

MISSISSIPPI  
ACADEMY OF SCIENCES



SIXTY-FIFTH ANNUAL MEETING

February 8 & 9, 2001

TUPELO, MISSISSIPPI

Ramada Inn  
854 North Gloster Street

Hosted by

University of Mississippi Medical Center

# Journal of the Mississippi Academy of Sciences

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*Editorial policy* is located on the inside front cover. *Information for contributors* is located on the inside back cover. Manuscripts and inquiries about publication and information about advertising should be sent to the editor: Kenneth J. Curry, University of Southern Mississippi, Post Office Box 5018, Hattiesburg, MS 39406-5018. 601-266-4930 (voice & fax) kenneth.curry@usm.edu

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**SCHEDULE**

**WEDNESDAY, FEBRUARY 07, 2001**

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<u>TIME</u>	<u>EVENT</u>	<u>LOCATION</u>
4:00 PM to 6:00 PM	Board of Directors Meeting	Woody's, 619 Gloster Street

**THURSDAY, FEBRUARY 08, 2001**

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<u>TIME</u>	<u>EVENT</u>	<u>LOCATION</u>
8:00 AM to 4:30 PM	Registration	Convention Center Lobby
8:20 AM to 4:30 PM	Divisional Programs	See Pages 19–86
8:30 AM to 11:45 AM	Geology and Geography Symposium: Active Tectonics in Northern Mississippi	Room 706
9:00 AM to 7:00 PM	Exhibits	Room 4
9:00 AM to 11:00 AM	Mississippi Center for Supercomputing Research User Advisory Group Meeting	Room 2
9:00 AM to 12:00 PM	Sigma Xi Symposium: Issues of Ethics in the Practice of Science and in Scientific Research	Executive Room
10:10 AM to 11:30 AM	History and Philosophy Symposium: Assumptions Underlying Science	Imperial Room
4:30 PM	2001 Dodgen Lecture & Presentation of Awards; lecture will be given by Dr. Jerome Goddard	Room 2 (see p. 9)
6:00 PM to 7:00 PM	Hospitality Hour	Room 4
6:30 PM	MAMP Executive Meeting	Room 2
7:00 PM	IMAGE Student Meeting	Room 2

**FRIDAY, FEBRUARY 09, 2001**

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<u>TIME</u>	<u>EVENT</u>	<u>LOCATION</u>
7:15 AM	Past-Presidents' Breakfast	Embassy Room
8:15 AM to 8:45 AM	MAS Business Meeting	Room 1
8:00 AM to 2:00 PM	Registration	Convention Center Lobby
8:20 AM to 4:15 PM	Divisional Programs	See Pages 11–85
9:00 AM to 1:00 PM	Exhibits	Room 4
12:00 PM	Mississippi Association of Biologists Luncheon	Embassy Room
4:15 PM	Divisional Programs end	



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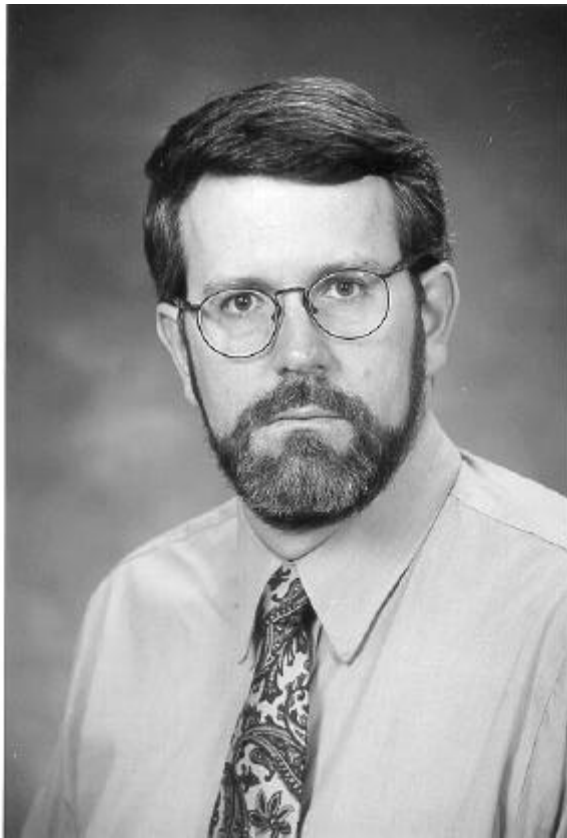
MISSISSIPPI ACADEMY OF SCIENCES MEETING OVERVIEW

