas to simplify analysis of performance in a complex environment. The method has been tested using synthetic data and the simulation results show the viability and usefulness of the method. Future work will include simulation of antennas from computed near fields. Also the method will be implemented with a commercial code for antenna design optimization.

#### 11:45 INTERFACE IN ELECTROPHORETIC POLYMER DEPOSITION

R.B. Pandey\* and Ray Seyfarth, University of Southern Mississippi, Hattiesburg, MS 39406

Monte Carlo simulations are performed to study the interface growth and roughness in an electrophoretic deposition of polymer chains. We consider coarse-grained model of polymer chains on a discrete lattice. Polymer chains are driven by an electrophoretic field and deposited on an impenetrable substrate. Short-range interactions among polymers (repulsive) and between polymer and substrate are considered. After depositing a sufficient amount of polymer chains, interface and bulk are relaxed. We have already examined in detail the scaling of the relaxed interface width with temperature, field, and molecular weight. Using a tracer chain, we study the dynamics and conformation of chains from interface to bulk.

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### FRIDAY MORNING

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#### Forrest II

#### 1:30 THE STANDARD MODEL AND FUNDAMENTAL CONSTITUENTS OF MATTER

Amin Haque, Alcorn State University, Alcorn State, MS 39096

Elementary particle physicists, through experimentation and theory, have developed a single theoretical framework called the Standard Model. This model explains nature's rules that apply for all particles and describes their interactions through the strong, weak, and electromagnetic forces. Gravity remains outside the Standard Model. According to this theory, all the fundamental particles in the universe can be grouped into just three "families": quarks, leptons—the building blocks of matter, and gauge bosons—the force carrier particles. Baryons (Protons, neutrons, etc) are formed when quarks exchange Gluons through the strongest Nuclear Force. Quark-antiquark pairs form mesons. Photons carry Electromagnetic Force which acts between electrically charged quarks and leptons. Charged particles, and neutral particles carry the Weak Force, which plays a role in radioactive processes. A particle called the Graviton (not yet observed) is believed to be responsible for the weakest

force, the Gravitational Force that acts between any particles with mass. The fundamental forces appear to behave very differently in ordinary matter, but according to the Standard Model they are basically very similar when matter is in a high-energy state. According to the Standard Model, the quarks, leptons and gauge bosons acquire their masses through the exchange of a new particle, known as the Higgs boson, and it is the strength of this interaction that gives the particles their masses. The Standard Model stands up to very precise and stringent tests, except the experimental detection of the Higgs bosons so far.

#### 1:45 SUPER DENSE STARS—QUARK STARS, NEUTRON STARS AND BLACK HOLES

Amin Haque, Alcorn State University, Alcorn State, MS 39096

When the fusion fuel burns out, massive stars explode and go supernova. The core becomes a neutron star (or a quark star) or a black hole depending on its mass. A neutron star has diameter 30 km and density  $2 \times 10^{14}$  g/cm<sup>3</sup>. The strong, dense magnetic fields emit radio pulses and X-rays. Recently, NASA's Chandra X-ray Observatory has found two denser neutron stars—RX 41856 and 3C58. They are too small and too cold to be standard neutron stars. In these denser stars neutrons themselves have broken into their more elementary particles, quarks, and would be a fundamental discovery in physics. If the original star was 15 or more times the mass of our sun, a much more smaller and denser core, a black hole, is created. The gravitational attraction is so strong from which nothing can escape, even light. To study a black hole, astronomers look for gas swirling around its edges, heated to millions of degrees, producing intense X-rays. Recently, the Chandra X-ray Observatory found a black hole in our Milky Way, with a mass about 2.6 million times the mass of the sun. In a recent-five year study by an international mission, powerful energy jets spewing out from the vicinity of black holes that weigh more than a hundred million Suns have been observed. Black holes are the most powerful and exotic objects; the more we learn about them, the more it will help to understand the universe.

#### 2:00 DARK MATTER AND DARK ENERGY

Amin Haque, Alcorn State University, Alcorn State, MS 39096

The recently observed fluctuations in the temperature of the cosmic microwave background radiation indicate that the universe is flat. This means that the total density of energy and matter of the universe must equal the critical density. Studies of galactic motion show that ordinary visible matter in stars, galaxies, planets, and interstellar gas only makes up 5 percent of the total energy density. There must be about 95 percent invisible (dark) matter. Measurements of the speed of rotation of galaxies

show that most galaxies are rotating faster than they should, more than twice as fast. Also, the outer parts of galaxies rotate as fast as the inner parts. This only makes sense if there is a spherical distribution of matter in each galaxy, which is not what we see. In 1998, astronomers reported that a group of distant supernovas were dimmer, and therefore farther from the Earth, than the standard theory indicated. This indicates that the universe expansion is accelerating. For that to happen, there would have to be some force pushing outward on the universe strongly enough to overcome gravity's inward attraction. Albert Einstein first imagined a repulsive force pervading space, which later came to be called the "cosmological constant." Recent discoveries have provided good evidence that there is such a repulsive force called "dark energy," "vacuum energy," antigravity, or "quintessence." Right now the density of vacuum energy is about three times as large as the energy density from dark matter.

2:15 GRB 990510 AS THE CAUSE OF THE MAY 10, 1999 SOLAR WIND STOPPAGE

Robert S. Fritzius, Shade Tree Physics, Starkville, MS 39759

On late May 10, 1999 the density of the solar wind, as measured by NASA's ACE and Wind spacecraft, was reported to have decreased to less than two percent of its normal value. Subsequently, and over a longer timeframe, the speed of the solar wind, as measured near the ecliptic, decreased to about one half its normal value. Earlier on May 10, at approximately 8:49 UT, an unusually intense Gamma-ray burst, GRB 990510, traversed the solar system from a direction near the South Celestial Pole. Literature reviews related to the solar wind stoppage and to the GRB, along with a first principles physical analysis, have been conducted to determine the likelihood of whether there was a causal relation between the GRB and the solar wind perturbation. It is concluded that GRB 990510 did cause the May 10–12 1999 solar wind stoppage. Quantitative and qualitative details are furnished to support the conclusion.

2:30 Break

2:45 ENGINEERING AS APPLIED PHYSICS—A CASE STUDY

David Loflin\* and S. Kant Vajpayee, University of Southern Mississippi, Hattiesburg, MS 39406

Engineering and engineering technology curricula rely heavily on fundamental principles of physics. At the University of Southern Mississippi, those pursuing engineering technology BS degrees take 12 semester hours of science. Of these, six hours are physics: General Physics I (PHY 111), General Physics II (PHY 112), and their associated labs, PHY 111/L & PHY 112/L. PHY 111 covers topics in areas of mechanics, thermodynamics and heat, and

vibrations and wave motion. PHY 112 covers electricity and magnetism, light and optics, and topics in modern physics. Several courses within the engineering technology curricula require a significant grounding in principles and applications of topics covered in physics. For example, Vector Statics (ENT 260) and Strength of Materials (ENT 340) apply the principles of mechanics covered in general PHY 111. Vector addition, Newton's laws of motion, torque, deformation of solids, stress-strain relationships, and pressure are some illustrative topics. Applied Thermal Science (ENT 330) is based on thermodynamic principles of heat transfer and energy flow covered in PHY 111. Introduction to Circuit Analysis (EET 110) is another course, where the application of electrical principles covered in PHY 112 is learned. Some of these principles are Ohm's law, and integration of capacitance, resistance, and inductance. A comprehensive discussion based on the first author's first-hand experience as a student will be presented.

3:00 CAN A UNIVERSITY CLAIM QUALITY BY WINNING BALDRIGE AWARD?

S. Kant Vajpayee, University of Southern Mississippi, Hattiesburg, MS 39406

The Malcolm Baldrige National Quality Award was set up by the US Congress in 1987 to raise the awareness about quality management and two recognize US companies for performance excellence. It now recognizes five organizations annually for quality achievements. The US Commerce Department's National Institute of Standards and Technology (NIST) manages the awards in cooperation with the private sector. Of the five most recent winners, in 2001, three have been educational institutions—one university and two school districts. It seems that educational institutions are becoming quality conscious too! The University of Wisconsin-Stout, the proud winner, claims to be "mission driven-market smart. Its mission guides all the key processes, including strategic planning, program development, partnership building, and teaching and learning. The university listens to and learns from its students throughout their academic careers and beyond. Student needs, expectations, attitudes and performance are tracked through surveys, course and program evaluations, and myriad of 'success measures' that link student performance to educational effectiveness." But, the basic questions remain: Can the Baldrige Award criteria assess the quality of a university? And what is meant by quality in the case of institutions of higher learning? The presentation will focus on these two questions, as well as on whether students are really the customers, or merely beneficiaries through association. Can one really measure the quality of a university? Or is it elusive like beauty?

3:15 EXAMINING SURFACE SEALING AND CRUSTING USING THE ACOUSTIC TO

### SEISMIC TRANSFER FUNCTION

Del M. Leary<sup>1\*</sup>, Craig J. Hickey<sup>1</sup>, James M. Sabatier<sup>1</sup>, and David A. DiCarlo<sup>2</sup>, <sup>1</sup>University of Mississippi, University, MS 38677, and <sup>2</sup>USDA-ARS National Sedimentation Laboratory, Oxford, MS 38655

Soil sealing is examined by measuring the acoustic to seismic (A/S) transfer function. An A/S transfer function is a sweep sine measurement using a suspended loud speaker to impinge acoustic energy from the air onto a soil sample. A laser Doppler vibrometer (LDV) is used to obtain the surface particle velocity as a measure of the seismic energy that has been transferred into the soil. This technique is non-contact and therefore allows successive measurements to be taken in time as the surface crust is formed. Soil samples are rained upon then allowed to dry forming a crust or seal that changes both the stiffness and hydraulic properties of the surface layer. Neshoba soils tested show a quantifiable decrease in the seismic energy transferred, as well as an increase in correlation between successive trials, as the crust forms. Additional measurements done with a submerged transducer show an even greater decrease in surface velocity due to an impedance mismatch within the soil itself. Future studies will also include an acoustic reflection technique to measure changes in the hydraulic flow resistivity.