	Convention Center Lobby	Room 1	Room 2	Room 3	Room 4	Imperial Room	Executive Room	Mississippi Room	Room 604	Room 606	Room 706
Thursday Morning	Registration	Chemistry and Chemical Engineering	Health Sciences	Cellular, Molecular and Developmental Biology	Exhibits	History and Philosophy of Science	Sigma Xi	Physics and Engineering	Psychology and Behavioral Neurosciences	Science Education	Geology and Geography
Thursday Afternoon	Registration	Chemistry and Chemical Engineering	Health Sciences	Cellular, Molecular and Developmental Biology	Exhibits	History and Philosophy of Science	Marine and Atmospheric Sciences	Physics and Engineering	Social Sciences	Science Education	Geology and Geography
Thursday Evening			Dodgen Lecture		Hospitality Hour						
Friday Morning	Registration	MAS Business Meeting	Mathematics, Computer Science and Statistics	Cellular, Molecular and Developmental Biology	Exhibits	Agriculture and Plant Sciences	Marine and Atmospheric Sciences	Physics and Engineering	Zoology and Entomology	Science Education	Geology and Geography
		Chemistry and Chemical Engineering									
Friday Afternoon	Registration	Chemistry and Chemical Engineering	Mathematics, Computer Science and Statistics		Exhibits	Agriculture and Plant Sciences	Marine and Atmospheric Sciences			Science Education	









## Ticks and Tick Ecology in Mississippi: Implications for Human Disease Transmission

Dodgen Lecture—2001

**Jerome Goddard**  
Medical Entomologist

Jerome Goddard was born and raised in Booneville, Mississippi. He holds a B.A.E. and M.S. in biology from the University of Mississippi (1979 and 1981), and a Ph.D. in medical entomology from Mississippi State University (1984). He and his wife, Rosella Blackman Goddard, have two sons. Jerome Goddard served as an Air Force medical entomologist for 3½ years prior to accepting the position of medical entomologist for the Mississippi Department of Health. He also is a clinical assistant professor of preventive medicine in the School of Medicine at the University of Mississippi Medical Center. In addition, he holds associate graduate faculty rank in the Department of Entomology and Plant Pathology at Mississippi State University.

Dr. Goddard has conducted research on tick ecology and tick-borne diseases. One series of projects he conducted investigated where and why ticks cluster in specific ecological micro-habitats. His present work is focused on rickettsial organisms associated with common, human-biting ticks.

He is perhaps best known as a broadly-trained, classical medical entomologist with almost encyclopedic knowledge of medically important arthropods. He has written a medical entomology textbook, "Physician's Guide to Arthropods of Medical Importance" which is now in its Third Edition and is used by physicians worldwide. Dr. Goddard has written two other books on medically important pests, two book chapters, and 80 scientific articles, 37 of which are published in refereed journals. In addition, he writes a regular column on medical entomology for the medical journal, *Infections in Medicine*.

Jerome Goddard has been a visiting professor in the Department of Dermatology at the Mayo Clinic, as well as a member of a NIH panel convened to study the future of tick taxonomy in the U.S. In 1999, he testified before Congress on the public health benefits of pesticides.

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.



**AGRICULTURE AND  
PLANT SCIENCE**

Chair: Franklin O. Chukwuma, Alcorn State  
University  
Vicechair: Maria T. Begonia, Jackson State  
University

**FRIDAY MORNING**

Imperial Room

**9:00 INVESTIGATION OF EDIBLE PLANTS AND  
THEIR ANTI-OXIDANT EFFECTS**

Lovell E. Agwaramgbo, Tougaloo College, Tougaloo, MS 39174

Oxidative processes (LDL & Lipid peroxidation) have been implicated in the onset of many cardiovascular diseases, cancer, diabetes, and aging. Many studies have reported that some compounds tend to slow down some of these processes. This investigation examined the ability of edible plants and vitamin E to inhibit oxidation under mild and harsh conditions. Reactions were carried in the presence and absence of plant materials and vitamin E, respectively. The results suggest that not all plants have anti-oxidant potential under our reaction conditions. Many plants that contain vitamins A & C did not inhibit oxidation. This may suggest that these vitamins may not be anti-oxidants, especially for our systems but may be precursors or activators of the anti-oxidant activity of other substrates. Acknowledgments: 1. BUSH Foundation Case Studies, 2. UNCF service Learning, 3. Tougaloo College Organic II Students, 4. Tougaloo College Title III Curriculum Enhancement/Academic Support

**9:15 DETERMINATION OF METABOLIC RATES  
OF GERMINATING *PHASEOLUS VULGARIS*  
SEEDS AT DIFFERENT TEMPERATURE**

Julius O. Ikenga, Mississippi Valley State University, Itta Bena, MS 38941

This research was designed to determine the metabolic rates of germinating seeds of *Phaseolus vulgaris* at 26°C and 14°C. *Phaseolus vulgaris* is a common kidney beans and a staple in human diet. It is valued as a cash crop and for its high protein and vitamin contents. Living organisms carry out several chemical processes that are essential for continued growth and development. These essential chemical processes constitute metabolism. Much of the metabolic processes occur in the mitochondria of cells and use oxygen as the final electron acceptor. Such chemical processes are termed aerobic respiration. Ripened seeds respire and give off CO<sub>2</sub> as a by-product. We used the indirect respirometry technique to measure the rate of CO<sub>2</sub>

that *P. vulgaris* respired in ppm/min. First, the seeds were soaked overnight in water and ripened for three days in a dark chest at 26°C. Twenty germinating seeds were blotted dry with paper towels and then placed in a respirometer bottle. The latter was tightly capped with a rubber stopper fitted with a Vernier CO<sub>2</sub> Gas Sensor Probe. The Probe was interfaced with a Vernier LabPro™ and set to collect 30 samples over a five minutes period. The above procedures were carried out again except that respirometry was done at 14°C. The control was carried out as above at 26°C using 25 non-ripened seeds of *P. vulgaris*. The metabolic rate of the germinating *P. vulgaris* seeds was found to be 362 ppm CO<sub>2</sub>/min. At 14°C, the metabolic rate dropped to 147 ppm CO<sub>2</sub>/min. The non-ripened seeds (control) showed a metabolic rate of 2 ppm CO<sub>2</sub>/min.

**9:30 DISCOVERING SOYBEANS AND HEALTH**

Juliet G. Huam<sup>1</sup>, Koretta Kitchens<sup>1\*</sup>, George T. Bates<sup>1</sup>, Wanda L. Dodson<sup>2</sup>, and Laura D. Salazar<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096 and <sup>2</sup>Mississippi State University, Mississippi State, MS 39762

Soybean is gaining in popularity as a substitute for animal protein and as a healthy food. Asians consumed 20–50 times more soy-based food per capita than Americans. This type of diet accounted for lower incidence of several chronic degenerative diseases in Asian countries compared to that of the United States. The objective of this paper is to examine the potential health benefits of soy protein. Soy products contain high quality protein, vitamins, minerals and isoflavone, a phytochemical. These soy products are low in saturated fat, have no cholesterol and are high in fiber content. Soy products, such as tofu, and soy concentrates have been associated with lowering cholesterol level, preventing coronary heart diseases, and reducing the incidence of breast, colon, prostate and endometrial cancer. Soy products have also been known to fight against osteoporosis, alleviate menopausal symptoms, and enhance overall human immune systems. Studies have shown that a low saturated fat diet that includes about 30–50 grams of soy protein per day may reduce the risk of coronary heart disease. The U.S. Food and Drug Administration also supports this soy protein health claim. Incorporating soy protein into the diet may be beneficial to our general health.