3:30 Divisional Poster Session

### VIBRATIONAL ANALYSIS OF ISOBUTENE AND ISOBUTENE-D<sub>8</sub> COMPARISON OF EXPERIMENTAL RESULTS WITH CALCULATED FREQUENCIES USING QUANTUM MECHANICAL METHODS

Chandra M. Pathak<sup>1\*</sup>, M.K. Shukla<sup>2</sup>, Jerzy Leszczynski<sup>2</sup>, and G.M. Kuramshina<sup>3</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096; <sup>2</sup>Jackson State University, Jackson, MS 39217; and <sup>3</sup>Moscow State University, Moscow 119899, Russia

The IR and Raman spectra of isobutene and isobutene-d<sub>8</sub> were recorded and investigated in vapor and liquid phases, respectively by one of us (CMP). The frequency assignments of the normal modes were proposed on the basis of the observed band shapes of the IR frequencies and depolarization ratios of the observed Raman frequencies. The frequency assignments were well supported by a normal coordinate analysis using Wilson's G-F matrix method. The present work was undertaken to calculate the normal frequencies of isobutene and isobutene-d<sub>8</sub> using more sophisticated quantum mechanical methods, which are available now. In the present work, different levels of theories such as HF, DFT(B3LYP), MP2, and CCD were applied employing the 6-311 G(d,p) basis set. Two possible isomeric structures of Isobutene characterized by the CZ symmetry point group were analyzed. One of the isomers exhibits a global minimum structure while the other

one exhibits the maximum (two imaginary frequencies) at the corresponding potential energy surface. Methyl-group vibrational barrier is found to be 2.08 kcal/mol at the B3LYP/6-311(d,p) level and the interaction between the two methyl groups is found to be very small. A detailed comparative study between the theoretically calculated normal frequencies and the experimentally observed ones both in isobutene and isobutene-d<sub>8</sub> will be presented. The present work suggests that a few frequency assignments proposed earlier by one of us (CMP) need to be altered.

### COPLANAR WAVEGUIDE FED MULTI-SLOT ANTENNA

Cuthbert M. Allen, Atef Z. Elsherbeni\*, and Charles E. Smith, University of Mississippi, University, MS 38677

A small, multi-slot, antenna is designed for RF and microwave sensors and radar applications. The design is realized using a series of parallel slots having tapered lengths, fed by a coplanar waveguide (CPW) to support wideband operation. The designed multi-slot antenna provides a 40% bandwidth centered at 10 GHz with 50 Ω input impedance. The operating bandwidth is held almost constant regardless of the length of the feeding mechanism. This feature is demonstrated by several numerical simulations. Return loss, input impedance, radiation pattern, gain, and efficiency of the proposed design are computed and analyzed to support X-band operation. Measured and computed characteristics of this novel wideband antenna design are presented.

### AN HP8510C NETWORK ANALYZER GRAPHICAL USER INTERFACE (GUI) AND ANALYSIS SOFTWARE USING MATLAB, FOR HPIB DATA ACQUISITION AND PROCESSING

Brian T. McDaniel\*, Charles E. Smith, Alexander B. Yakovlev, Atef Z. Elsherbeni, and Darko Kajfez, University of Mississippi, University, MS 38677

Network analyzers offer a simple and accurate method for making S-parameter measurements at high frequencies. The University of Mississippi's HP8510C, for instance, has a frequency range from 45KHz-75GHz. However, exporting the measured data to a file on disk, taking the disc to a PC, then creating "command line" software programs to read the files can consume more time and effort than making the desired measurements. Also, "command line" programs can be difficult to use, by anyone other than the creator, especially when the required data file format may be unknown. This paper presents the software and hardware design and implementation of a user-friendly GUI HPIB data acquisition, analysis and presentation system for the HP8510C Network Analyzer. The hardware used for the system is an HP8510C Network Analyzer with HPIB capability, a PC with a National Instruments NI-488.2 HPIB card and corresponding drivers, HPBASIC software,

and MATLAB. The design of the HPIB data acquisition software is presented which includes setup and programming. The design of the GUI analysis and presentation software methods is also introduced in detail. Using these techniques, The University of Mississippi has implemented an efficient, user-friendly environment for making microwave measurements and transporting the scattering parameter measurement data to a PC for analysis and presentation with MATLAB in rectilinear plots and Smith Charts.

3:45 Divisional Business Meeting

**PSYCHOLOGY AND  
SOCIAL SCIENCE**

Chair: Ann Marie Kinnell, University of Southern  
Mississippi  
Vicechair: Pamela Banks, Jackson State University

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**THURSDAY MORNING**

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Lamar II

Special Session: Recent Research in Forensic Science  
(8:30–10:40)

8:30 APPLICATIONS OF THE HUMAN GENOME  
PROJECT IN TEACHING FORENSICS

Marie Elaine Danforth, University of Southern Mississippi,  
Hattiesburg, MS 39406

The Human Genome Project is arguably one of the greatest scientific achievements in history. Its potential effects are ubiquitous, seen in areas from medical advances to hiring practices. The uses of the HGP within forensic anthropology and forensics in general are many, and this paper will present several of these applications, focusing on how they might be discussed within the classroom setting. The first use is extended identification of criminals and victims. Recently perpetrators have begun to be identified through cold hits in state DNA databases. In turn, others have been exonerated through DNA as well. Another use is our understanding of systems of classifying human variation, usually considered under racial lines, which is bound to come under reconsideration given the new genetic information. In a third application, we will consider genes thought to have an effect on personality traits, especially those that might predispose individuals to certain behavioral tendencies. All of these use can of course be of great help to law enforcement agencies, but such information also carries a great number of ethical issues associated with it, especially in terms of personal privacy and individual rights. Thus, the

HGP can also be called one of the most dangerous achievements as well. In the classroom, its benefits and drawbacks must be clearly presented to students.

8:50 THE USE OF DRUGS IN TEACHING  
CHEMISTRY

Gerald Mattson, University of Southern Mississippi,  
Hattiesburg, MS 39406

Cocaine and other drugs provide infamous examples to reinforce concepts important for understanding chemistry. The presentation will focus on solubility, volatility, three-dimensional structure, and acid base reactions involving stimulants such as cocaine and methamphetamine, depressants such as barbiturates, anti-depressants such as Librium and Valium and narcotics such as heroin and morphine.

9:10 VARIOUS TECHNIQUES FOR LIFTING  
LATENT FINGERPRINTS FROM HUMAN  
SKIN

Erin M. Outlaw, University of Southern Mississippi,  
Hattiesburg, MS 39406

Though it is difficult to lift viable latent fingerprints off human skin, five accepted techniques have been developed: iodine fuming followed by the transfer of the latent print to another surface; transferring the latent onto Kromecote paper and dusting with conventional powders; sprinkling lead dust on the suspected print then utilizing x-rays to produce a visual print; dusting the area of skin with magnetic powder and transferring the latent print to Dacty-foil; and using cyanoacrylate fuming to create a visible latent print then dusting with conventional powders. These techniques, though accurate in lifting latent prints off other varied surfaces rarely produce the desired results on human skin due to the variety of environmental and biological circumstances to which the body is exposed.

9:30 FORM BLINDNESS AND LATENT PRINT  
EXAMINERS

Dean Bertram\* and Jon S. Byrd, University of Southern  
Mississippi, Hattiesburg, MS 39406, and Mississippi Crime  
Laboratory, Jackson, MS

What is form blindness? It is a combined physical and mental fault, an imperfection in the brain that causes the inability to interpret and correctly store what is actually focused on the human retina. Problems in comparison training are due not only to failure to see the outside of things but to the failure to recognize the real differences and the fundamental similarities and to understand them and interpret them when they are seen. This presentation will review the theory behind form blindness as well as the relationship to testing for laboratory positions as a latent fingerprint examiner.

9:50 Break

10:00 HOW MODERN FORENSIC TECHNIQUES  
COULD HAVE CAUGHT JACK THE RIPPER

Nina K. Carroll, University of Southern Mississippi,  
Hattiesburg, MS 39406

Jack the Ripper is indisputably the most infamous serial killer in history. Several factors contributed to his never having been captured. I attempt to reveal how the forensic techniques unavailable in the nineteenth century such as fingerprinting, DNA analysis, tool mark analysis on bone, and forensic profiling could have exposed the identity of the man who composed his letters from hell.

10:20 NON-METRIC AND METRIC SKELETAL  
TRAITS AND THEIR POTENTIAL VALUE TO  
THE FORENSIC ANTHROPOLOGIST

Kristi E. Turner, University of Southern Mississippi, Hat-  
tiesburg, MS 39406

Non-metric and metric traits are routinely recorded in osteological studies for their potential utility in the reconstruction of activity patterns of individuals and the genetic structure of a group. Of particular value to the forensic anthropologist is reconstructing the handedness of a homicide victim. Specifically, if an individual may be identified as left-handed by evaluating several features of the upper arm and shoulder, the probability of making a positive identification increases dramatically, simply by eliminating the number of right-handed individuals on a missing persons list. Of other interest is whether particular activities may be suggested, such as baseball throwing or shoveling, by evaluating muscle attachments sites and wear on bones. This project involved the evaluation of three potentially valuable traits found on the arm and shoulder in 50 Black and White men and women of known identity and occupation, from the Terry Collection of the Smithsonian Institution. The objective was to examine the variability of these traits between individuals, on both left and right arms to determine whether they reflect handedness, occupation, or elements of both. Patterns of frequency are compared by age, sex, race, and side. Implications of findings for forensic anthropology are described in further detail.