**9:45 FRESHWATER VIRAL DENSITIES IN NORTH  
MISSISSIPPI**

Allison Grisham\* and Clifford Ochs, University of Mississippi, University, MS 38677

In recent years it has been discovered that viruses are a major cause of mortality for planktonic bacteria in marine systems and have significant effects on nutrient cycling and energy flow. The ecological role of viruses in freshwater systems is poorly known. In this study, we determined densities of viruses from four freshwater lakes and examined empirical relationships of viral densities with bacterial density, algal biomass, and temperature. Samples

from the surface water of the lakes were collected in March, June, August, and November 1999. The greatest density of viruses was  $18.7 \times 10^6$ /ml in March. Lower densities, ranging from  $0.4 \times 10^6$  to  $4.0 \times 10^6$  viruses/ml, were observed during the rest of the year. Viral densities in the four lakes were significantly positively related to algal biomass but not to bacterial density. In February and June 1999, samples were also collected across an environmental gradient beginning with the headwaters of a spring, through the receiving pond, and into the creek draining the pond. In contrast to the seasonal pattern observed for the other lakes, viral densities in June exceeded  $20 \times 10^6$ /ml, whereas in February viruses were generally less than  $5 \times 10^6$ /ml at all sites across the gradient. For both dates, viral densities were significantly positively related to bacterial concentration.

10:00 Break

10:15 MULCHING FOR WEED CONTROL IN FIELD-GROWN FEVERFEW

Patrick E. Igbokwe, Cherie Edwards\*, and Magid Dagher, Alcorn State University, Alcorn State, MS 39096

Two synthetic (Black Plastic and Weed Barrier) and one organic (Pine Bark Nuggets) mulching materials were evaluated for purple nutsedge control in field-grown feverfew (*Tanacetum parthenium*). Mulching effect on feverfew growth, yield, mineral composition and soil characteristics were also investigated. The study was conducted at the Alcorn State Experiment Station. The soil type is Memphis silt loam. A completely randomized design with three replications were used in this study. Findings suggest that Feverfew planted in southwest Mississippi during the fall planting season will overcome the region's mild winter, grow to maturity in the following spring, producing numerous, small, daisy-like heads of yellow flowers with outer rays. Both 6-mil black plastic and weed barrier will provide better control of purple nutsedge in field-grown feverfew in the fall and early spring, resulting in overall better plant growth and development than pine bark nuggets.

10:30 C:N RATIOS AND RATE OF DECOMPOSITION OF *BRASSICA JUNCEA* RESIDUES

Cedric A. Sims<sup>1\*</sup>, Girish K. Panicker<sup>1</sup>, Alton B. Johnson<sup>1</sup>, Diane E. Stott<sup>2</sup>, Ahmad H. Al-Humadi<sup>1</sup>, and Jesse Harness<sup>1</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096 and <sup>2</sup>USDA-ARS, NSERL, Purdue University, West Lafayette, IN 47907

Crop residues are the major and often the only input of carbon in farmland soils. Residue management has been established as a valuable technology for reducing erosion. As a part of the erosion prediction studies being conducted on horticultural crops in Mississippi, root or shoot residues of Spring Mustard (*Brassica juncea*) were placed in fiberglass mesh bags either at the surface or 15 cm deep in a Memphis silt loam soil (Typic Hapludalf) and

was allowed to undergo decomposition over a 6 month period. Bags with decayed samples were collected randomly from the field every 10 days and analyzed for organic carbon and nitrogen. While both root and shoot residues on the surface maintained high C:N ratios (>20) throughout the six months, the subsurfaced shoot reached a low C:N ratio (<20) in the fourth month and it further lowered the C:N ratio in the succeeding months. The C:N ratios of the subsurfaced root were lower than the surfaced root after one month of application and it maintained the ratios close to 20 in the succeeding periods. Subsurfaced residues decomposed faster than surfaced residues. The decomposition rates of both subsurfaced root and shoot were negatively correlated with the low C:N ratios.

10:45 C-FACTOR RESEARCH FOR EROSION PREDICTION MODELS: PHILOSOPHY AND METHODOLOGY OF DATA COLLECTION

Girish K. Panicker<sup>1\*</sup>, S.C. Tiwari (Rtd)<sup>1</sup>, G.A. Weesies<sup>2</sup>, Diane E. Stott<sup>3</sup>, Ahmad H. Al-Humadi<sup>1</sup>, Cedric A. Sims<sup>1</sup>, Liang C. Huam<sup>1</sup>, Patrick E. Igbokwe<sup>1</sup>, O.P. Vadhwa<sup>1</sup>, Alton B. Johnson<sup>1</sup>, Jesse Harness<sup>1</sup>, J. Bunch<sup>4</sup>, and T.E. Collins<sup>5</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096; <sup>2</sup>USDA-NRCS, NSERL, Purdue University, West Lafayette, IN 47907; <sup>3</sup>USDAARS, NSERL, Purdue University, West Lafayette, IN 47907; <sup>4</sup>USDA-NRCS, NPDC, Baton Rouge, LA 70874; and <sup>5</sup>USDA-NRCS, Jackson, MS 39269

The increased demand for food, fiber and fuel, due to population increase, is causing marked acceleration of soil erosion. The Universal Soil Loss Equation (LISLE) and its replacement, the Revised Universal Soil Loss Equation (RUSLE), are the most widely used of all soil erosion prediction models. Of the five factors in RUSLE, the cover and management (C) factor is the most important one from the standpoint of conservation planning because land use changes meant to reduce erosion are represented here. Even though the Revised Universal Soil Loss Equation (RUSLE) is based on the LISLE, this modern erosion prediction model is highly improved and updated. Alcorn State University entered into a cooperative agreement with the NRCS of USDA in 1988 to conduct C factor research on vegetable and fruit crops. The main objective of this research is to collect plant growth and residue data that are used to populate databases needed to develop C factors in RUSLE, and used in databases for other erosion prediction and natural resource models. The enormous data collected on leaf area index (LAI), canopy cover, lower and upper biomass, rate of residue decomposition, C:N ratio of samples of residues and destructive harvest and other growth parameters of canopy and rhizosphere made the project the largest data bank on horticultural crops. The philosophy and methodology of data collection will be presented.

11:00 INCIDENCE OF SPLITTING IN 'PREMIER' AND 'TIFBLUE' RABBITEYE BLUEBERRIES

D.A. Marshall<sup>1\*</sup>, Kenneth J. Curry<sup>2</sup>, and James M. Spiers<sup>1</sup>,

<sup>1</sup>USDA-ARS Small Fruits Research Station, Poplarville, MS 39470 and <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406

Berry splitting, resulting in poor fruit quality, often occurs in rabbiteye blueberries (*Vaccinium ashea* Reade) after a significant rainfall, even in plants that were sufficiently irrigated. This splitting appears to vary between cultivars. To simulate an excessive rainfall, two rabbiteye blueberry (*Vaccinium ashei* Reade) cultivars 'Tifblue' (considered more susceptible to splitting) and 'Premier' (considered less susceptible) were subjected to varying soil moisture levels. Fruit were immersed in distilled (to emulate rainwater) and tap (overhead irrigation) water. 'Premier' is more likely to split if fruit are developed on plants in moist soil conditions, while soil moisture levels do not affect 'Tifblue' splitting. Both 'Premier' and 'Tifblue' are more likely to split if immersed in distilled water (rain) as opposed to tap water (overhead irrigation). Splitting apparently does not occur in either cultivar from excessive irrigation alone. In this study we correlates the frequency of splitting to fruit quality measurements such as soluble solid content, total solids, titratable acidity, pH, and force needed to split an intact berry. We anticipate that this will be a contribution to more constraining breeding parameters not only for rabbiteye blueberry, but also for other blueberries being developed such as the southern highbush.