10:40 A TECHNIQUE TO ENHANCE THE QUALITY  
OF FINGERPRINTS FROM THE DECEASED

Dean Bertram\* and Kimberly R. Wright, University of  
Southern Mississippi, Hattiesburg, MS 39406, and Forrest  
General Hospital, Hattiesburg, MS 39402

Antigen Retrieval Solution [ARS] was introduced as an aid in the testing of tumors. In this study, digits from corpses were fingerprinted before and after soaking in ARS for various lengths of time and at various conditions. Soaking in ARS yielded dramatic improvements in fingerprint quality and evidentiary value.

Regular Session

11:00 GENDER DIFFERENCES IN PERCEIVED  
PARENTAL APPROVAL OF SEXUAL  
BEHAVIOR AMONG AFRICAN AMERICAN  
COLLEGE STUDENTS

Christopher Curtis\*, Kaye F. Sly, and Pamela Banks, Jack-  
son State University, Jackson, MS 39217

Research suggests that gender and communication with parents are factors that influence the sexual behavior of college students. The present study investigated gender differences in perceived parental approval of sexual behavior at four different levels of relationship involvement in a sample of 142 African American college students (45 males, 97 females). It was hypothesized that males would perceive more parental approval of sexual intercourse than females at all four levels of relationship involvement (someone with whom they have dated once, someone with whom they are going steady, someone with whom they are in love, and someone they planned to marry). Participants completed an assessment package that included personal data/behavioral and attitude assessment and the Parental Approval and Friend's Approval of Sexual Behavior scale (PASB). The results of this study support the hypothesis. Chi Square analyses indicate an association between gender and perceived parental approval of sexual behavior. Significantly more males than females perceived parental approval of sexual intercourse at all four levels of relationship involvement. The results suggest that parents may be more liberal in their attitudes toward premarital sex for males than females.

11:20 SOUTHERN BELLES? UNDERSTANDING  
BEAUTY PERFORMANCES AND  
PERCEPTIONS AMONG YOUNG SOUTHERN  
WOMEN

Jacqueline C. Bergeron, University of Southern Mississippi,  
Hattiesburg, MS 39406

This research project will evaluate different aspects of beauty and appearance in young, white, southern women's lives. The main topics to be explored are the relationship of body-image satisfaction to youth, the effects of the media on the development of beauty perceptions and performances, the presence and conception of ideals, for a woman's appearance, and how the aforementioned components relate to each other. The method that will be used to carry out this research project will involve interviews with white women, aged 18–24, living in the Hattiesburg area. The data will be collected using inperson taped interviews. The subjects will be asked a series of open-ended questions dealing with the role of beauty in their lives, from late childhood to the present day, and how it has affected the way they view themselves and their bodies. The major theory of this project is the idea that a female's



satisfaction with her appearance is high before she enters adolescence, and falls after she goes through adolescence. The assumption behind this theory is that going through adolescence involves “becoming a woman,” which involves making oneself looking like one. This time is when the role of beauty and the preoccupation with beauty would come into play. Before adolescence, then, beauty and appearance would not have played as integral a role, and thus, body-image satisfaction would be higher.

11:40 MISSISSIPPI HISTORY ON TRIAL: THE LEGEND AND LESSONS OF THE PARCHMAN FARM SYSTEM

Angela Dunlap, University of Southern Mississippi, Hattiesburg, MS 39406

Jean-Jacques Rousseau once remarked that “History is the art of choosing, from among many lies, that one which most resembles the truth.” Consistent with Rousseau’s theory, many historical accounts lack objectivity because the author or researcher maintains some level of personal interest, involvement, or connection in the subject matter he or she covers. For example, various works that document the South’s history of racial problems convey a slanted perspective that complicates one’s understanding of “truth.” In this paper, I use the Marxist approach to examine William B. Taylor’s *Down on Parchman Farm* and David M. Oshinsky’s *Worse Than Slavery*. Oshinsky argues that the practice of convict leasing and a prison/plantation system such as Parchman Farm could only emerge from the hostile social climate of post-bellum Mississippi. Taylor, on the other hand, defends the Parchman Farm system and rationalizes that a disproportionate number of incarcerated African-Americans was inevitable following Emancipation and Reconstruction. However, I illustrate how our capitalist economy, not racism, helped create and advance such correctional models as convict leasing and the Parchman plantation system. Further, I contend that capitalism maintains a controlling ideology over our social and political economies and perpetuates class division. Thus, in terms of production, capitalism reproduces this ideology.

12:00 Divisional Business Meeting

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THURSDAY AFTERNOON

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Lamar II

1:20 EARLY TOBACCO ABSTINENCE IN HIGH RISK SMOKERS

Zakiya Nicks\* and Suchitra Krishnan-Sarin, Yale School of Medicine, New Haven, CT

Many smokers attempt cessation, however, high relapse rates in the first few days of cessation are commonly

seen especially in high risk smokers (alcohol drinkers, those who have depressive symptoms, and females). The purpose of this study is to conduct a prospective examination of the clinical course of tobacco (nicotine) abstinence effects including mood changes and craving in response to presentation of cues over the first week and month of abstinence in male and female smokers who are either heavy/light alcohol drinkers with/without depressive symptoms. Subjects participated in a one month smoking cessation program using contingency management and brief, frequent behavioral counseling based on AHCPR guidelines (Cooney 2001). Cue-reactivity was examined during acute withdrawal (Day 3) and chronic withdrawal (Day 7) using standardized scripts written to induce negative affect (Tiffany et al. 1990). Also, mood changes were evaluated using CES-D and Profile of Mood States (POMS). Cue-reactivity procedures, selection of cues, and preparation of cue-tapes were developed. However, no data has been gathered. Data gathered from the CES-D and POMS showed that different subgroups of high-risk smokers experience differences in onset and intensity of depressive symptoms.

1:40 EVOLUTION AND AMERICA: AN IDEOLOGICAL APPROACH

Jude Toche, University of Southern Mississippi, Hattiesburg, MS 39406

The theory of evolution is the cornerstone of modern biology. However, many Americans are quite hostile to the idea of biological evolution. This observation is hardly new, but most explanations of this phenomenon center on religion as a causal factor in the popular rejection of evolution by Americans. Rather than give complete weight to the influence of religion, one should consider the impact of American ideology on the disavowal of evolution. American ideology places individualism in a preeminent position. According to this tenet of American ideology, the individual is the primary actor in nearly all things. However, in evolutionary theory, the individual is of little consequence. As such, evolution is counterintuitive to the average American. This study explores the possibility of a connection between American individualism and the reluctance of the American population to embrace the ideas of Charles Darwin and other evolutionary biologists. While this study does not attempt to eliminate the possibility of religious influence on the American aversion to the theory of evolution, it examines another facet of the American distaste for Darwin. This study uses literature from the fields of biology, sociology, and psychology to explain the possible connection.

2:00 SOCIO-ECONOMIC STATUS AS A PREDICTOR OF POSTPARTUM DEPRESSION

Erika Johnson\* and Michael O’Hara, Jackson State University, Jackson, MS 39217, and University of Iowa,

Iowa City, IA 52245

Previous studies have shown that in impoverished populations, rates of postpartum depression (PPD) were significantly elevated. The goal of this study was to determine whether socio-economic status (SES) can be used as a predictor of PPD. It was predicted that women with lower socio-economic status would be more likely to develop PPD. In the context of screening for a PPD treatment study, 4,233 woman who has recently given birth from four counties in a mid-western state (mean age = 30.1) were given The Inventory to Diagnose Depression (IDD). This questionnaire assessed symptoms from low mood to decreased concentration. Scoring criteria was similar to that of the DSMIV. Socio- economic status was measured using the Hollingshead's Four Factor Indicator of Social Status (1975). The prevalence of PPD was determined by looking at the total number of women and comparing it to the number who received a positive score on the IDD. The prevalence rate found was 20.72%. This rate is slightly higher than previously reported rates, which is consistent with the existing literature. A Pearson's r correlation was computed between SES and total IDD scores ( $r = -0.235, p < 0.01$ ). As SES increases, the risk for PPD decreases. These findings are valuable in the effort to treat women in low income environments.

#### 2:20 VALUES ORIENTATION AND ATTITUDES TOWARDS SUICIDE AND ABORTION

E. Thomaseo Burton\* and Kaye F. Sly, Jackson State University, Jackson, MS 39217

The relationships between values orientation (VO) and support for or opposition to suicide and abortion were assessed in 188 African American undergraduate students (47 males, 141 females). Gender differences in suicide and pro-life/pro-choice attitudes were also explored. Individualistic and community oriented VO were assessed using the Rokeach Values Survey. Suicide and abortion attitudes were assessed using the Death Related Social Issues Attitude Questionnaire. It was hypothesized that females would be less supportive of suicide than males, and that males would be less supportive of abortion than females. It was further hypothesized that endorsement of individualistic values would predict support for suicide and abortion while endorsement of community oriented values would predict opposition towards these death related social issues. T-tests revealed no significant gender differences in attitudes towards suicide or abortion ( $t = 1.571, p < 0.118$ ;  $t = 1.737, p < 0.084$ ). There was, however, a tendency for females to be less supportive of suicide and for males to be less supportive of abortion. An individualistic value, "A Sense of Accomplishment," was found to be the best predictor of support for both suicide and abortion in this population ( $\beta = 0.144, p < 0.023$ ;  $\beta = 0.131, p < 0.038$ ). These findings suggest that African American college

students who rank individualistic values as important can be expected to be more supportive of suicide and abortion. This research was supported by NIMH-COR grant MH-16926.

2:40 Break

#### 2:50 A SEARCH FOR THE LOST: AN ARCHAEOLOGICAL ANALYSIS OF TURKEY CREEK CEMETERY

Kelly McClave, University of Southern Mississippi, Hattiesburg, MS 39406

Historical in conjunction with public archaeologists have a responsibility that goes beyond research and academic standards. They have a professional responsibility to the descendents and the public whose ancestors they wish to study. It is important for historical/public archaeologists to involve the groups with cultural and genetic connections with the subjects of archaeological study and any interested public members. A possible service that an archaeologist can render to a community is the identification of a cemetery. The main objective of this paper is to ascertain the existence of an African American communities cemetery and to prove that it was in fact, larger and more extensive than previously believed.

#### 3:10 MEASURING COASTAL ENVIRONMENTS THROUGH THE HEALTH OF THEIR PEOPLE

Erin R. Villarraga, University of Southern Mississippi, Hattiesburg, MS 39406

There has been an ongoing debate as to whether the Mississippi Gulf Coast provided a stable environment for Native American habitation. We have some evidence of occupations on the coast including a few burials. Until recently, these remains have been sparsely analyzed. This study hopes to reveal whether aquatic subsistence adaptations were able to completely sustain the groups that practiced them on the Gulf coast by comparing health patterns of two coastal sites, Harvey and Mulatto Bayou, to those at Kellogg. For the purposes of this study, the inland Kellogg site is the control because my analysis and that of others shows Kellogg individuals were healthy. To determine health patterns at the three sites, I use Nordin's index for cortical bone maintenance. The index is found by measuring the thickness of femoral midshafts on radiographs with sliding calipers. My results show that mean cortical thickness at the Harvey site was above 46%, the standard for healthy cortical thickness. However, the Mulatto Bayou sample mean was below this standard, though just barely. Low cortical thickness is associated with systemic dietary stress and lack of physical activity. While the mean of Mulatto Bayou is slightly lower than the standard for health, it may not be significantly lower. My research shows that at least some areas of the Mississippi Gulf coast were stable and plentiful environments for Native Americans.

3:30 MISSISSIPPI RIVERS: A STUDY OF CHOCTAW INDIAN PLACE-NAMES OF THE STREAMS AND RIVERS OF THE STATE OF MISSISSIPPI

Chris McPhail, University of Southern Mississippi, Hattiesburg, MS 39406

The present-day state of Mississippi has thousands of miles of rivers and creeks that were once the focal point of Choctaw Indian lifeways. In this study I am researching and translating the original names of some of the more significant streams of the state. By comparing this information to known physical, cultural or biological characteristics of those waterways it is possible to gain insight into why a particular stream was so named. These names can reflect naturally occurring characteristics, historical events or cultural attributes. We may assume these occurrences and attributes were important enough for Choctaw Indians to bestow upon these streams a title that echoes this importance. Thus it is possible to determine what stream features, whether cultural or natural, were significant in the everyday lives of prehistoric Choctaw. The information provided in this study offers us a possible view of stream characteristics that were considered essential to Choctaw lifeways. In addition, this research provides a compilation of Choctaw stream place-names and their translations for preservation and future studies.

3:50 A PUBLIC ANTHROPOLOGY WEB PROJECT  
Jeffrey Kaufmann, University of Southern Mississippi, Hattiesburg, MS 39406

Graduate students submitted summaries of 1928 and 1989 volumes of the journal *American Anthropologist* in an effort to make anthropological articles from one of the discipline's lead journals available to a wide audience. Their summaries were published on the web at [www.publicanthropology.org](http://www.publicanthropology.org), a site that is receiving around 30,000 hits per month. This project demonstrates how far anthropological theory has moved in six decades.

**SCIENCE EDUCATION**

Chair: Willie R. Heard, University of Southern Mississippi  
Vicechair: Aimeé T. Lee, University of Southern Mississippi

**FRIDAY MORNING**

Lamar II

8:30 DESIGNING A BIOLOGY TRAIL

Aimée T. Lee, Richard Watkins\*, and Rosalina V. Hairston, University of Southern Mississippi, Hattiesburg, MS 39406

The Biological Sciences Learning Center at USM, formerly known as the Frazier Museum of Natural Science, is a focal point for the University's biology program. We are in the process of building a multipurpose Center that plays an important role in undergraduate instruction, teacher training in the life sciences, and outreach to the community. The Center's experience-based learning environment incorporates an interactive, dynamic museum and modern instructional technology, including Web-based instruction. We reach out to the community to improve biology education and scientific literacy through Center programs, such as the Biology Trail, which is designed for all ages. Last year alone, faculty and graduate students working within the Center welcomed several hundred school-age youth plus their teachers and parents, several church youth groups, cub scouts, adult learners, and provided informal science education for all of our guests. We have designed a Biology Trail consisting of several stations dispersed around campus where we engage the students by asking questions appropriate to their various educational levels. We encourage them to answer the questions using all of their senses. In the future, we plan to design more interactive displays that can be incorporated into the Biology Trail.

8:45 SERVICE LEARNING AND SCIENCE: THE SCOTT AQUARIUM/BILOXI SCHOOL DISTRICT LIGHTHOUSE PROJECT

Howard Walters<sup>1\*</sup>, Sue Durbin<sup>2</sup>, Becky Espey<sup>1</sup>, Tom Schnaubelt<sup>3</sup>, and Becky Denham<sup>3</sup>, <sup>1</sup>J.L. Scott Marine Education Center and Aquarium, Biloxi, MS 39530; <sup>2</sup>Biloxi School District, Biloxi, MS; and <sup>3</sup>The Center for Community and Civic Engagement

Through the Learn and Serve America Program of the Corporation for National and Community Service—the Center for Community and Civic Engagement, USM's J.L. Scott Marine Education Center and Aquarium, and the Biloxi School District have implemented an innovative partnership. Combining ocean and aquatic sciences education, basic skills development, and community service learning, the partners believe students will be motivated and prepared for community leadership as they mature to adulthood, and have an enhanced understanding of oceanic and aquatic ecosystems. Other aspects of this innovative program include establishing an externally funded informal science educator within the operational structure of an elementary school, and developing curricular materials which link science and community service.

9:00 MOTIVATION AND LEARNING STRATEGIES OF DISTANCE LEARNERS

Beth Dunigan\* and Kenneth J. Curry, University of Southern Mississippi, Hattiesburg, MS 39406

During the summer semester of 2002, an online undergraduate course, BSC 305, Evolution, was conducted by a team consisting of Ken Curry, Associate Professor of Biological Sciences, and three Science Education graduate students, Sheila Hendry, Karen Ng, and Beth Dunigan. Research on student motivation and learning strategies was conducted during the course. This research was based on the theory of self-regulated learning and data was collected using the Motivated Strategies for Learning Questionnaire for measuring motivational and learning strategies. Data on motivation were collected at the beginning of the semester and data on the learning strategies were collected at the end of the semester. Scores from each subheading were correlated to the final grades. Additionally, qualitative data were collected throughout the semester in order to determine the learning strategies of these students and if students changed their learning strategies during the semester. Preliminary findings indicate that the following subscales may predict achievement in online courses: elaboration, organization, critical thinking, and effort management. Additionally, students indicated that as long as they kept up with the reading, and read for understanding, they would do well in the course.

9:15 DEVELOPMENT OF AN ORAL HISTORY OF THE GRAND BAY NATIONAL ESTUARINE RESEARCH RESERVE PROPERTY IN GAUTIER, MISSISSIPPI

Kelli McCutcheon\* and Jennifer Buchanan, Cooperative Intern Program, Mississippi Gulf Coast Community College–Jackson County Campus, Gautier, MS 39553, and Grand Bay National Estuarine Research Reserve, Biloxi, MS 39530

The Grand Bay National Estuarine Research Reserve was the setting for a study, which analyzed land use changes within the general vicinity of the reserve during the 20<sup>th</sup> century using both historical accounts received through one-on-one interviews with senior citizens and interpretations of aerial photography. The researchers identified elder members of the community who lived most of their lives in proximity to the reserve, developed an appropriate standardized survey that was used to interview these older members of the nearby community, interviewed the seniors and documented with audio tape their historical accounts. Additionally, the researchers surveyed the reserve vicinity to document current land uses, and drafted land use maps in Arcview to document land use changes over time.

9:30 Break

10:00 CONVERSION AND PRESERVATION OF 35 MM SLIDES TO DIGITAL FORMAT

Michelle Jordan\* and Kay Baggett, Cooperative Intern Program, Mississippi Gulf Coast Community Col-

lege–Jackson County Campus, Gautier, MS 39553, and University of Southern Mississippi, J.L. Scott Marine Education Center and Aquarium, Biloxi, MS 39530

The evolution of audio-visual media increasingly creates issues of compatibility of format, equipment availability, and technical expertise of users. A more critical and often overlooked issue is the failure of most libraries to preserve and convert valuable data—from visual and pictorial to numeric and text-based—to formats compatible with the latest hardware. Consequently, historic collections of tapes, slides, and films which contain useful data are many times not accessible due to format. The 35 mm slide collection at the MEC&A contains thousands of visual images of biological organisms and habitats which may be of use in educational publications and scientific studies in the future. This project continued the conversion of these slides to digital, JPEG format and laid the groundwork for eventual archiving of the slides.

10:15 WALTER ANDERSON'S ART AND HIS INTERACTIONS WITH THE HORN ISLAND ECOSYSTEM

Jamie L. Lambert\* and Patricia Pinson, Cooperative Intern Program, Mississippi Gulf Coast Community College–Jackson County Campus, Gautier, MS 39553, and The Walter Anderson Museum of Art, Ocean Springs, MS 39564

Walter Anderson loved Horn Island, and he spent much of his time there. The ecosystem and the artist became one and the same at times—at least in spirit. The primary objective of this project was to evaluate Walter Anderson's interaction with the Horn Island ecosystem, and its effects on his art, through a study of his Horn Island Logs, related paintings and drawings, and an interview with his son, John Anderson. Through reading the Logs, and examining his Horn Island related art, a relationship between the ecosystem and Anderson's art can be observed. The study results allow one to see Anderson's connection with the island through his art.

10:30 Divisional Business Meeting

10:45 Divisional Poster Session

ALCORN STATE UNIVERSITY NUTRITION PUBLIC LEARNING UTILIZATION SYSTEM HEALTH AND FITNESS RESEARCH PROJECT

Deborah Caples\*, Franklin Jackson, Rafida Idris, and Samuel Besong, Alcorn State University, Alcorn State, MS 39069

The Nutrition PLUS Health and Fitness Research Project investigated the lifestyles changes of the rural community inhabitants in Southern Mississippi. The objective of this project was to decrease high fat foods consumption and improve healthy lifestyle through

knowledge enhancement and modification of sensitive cultural practices that promote obesity. African American men and women were recruited for the 10-week N-PLUS Health and Fitness Project. Data was collected in the Client's Tracking and Evaluation Folders. A pre-post evaluation questionnaire was administered to measure the model design and learning objectives. The instruments used for the evaluation were the Social Learning Theory, Social Cognitive Theory and the Health Beliefs Models to assess levels of changes in behavior. Means and percentages were determined to evaluate the difference between variables. A medical history of chronic disease was reported in 92% of the subjects. Obesity ranked 77%, hypertension ranked 50%, and heart disease ranked 27% with 95% of the subjects showing body weights above the Body Mass Index (BMI) standards. The education level of 67% of the subjects was less than 15 years. Data analysis showed an average mean score of 3–4 pounds weight loss in 77% of the subjects, with 73% showing improvements in diastolic and systolic blood pressure readings. The consumption of vegetable and dairy products increased 28%, while the consumption of high fat foods decreased by 24%.

#### Resume Regular Session

#### 11:00 GULF COAST RESEARCH LABORATORY: SERVING MISSISSIPPI FOR FIFTY-FIVE YEARS

Joyce K. Stone\* and Joyce M. Shaw, Cooperative Intern Program, Mississippi Gulf Coast Community College–Jackson County Campus, Gautier, MS 39553, and University of Southern Mississippi, Gulf Coast Research Laboratory, Ocean Springs, MS 39566

The Gulf Coast Research Laboratory (GCRL) is a unique institution serving the citizens of the State of Mississippi State agencies such as MS Department of Marine Sciences and MS Department of Environmental Quality use scientific research results and analyses generated by GCRL to make management and conservation decisions which impact the live of Mississippians. GCRL scientists have been appointed to state advisory boards and continue to serve the state in this way today. The purpose of this project is to identify the people, projects, and publications that illustrate the interactions and connections of GCRL with its sister agencies. A bibliography of publications generated by GCRL personnel working on state supported projects and GCRL staff who have served in advisory or leadership positions at state agencies, with a special focus on Dr. William Walker, Director of the Mississippi Department of Marine Resources and former GCRL scientist and administrator, was added to an existing database. Information gathered for this project was presented in a poster format at the 2003 annual meeting of the Mississippi Academy of Sciences.

#### 11:15 DEVELOPMENT AND IMPLEMENTATION OF A HANDS-ON UNIT OF INSTRUCTION FOR ELEMENTARY STUDENTS

Cheryl Rodgers\*, Ron Carstens, and Teresa Callahan, Cooperative Intern Program, Mississippi Gulf Coast Community College–Jackson County Campus, Gautier, MS 39553, and Magnolia Park Elementary School, Ocean Springs, MS 39564

The primary objective of the rocket/solar system unit was to develop children's understanding of the relationship the earth has with other objects within our solar system. The intern assisted the teacher at Magnolia Park Elementary School in providing hands-on activities that allowed children to visualize a trip from the Earth on rockets to explore other objects found throughout our universe. The intern assisted students in building and launching an Alpha III model rocket. The final phase of the project was to guide students in identifying special characteristics that distinguish each planet/object found in our solar system. After discussion with the instructor, a pre-test was given to assess beginning student knowledge. A post-test was administered to determine the knowledge gains as a result of participation in the unit of study.

#### 11:30 A SUCCESSFUL GRE STUDY PROGRAM: THREE YEARS OF RESULTS

Carolyn E. Beck, Susan W. Bourland\*, and Frederick E. Varnado, University of Southern Mississippi, Hattiesburg, MS 39406

One of the widely believed myths about the GRE is that original test scores cannot be significantly increased. Our success in assisting students in raising scores through participation in a study program refutes this myth. The study program was developed to assist McNair scholars in increasing GRE scores to enhance their ability to enter graduate schools and in acquiring funding for graduate education. The program consists of classes lasting four hours daily for three days a week for a nine week summer session. Classes focus upon reviews of basic math skills (arithmetic, algebra, and geometry) and verbal skills exercises. Additional emphasis is placed on learning the skills needed to master the test itself. Minimal time is spent on the analytical section of the test. A variety of learning activities were designed to maintain interest in the course and include lectures, problem solving sessions, computer drills, small group studies, and game playing. Students were tested using full-length computer adaptive tests before beginning the program, at mid-term and at the end of the period. Scholars then completed the actual GRE exam. Results over three summers have shown increases in scores of 300 points for the majority of students, with some gaining as many as 600 points on the three part test. The final program test score is an excellent predictor of actual exam results.

11:45 TRANSFORMATIONS FROM TRADITIONAL TO INVESTIGATIVE STUDENT-ACTIVE INTRODUCTORY COLLEGE BIOLOGY

Rosalina V. Hairston\* and Aimeé T. Lee, University of Southern Mississippi, Hattiesburg, MS 39406

The objective of this study was to improve the content, method of instruction, and delivery of two sequential introductory college biology courses. A two-week summer workshop was conducted for biology instructors and graduate teaching assistants to develop competency in designing and teaching investigative laboratory activities, use constructivist teaching methods and cooperative learning, and integrate educational technologies in the lecture and laboratory. During the fall, weekly meetings of graduate teaching assistants and the freshman laboratory coordinators provided feedback on students' perception and performance on investigative activities. A quantitative analysis was used to assess the students' knowledge of biology and science process skills using pretest-posttest control versus experimental group research design. Significant differences and correlation were found in the scores of the experimental group on science process skills and biology content knowledge demonstrating change in student achievement is influenced by the reform initiative. A qualitative evaluation was conducted by triangulation of several data sources. The qualitative analysis revealed that students have a positive attitude toward the use of educational technologies such as computer simulations, the Internet, and Calculator-Based Laboratory systems. The students' open-ended investigation projects indicated their ability to effectively transfer learning from models and simulations to solving real-life problems.

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FRIDAY MORNING

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Lamar II

1:00 BIOLOGICAL SCIENCES LEARNING CENTER SERVES MULTIPLE FUNCTIONS WITHIN UNIVERSITY COMMUNITY

Andrea L. Johnson\* and Aimeé T. Lee, University of Southern Mississippi, Hattiesburg, MS 39406

The Biological Sciences Learning Center at the University of Southern Mississippi serves as the base for the freshmen biology program, as well as providing the university community with an easily accessible location in which to explore basic biology and related concepts. The primary focus of the Learning Center is to arm undergraduates with a working knowledge of the building blocks of biology and spark further interest in science through laboratory investigations. Through various interactive displays, students are allowed to explore such concepts as bacterial reproduction, population genetics,

mollusk and arthropod diversity, the teeth and bones of vertebrates, and fossil remains. These displays range from basic shell and bone exhibits to more advanced presentations providing evidence and timelines depicting forms of evolutionary change. Varying levels of facts and concepts are presented within these displays, allowing students from diverse ages, backgrounds, and intellectual stages to experience the exhibits on multiple levels, or those levels appropriate to each individual. In addition to serving the university, the Learning Center provides an outreach program welcoming students and individuals from local schools and organizations to explore the resources on hand. The Learning Center also serves a dual function by providing graduate and undergraduate students of the biological sciences department with a venue in which to learn strategies conducive to teaching others and gain the confidence needed for future science-based education careers.

1:15 ACTIVE LEARNING STRATEGIES IN A COMMUNITY COLLEGE MICROBIOLOGY CLASS

Mary F. Lux, University of Southern Mississippi, Hattiesburg, MS 39406

Active learning strategies can be used to promote student participation in the learning process. Active learning, an important component of laboratory exercises, can also be included as part of the lecture portion of the course. The students who participated in this study were enrolled into sections of Microbiology for the Summer, 2002 session at the Forrest County Allied Health Campus of Pearl River Community College. Both sections met weekly for a five-hour block of time. The Monday section started as the control section and participated in limited active learning activities during lecture. The test section met on Thursday. In the test section, lecture time was used to promote active learning strategies such as creating illustrations, completing tables, and working in small groups. The same of content, text, and tests were used for both classes. Students completed a pretest on the first day first class day of each section, and the identical 10 questions were incorporated into a 100 item final exam. The results of the study yielded the following average percentage scores for a pretest, post test, and final, respectively: Monday, 14, 47, 83 and Thursday, 13, 72, 91. The higher (post) test scores for the Thursday (test) group suggest that the active learning activities increased student learning.

1:45 INFUSION OF TECHNOLOGY INTO THE ELEMENTARY SCIENCE METHODS CLASSES

Lawrence Bellipanni<sup>1\*</sup>, Janie Green<sup>2</sup>, Greg Bellipanni<sup>2</sup>, Deanna Buckley<sup>1</sup>, and Rudy Sirochman<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406, and <sup>2</sup>Hatties-

burg Public School District, Hattiesburg, MS 39401

The Center for Science and Mathematics Education at the University of Southern Mississippi is dedicated to providing students with best practices based on research in teaching and learning in science and mathematics. The purpose of this project from the Center is to teach 100–150 preservice elementary teachers, over a two year period, to design effective instruction using the tools of technology that are available in most public school classrooms in South Mississippi. By incorporating lessons in Science for Elementary Teachers (SCE 432) on unit design using power point, which can be loaded on the Center's server, carefully designed web pages are instantly available to the teacher candidate on the day of the practicum lesson from the public school classroom. Administering the GALT to the experimental and control groups of SCE 432 students will determine the effectiveness of developing logical thinking in using this technology. Our interest is in determining if using technology will have an effect on the practicum students logical thinking processes. Our vision is to facilitate quality math and science instruction in elementary classrooms as well as providing experience using the tools that can make that instruction most effective. Our elementary teacher candidates, upon the completion of this experience will be literate in both power point presentations and web based design for their own classrooms in the future.

2:00 COMPOSITE ACT SCORES PREDICT SUCCESS IN INTRODUCTORY BIOLOGY CLASSES AT THE UNIVERSITY OF MISSISSIPPI

Wendy J. Garrison\*, Paul K. Lago, Lucile M. McCook, and Gail E. Stratton, University of Mississippi, University, MS 38677

As part of a continuing analysis of how to best serve our students, our objective was to see whether ACT scores were good predictors of student success, as measured by grade, in our classes. ACT scores and final grades were obtained from the University's Academic Support Center. Identifying information such as student name and ID was not used. Data were pooled for 875 students in our non-majors (BISC102) sections for Fall 2001, and for nearly 400 students each year in majors (BISC160) for Fall 1999, 2000, and 2001. The percent of students with A, B, C, D, and F grades was graphed as a function of ACT score. We found that for non majors the composite ACT score at which students had a 50/50 chance of getting an A, B, or C was 18, whereas in the majors' class it was 24. Based on a chi square test, the results were significant  $p \ll 0.001$ . In addition, a steadily increasing proportion of high grades were seen with increasing ACT scores. All entering freshmen planning to take majors biology are now informed of our findings and those with ACT scores below 22 may choose to take the nonmajors course first. In the nonmajors'

classes, we are keeping the results in mind when reviewing the efficacy of new teaching methods.

2:15 EXPANSION OF PROJECT S.U.R.G.E.: USING BIOLOGICAL MODELS TO TEACH ABOUT REDUCED GRAVITY

Jennifer Anderson\*, Christina Watters, Brittney Hembra, Brian Robinson, Michael Dodge, Brian D. Ortman, and Patricia M. Biesiot, University of Southern Mississippi, Hattiesburg, MS 39406

Project S.U.R.G.E. (Students Understanding Reduced Gravity Environments) is a traveling presentation that provides information and gives demonstrations on reduced gravity environments to K-12 students in southern Mississippi. The presentation is intended to increase exposure to and interest in science and technology, particularly microgravity research, before students reach the college level. Project S.U.R.G.E. fulfills the outreach requirements of NASA's Reduced Gravity Student Flight Opportunities Program (RGSFOP) which invites college students to propose, design, and perform a reduced gravity experiment aboard NASA's KC-135 aircraft (the "Weightless Wonder"). Project S.U.R.G.E. as developed in 2001 by a RGSFOP team of undergraduates from USM's Department of Chemistry and Biochemistry, focused on physical aspects of reduced gravity. In 2002, our RGSFOP team, from USM's Department of Biological Sciences (BSC), introduced biological components. BSC's Project S.U.R.G.E. activities include a PowerPoint lecture on various gravity conditions and how they are achieved. In addition, an age-appropriate lecture is given on the 2002 RGSFOP biological study, a comparison of the effect of altered gravity conditions on swimming and orientation by two unrelated species of gelatinous zooplankton, a comb jelly and a jellyfish. Hands-on student activities include manipulation of a model statocyst, the invertebrate equivalent to the human inner ear, and a chair-spinning experiment that demonstrates the disorienting effects of microgravity on the human body.

2:30 STUDY OF CYTOTOXIC EFFECTS AND DNA FINGERPRINTING ON THE MCF-7 BREAST CANCER CELL LINE

Duana Meseyton<sup>1\*</sup>, Robert L. Elliott<sup>2</sup>, Jonathan F. Head<sup>2</sup>, and Xianpeng Jiang<sup>2</sup>, <sup>1</sup>Delta State University, Cleveland, MS 38733, and <sup>2</sup>The Elliott-Haley-Head Mastology Research and Treatment Center, Baton Rouge, LA 70816

The Elliott-Haley-Head Mastology Research Center is dedicated in their pursuit of a cure for breast cancer, which continues to be the primary cancer observed in women in the 21<sup>st</sup> century. This rigorous and imperative task involves learning more about the characteristics of the MCF-7 breast cancer cell line with regards to the cytotoxicity of agents such as Ga, Ga-tf, and Nifedipine, and also

towards the effects of certain genes, such as IL-6, IL-6R, G3PDH, and VEGF, on the MCF-7 genetic make up. Cytotoxicity experiments and reverse transcription-polymerase chain reactions were the basis for finding this information. A presentation of techniques, an explanation of methods, and a results analysis will be shown by power point presentation.

2:45 GULF OF MEXICO-CENTER FOR OCEAN SCIENCES EDUCATION EXCELLENCE (COSEE)

Sharon H. Walker<sup>1\*</sup>, John Dindo<sup>2</sup>, Michael Spranger<sup>3</sup>, Richard Tinnin<sup>4</sup>, Jessica Kastler<sup>5</sup>, and Dan Brook<sup>6</sup>, <sup>1</sup>University of Southern Mississippi, Ocean Springs, MS 39564; <sup>2</sup>Dauphin Island Sea Laboratory, Dauphin Island, AL 36528; <sup>3</sup>University of Florida, Gainesville, FL 32601; <sup>4</sup>The University of Texas Marine Science Center, Port Aransas, TX 78373; <sup>5</sup>Louisiana University Marine Consortium, Cocodrie, LA 70344; and <sup>6</sup>Mississippi State University, Starkville, MS 39759

This COSEE-Gulf of Mexico effort will use the thematic areas of habitats and organisms, marine technology, and physical parameters that exist within the five, Gulf Coast States to promote an enhanced awareness and understanding of ocean sciences. This is one of the seven COSEEs funded in the U.S. and is being supported by NSF, NOAA-OAR-Sea Grant and ONR/NOPP. This COSEE will physically be located at The University of Southern Mississippi's Scott Aquarium in Biloxi. Satellite COSEEs will be located at the Dauphin Island Sea Lab, the University of Texas' Marine Science Institute, the University of Florida Sea Grant Extension Program and its Museum of Natural History, and the Louisiana Marine Sciences Consortium. Additional assistance will be provided by Mississippi State University, the University of New Orleans, the Louisiana Public Broadcasting Station, the U.S. Navy, the National Marine Educators Association, and the National Science Teachers Association. Over a two-year period, this COSEE collaborative will reach 240 "first-tier" teachers and their 360,000 students, a potential 4,800 "second-tier" teachers, and their 504,000 students, a potential of hundreds of researchers, 700 informal educators, 34 undergraduate students, and approximately 800,000 interested public, thereby creating an improved understanding of the oceans' dynamics and the scientific research being conducted within the partnering institutions and outreach facilities. Each of the satellite COSEE facilities has ocean scientists, graduate, and undergraduate students, and ocean sciences educators who will implement the objectives of this effort.

**ZOOLOGY AND ENTOMOLOGY**

Chair: Alex D.W. Acholonu, Alcorn State University  
Vicechair: Elgenaid Hamadain, Jackson State University

**FRIDAY MORNING**

Lake View II

9:00 A COMPARISON OF COLEOPTERAN FAMILIES FOUND IN DISTURBED AND UNDISTURBED AREAS IN YUCATAN, MEXICO

James Goode\* and James P. McKeown, Millsaps College, Jackson, MS 39120

Families of the order Coleoptera found in two areas of Yucatan, Mexico were catalogued in an effort to determine if unique families could be found in discrete areas. One area was undisturbed dry, tropical forest, and the other was an agricultural plantation; they were 25 miles apart. Insects were captured via sweep nets, Malaise traps, pit-fall traps, black lighting, and Burlese funnels. Insects were killed in Nalgene vials containing cedar chips and a sufficient amount of ethyl acetate. A total of 189 insects was catalogued over a two-week period representing 23 different families. Of these families recorded, 15 families were common to both areas. Only three families were unique to the agricultural area, and 6 families were unique to the undisturbed forest area. Based on the insects collected, there was not a marked difference in the families that were found in each area. The unique families could be a result of a collection bias in each area.

9:15 A COMPARATIVE STUDY OF HYMENOPTERA DIVERSITY BETWEEN KIWIC RESEARCH STATION AND HACIENDA TABI IN THE YUCATAN PENINSULA OF MEXICO

Barrot Lambdin\* and James P. McKeown, Millsaps College, Jackson, MS 39120

A survey of families within the Order Hymenoptera was performed in two distinct locations in the Yucatan Peninsula of Mexico to determine if a correlation exists between ecological setting and overall family diversity. One site, Kiwic, was representative of a relatively undisturbed section of dry, tropical forest, while the other site, Hacienda Tabi, was characteristic of a once operational agricultural setting. It was hypothesized that an increased diversity of Hymenoptera families would be obtained at the undisturbed setting of Kiwic when compared to the disturbed setting of Hacienda Tabi. Utilizing sweep nets, malaise traps and black lights, a total of 25 families of Hymenoptera were



collected. The site at Hacienda Tabi yielded 16 families, and the location at Kiwic produced 23 families. The two research sites shared 14 of the same families of Hymenoptera. Two families collected at Hacienda Tabi were not found at Kiwic, and 9 families collected at Kiwic were not found at Hacienda Tabi. These results indicate that a slight increase in family diversity was observed at the site of Kiwic research station compared to that at the Hacienda Tabi.

9:30 A COMPARATIVE WATER QUALITY STUDY OF TWO SITES ON RED CREEK

Mary Ellen Maples\*, Tim Ellis, and Krystal Gordon, Mississippi Gulf Coast Community College, Perkinston, Campus, Perkinston, MS 39573

Contaminants alter the ecological conditions in any water stream, whether the water stream is a lake, pond, ditch, creek, river, or ocean. We noticed that the water stream near our campus was often polluted with visible trash, we would go and eliminate the visible trash, but we decided to take our concerns a step further and start water quality testing in the fall of 2000. Our testing equipment consisted of dissolved oxygen meters, pH meters, and thermometers. Not enough data could be recorded so we added chlorine testing, alkalinity, and turbidity in the fall of 2001. We got rid of the meters and used only the LaMotte pollution Test Kits and the results were analyzed. We also added another site 20 miles down stream to pinpoint water problems. Water samples were taken monthly and aquatic macroinvertebrates were taken quarterly. Insects both larvae and adult stages were collected at the two sites. Our visible presence has improved the water quality and environmental conditions at both sites.

9:45 A COMPARATIVE STUDY OF THE SEASONAL DISTRIBUTION OF POLLUTANTS IN EAGLE LAKE AND CHORTARD LAKE IN WARREN COUNTY, MISSISSIPPI

Chadric O. Neal\* and Alexander Acholonu, Alcorn State University, Alcorn State, MS 39069

Contaminants alter the ecological conditions of many lakes, hence some measure of the degree of pollution is needed in an aquatic habitat profile study. The present study was conducted on two lentic bodies of water, Eagle Lake and Chotard Lake in Warren County, Mississippi, to compare their habitat profiles and to find out if they meet the Mississippi water quality standard. During the period, February 2001 to October 2001 (i.e., a period covering the winter, spring, summer, and the fall seasons), water samples were collected at three different locations in three replicates from Eagle Lake and Chotard Lake respectively. The following parameters were tested for each site in both lakes: ammonia (nitrogen), total alkalinity, carbon dioxide, silica,

phosphate, chloride, sulfide, nitrate-N, dissolved oxygen, turbidity, and temperature. There were not many significant differences in the test results obtained from both lakes. The two lakes meet the Mississippi water quality standard for ephemeral water bodies and are good for recreational uses.

10:00 ASSESSMENT OF WATER QUALITY IN THREE LENTIC BODIES OF WATER IN THE INDUSTRIAL AREAS OF WARREN COUNTY, MISSISSIPPI

Timotheus Meeks\* and Alexander Acholonu, Alcorn State University, Alcorn State, MS 39096

Lentic bodies of water hardly remain free from human contamination, especially those located near industrial areas. This study was conducted on three lentic bodies of water, namely, International Papermill Reservoir and Ball Ground Creek, located in the vicinity of the International Papermill in Redwood, MS, and the U.S. Army Corps of Engineers Canal located in the industrial area of Vicksburg, MS, to compare their habitat profiles, the seasonal distribution of pollutants, and to find out if they meet the Mississippi water quality standards. During the period, September 2001 to July 2002, (including the fall, winter, spring, and summer seasons) water samples were collected in three replicates from three sites in each of the bodies of water. They were taken to the laboratory and tested according to the manufacturers of LaMotte Test Kits. The chemical parameters tested were total alkalinity, ammonia-nitrogen, carbon dioxide, chlorides, chromium, cyanide, dissolved oxygen, fluoride, hardness, iron, manganese, nitrate-nitrogen, pH, silica, sulfide, and zinc. The physical parameters tested were water temperature, atmospheric temperature and turbidity. The results were then analyzed and the three lentic bodies of water were compared. There were no significant differences in their habitat profiles and all of them met the Mississippi Water Quality Criteria.

10:15 MACROINVERTEBRATES ASSOCIATED WITH HEADWATER STREAMS AT CAMP McCAIN TRAINING SITE, MISSISSIPPI

Earl T. Ducote\* and Fred Howell, University of Southern Mississippi, Hattiesburg, MS 39406

Sections 303 and 304 of the Clean Water Act requires states to protect biological integrity as part of their water quality standards. Keeping with good environmental stewardship in 1997 the Mississippi Military Department implemented an Aquatic Biomonitoring Program at the Camp McCain Training Site in Grenada County, MS. The objective of this program is to determine the status of the water resources (Are the designated/beneficial and aquatic life uses being met?). Rapid bioassessment using the benthic macroinvertebrate assemblage has been the most popular set of protocols among water resource agencies since EPA

published their first edition of Rapid Bioassessment Protocols for use in Wadeable Streams and Rivers in 1989, and the second in 1999. Systematic sampling of three headwater streams (Crowder, Epison and Campbell) has been conducted each autumn, beginning in 1997-current, at designated 100 m reaches exiting the camp. A multihabitat procedure using a D-frame dip net is the sampling method used. USEPA indicates that this technique is scientifically valid for low-gradient streams. Taxonomy is to genus/species, which provides more accurate information on ecological/environmental relationships and sensitivity to impairment. Benthic metrics used to evaluate aspects of both elements and processes within the macroinvertebrate assemblage are; Taxa Richness, EPT index, EPT/Chironomidae, Percent Shredders, NC Biotic Index and, Brillouin and Shannon "diversity and evenness" indexes. Water quality assessments and autumnal community trends of each headwater stream are based on current site-specific monitoring data.

10:30 Break

10:45 ASSESSMENT OF WATER QUALITY IN TWO LOTIC BODIES OF WATER IN JEFFERSON COUNTY, MISSISSIPPI, A PRELIMINARY STUDY

Rosie Hopkins\* and Alexander Acholonu, Alcorn State University, Alcorn State, MS 39096

This study was conducted to find out if Coles Creek and Mud Island Creek located off the Natchez Trace Parkway, in picnic areas, are polluted or meet the Mississippi Water Quality Standard. The main thrust is to eventually check the distribution of pollutants and/or human contamination in all seasons of the year. In August 2002, that is during the summer period, water samples were collected in three replicates at one week intervals from three sites in each of the two bodies of water. They were taken to the laboratory and tested according to the manufactures of LaMotte Test Kits. The chemical parameters tested were total alkalinity, ammonia-nitrogen, carbon dioxide, chlorides, chromium, cyanide, dissolve oxygen, fluoride, total hardness, iron, manganese, nitrate-nitrogen, pH, silica, sulfide, and zinc. The physical parameters tested were atmospheric temperature, water temperature, turbidity and conductivity. The two lotic bodies of water were compared. There were no significant differences found in their habitat profiles and they met the Mississippi Water Quality Standard.

11:00 ROLE OF ALIESTERASE IN SUSCEPTIBILITY OF TOBACCO BUDWORM AND CORN EARWORM TO FIVE ORGANOPHOSPHORUS INSECTICIDES

Elgenaid Hamadain, Jackson State University, Jackson, MS

39217

Aliesterase activity towards three substrates were compared in laboratory strains of tobacco budworm (TBW) and corn earworm (CEW). *In vitro* inhibition of 4-nitrophenyl butyrate hydrolysis by the oxons of five organophosphorus insecticides in both species was determined. Noncatalytic detoxication of the oxons of parathion and chlorpyrifos by TBW and CEW aliesterases was investigated. Synergism by Aliesterase inhibitor DEF (S, S, S-tributyl phosphorothioate) in TBW was studied using methyl parathion and chlorpyrifos. Aliesterase specific activity was significantly (>2-fold) higher in TBW than in CEW. All oxons, except methyl paraoxon, were more potent inhibitors of TBW aliesterase than of CEW aliesterase. Methyl paraoxon was a weak inhibitor in both species. Both TBW and CEW homogenate increased the  $I_{50}$  of the two oxons towards bovine brain acetylcholinesterase, indicating detoxication of the oxons by larval homogenate. Percentage detoxication was higher for TBW than for CEW, and was greater for chlorpyrifos oxon than for paraoxon in both species. DEF increased the toxicity of both methyl parathion and chlorpyrifos. Synergism correlated with anti-aliesterase activity of the insecticide alone. Results demonstrate that higher activity of aliesterase can partially explain the relative tolerance of TBW compared with CEW. It seems likely that aliesterase acts as an alternate phosphorylation site, thereby reducing the concentration of the oxons reacting with acetylcholinesterase and thus, provide protection to this target. Though this protective mechanism exists in both species, its expression was greater for TBW than for CEW, accounting for the greater tolerance in TBW.

11:15 STUDY OF METABOLIC RATES OF MOSQUITOFISH, *GAMBUSIA AFFINIS*, AT DIFFERENT TEMPERATURES

Julius O. Ikenga\* and Quionnes Y. Clark, Mississippi Valley State University, Itta Bena, MS 38941

This research was designed to study the metabolic rates (mRs) of mosquitofish, *Gambusia affinis*, at 24 to 28°C. *G. affinis* is a small, temperate fish that is increasingly becoming popular in its own right, especially in the wake of the Nile virus transmission. Nile virus is transmitted by mosquitoes, particularly the tiger mosquitoes. *G. affinis* has been known to be very proficient in removing mosquito larvae from bodies of water, thereby helping to curtail the spread of mosquitoes. The mRs of *G. affinis* at the above temperatures were measured using the indirect respirometry technique. All mosquitofish used in this study had a body volume of one milliliter. Data collected from end-point titration of the test waters were adjusted and used to calculate the mRs in  $\mu\text{M CO}_2/\text{ml/hr}$ . Metabolic rates found for *G. affinis* ranged from 3 to 15  $\mu\text{M CO}_2/\text{ml/hr}$  at 24°C, 6 to 14.5  $\mu\text{M CO}_2/\text{ml/hr}$  at 25°C, 6 to 24  $\mu\text{M CO}_2/\text{ml/hr}$  at 26°C, 7.5 to 19.5  $\mu\text{M CO}_2/\text{ml/hr}$  at 27°C, and from 6 to 20.5

$\mu\text{M CO}_2/\text{ml/hr}$  at  $28^\circ\text{C}$ . Mean mRs found at 24, 25, 26, 27, and  $28^\circ\text{C}$  were 7.8, 9.1, 17.2, 13.8, and  $13.4 \mu\text{M CO}_2/\text{ml/hr}$ . Peak metabolic activity was observed at  $26^\circ\text{C}$ . Mosquitofish used in this study were fed on Tropical Flakes<sup>®</sup>. Since mosquitofish indulge on mosquito larvae, a comparison of mRs of a group fed on Tropical Flakes<sup>®</sup> versus a group fed on mosquito larvae would be in order.

11:30 METABOLIC RATE DIFFERENCES BETWEEN THE SUNSET FIRE PLATY (*XIPHOPHORUS MACULATUS*) AND THE BLACK MOLLY (*POECILIA SPHENOPS*) AT DIFFERENT TEMPERATURES

Julius O. Ikenga\* and Wilma Williams-Robinson, Mississippi Valley State University, Itta Bena, MS 38941

We have compared the metabolic rates (mRs) of the Black Molly (*Poecilia sphenops*) and the Sunset Fire Platy (*Xiphophorus maculatus*) at 26, 28, and  $29^\circ\text{C}$ . The mRs were measured using the indirect respirometry technique. The Sunset Fire Platy and Black Molly were chosen for this test because of their popularity as small aquarium pets and also because both species are readily available. Both species weighed approximately one gram. Data generated from end-point titration of the test waters were used to calculate the metabolic carbon dioxide ( $\text{CO}_2$ ) produced by the test fishes. The two species responded metabolically to changes in temperature. The mRs of the Sunset Fire Platy ranged from  $0.49 \mu\text{M CO}_2/\text{ml/hr}$  to  $1.42 \mu\text{M CO}_2/\text{ml/hr}$  at  $26^\circ\text{C}$ ,  $0.42 \mu\text{M CO}_2/\text{ml/hr}$  to  $1.48 \mu\text{M CO}_2/\text{ml/hr}$  at  $28^\circ\text{C}$ , and from  $0.48 \mu\text{M CO}_2/\text{ml/hr}$  to  $1.01 \mu\text{M CO}_2/\text{ml/hr}$  at  $29^\circ\text{C}$ . The mRs of the Black Molly ranged from  $0.97 \mu\text{M CO}_2/\text{ml/hr}$  to  $1.0 \mu\text{M CO}_2/\text{ml/hr}$  at  $26^\circ\text{C}$ ,  $0.45 \mu\text{M CO}_2/\text{ml/hr}$  to  $0.99 \mu\text{M CO}_2/\text{ml/hr}$  at  $28^\circ\text{C}$ , and from  $0.49 \mu\text{M CO}_2/\text{ml/hr}$  to  $1.50 \mu\text{M CO}_2/\text{ml/hr}$  at  $29^\circ\text{C}$ . Peak metabolic activities for both species were observed at  $26^\circ\text{C}$ . The latter, very possibly, represents the optimum metabolic temperature for the two species. The average mRs dropped for both species at  $28^\circ\text{C}$  only to rise again at  $29^\circ\text{C}$ . The Sunset Fire Platy overall showed a higher metabolic activities than the Black Molly.

11:45 Divisional Business Meeting

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FRIDAY AFTERNOON

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Lake View II

1:00 EVALUATING DIVERSITY: A BASELINE STUDY COMPARING THE DIVERSITY OF THE ORDER DIPTERA IN TWO DISTINCT SITES OF THE YUCATAN PENINSULA OF MEXICO

Robert Caskey, Millsaps College, Jackson, MS 39120

A baseline study of the insect order Diptera (flies) was conducted in the Yucatan Peninsula of Mexico (Latitude:  $20.0^\circ\text{N}$  Longitude:  $90.0^\circ\text{W}$ ) in which diversity was compared between two sites: (1) the land immediately surrounding a former sugar cane plantation associated with the Hacienda Tabi (maintained by Consejo Nacional de Cuerpos de Conservación Mexicanos) and (2) the undisturbed dry tropical forest at the Helen Moyers Biological Reserve located at Kiuic (maintained by Millsaps College). It was hypothesized that a richer diversity would be present at the Kiuic site, which is relatively undisturbed, compared to the Tabi site. The following 17 Dipteran families were recorded for both sites: Tabanidae, Stratiomyidae, Asilidae, Culicidae, Mycetophilidae, Tachinidae, Muscidae, Tipulidae, Anthomyiidae, Bombyliidae, Tanypezidae, Syrphidae, Sciaridae, Pipunculidae, Chironomidae, Dolichopodidae, and Conopidae. The Kiuic site also reported 6 additional families: Phoridae, Heleomyzidae, Bibionidae, Scatopsidae, Scenopinidae, and Mydidae. The Tabi site, however, reported 8 additional families: Sarcophagidae, Ropalomeridae, Drosophilidae, Therevidae, Ceratopogonidae, Sciomyzidae, Calliphoridae, and Platystomatidae. Since many of the families individual to the Tabi site are common, these findings were interpreted not to indicate a significant difference in diversity between the two sites. For more conclusive data, more work must be done in the future, both in the identification of these insects to species, and in the studying of specific families.

1:15 INVESTIGATION OF POTENTIAL SEASONAL DIFFERENCES IN ACTIVITY BUDGETS FOR A GROUP OF CAPTIVE ATLANTIC BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*)

Rachel Thames\* and Stan Kuczaj, University of Southern Mississippi, Hattiesburg, MS 39406

The objective of this study was to determine if the activity budgets of captive dolphins changed throughout a 12-month period. Instantaneous scan samples were taken on a group of 8 dolphins housed at Marine Life Oceanarium during four eight-week periods. The four periods consisted of times that corresponded to winter, spring, summer and fall seasons. Activity budgets were constructed for the following behaviors: rest, swim, swim high, play, and play high. Activity budgets for the dolphins were relatively stable throughout the year despite differences in the number of performance shows and weather conditions. The captive dolphins in the study maintained a consistent activity budget throughout the year. This seems to indicate that these dolphins are not affected by differential energetic requirements.

1:30 Divisional Poster Session

PRELIMINARY STUDIES ON ANTI-TOXOPLASMA GONDII ANTIBODIES FROM CRYSTAL SPRINGS, MISSISSIPPI

Tanjanikia McKinney\*, Alexander Acholonu, Abram H. Dunbar, Tori S. Hill, and George Bates, Alcorn State University, Alcorn State, MS 39069

*Toxoplasma gondii* infection in food-producing animals is a potential public health problem because the infection can be transmitted to human beings through handling and consumption of contaminated raw meat. Immunocomprised individuals and fetuses have the greatest risk for developing clinical toxoplasmosis. The objective of this study is a serologically determine the prevalence of anti-*Toxoplasma gondii* antibodies in pigs from Crystal Springs, MS and to eventually extend it to other areas in Southwest Mississippi. The long-term goal is to implement control strategies to reduce *T. gondii* infection in swine farms in Mississippi. Between the months of April and October 2002, blood samples from pigs were collected from a slaughterhouse in Crystal Springs, MS. The blood samples

were centrifuged and the sera collected, labeled, and stored in the freezer. Modified agglutination test (MAT) was performed at three different dilutions. A titer at 1:25 was considered seropositive. Of a total of 370 samples tested, 166 (45%) were positive. The prevalence of *T. gondii* in pigs in Crystal Springs is high compared to previous reports. When the study is completed, it will give an insight into how serious toxoplasmosis is in the state of Mississippi and lead to the formulation of possible control strategies.

A LIST OF THE ANTS OF MISSISSIPPI WITH A KEY TO THE GENERA

Timothy C. Lockley, USDA-APHIS-PPQ-CPHST, Gulfport, MS 39501

A list is presented of the 148 species of ants in 41 genera occurring in Mississippi. With the exception of widespread species, distribution is given by county when known. This list is preliminary to a more thorough physical survey of the State's myrmecofauna.

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