#### 11:15 ACTIVITY OF THE FUNGUS *COLLETOTRI- CHUM FRAGARIAE* IN THE EARLY STAGES OF INFECTION IN STRAWBERRY

Reena Shetty<sup>1\*</sup>, Kenneth J. Curry<sup>1</sup>, and Barbara J. Smith<sup>2</sup>,  
<sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406-5018 and <sup>2</sup>Agricultural Research Service, Small Fruits Research, Poplarville, MS 39470-2005

*Colletotrichum* species infect strawberry plants and cause anthracnose. The focus of this study is the pre-infection and the early stages of infection. We have observed that lesions developed on the uppermost portion of the youngest petiole on plants sprayed with spores of *Colletotrichum fragariae*. We have observed a few fungal cells associated with early lesions and in extreme cases we have failed to find any fungal cells by serial sectioning. The appressoria observed in surface view are difficult to find in cross section. Some epidermal cells as seen in cross section within a lesion show a distinct pattern of granulation. We have not been able to confirm if this granulation pattern is correlated with the macroscopic dark lesions. Occasionally plant lesions in areas other than the youngest petiole have been observed. Preliminary evidence suggests that most spores on most areas of otherwise susceptible plants do not germinate. Occasionally a germ tube or immature appressorium is observed which suggests that further study is warranted. There is an increasing body of evidence that many fungi previously thought to be strictly saprophytic or pathogenic might exist as symptomless endophytes. Endophytes are fungi that complete their life cycle within the host and remain symptomless during the vegetative

phase of parasitism. This suggests that looking for *Colletotrichum* in an endophytic phase in strawberry would not be unreasonable.

#### 11:30 TROPHIC RELATIONS OF *COLLETOTRI- CHUM ACUTATUM* AND *C. FRAGARIAE* IN STRAWBERRY (*FRAGARIA X ANANASSA*)

Maritza Abril<sup>1\*</sup>, Kenneth J. Curry<sup>1</sup>, and Barbara J. Smith<sup>2</sup>,  
<sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406-5018 and <sup>2</sup>Agricultural Research Service, Small Fruits Research, Poplarville, MS 39470-2005

The plant pathogens, *Colletotrichum acutatum* and *C. fragariae*, both cause anthracnose disease in strawberry plants. *Colletotrichum acutatum* is found worldwide and is increasingly important as the cause of strawberry petiole, stolon, and anthracnose fruit rot. *Colletotrichum fragariae* is often associated with anthracnose crown rot in strawberry and seems to be restricted to the southeastern United States. Using light and electron microscopy the ontogeny of the infection process on petioles and stolons by both pathogens on the 'Chandler' strawberry cultivar were observed. Previous studies suggested that *C. fragariae* might be hemibiotrophic (obtaining nutrients from living cells before becoming necrotrophic [obtaining its nutrients from host cells it had previously killed]) while *C. acutatum* was necrotrophic throughout its development. Bailey, O'Connell, Pring, and Nash (1992, *Colletotrichum: Biology, Pathology, and Control*, CAB International, pp. 88-120) predicted that species of *Colletotrichum* with a narrow host range, e.g., *C. fragariae*, were likely to be hemibiotrophs based on intimacy of host relationship while generalists such as *C. acutatum* would be necrotrophs. Parbery (1996, *Biol. Rev.* 71:473-527) postulated the trend of biotrophic fungi moving towards necrotrophy based on the expansion of food resources. Our exhaustive search of the host tissue infected by either fungus has indicated a very transient biotrophic phase for both *C. fragariae* and *C. acutatum* that barely fits the current concept of hemibiotrophy.

#### 11:45 Divisional Poster Session

#### CHLOROSIS IN *BRASSICA JUNCEA*: AN ASSESSMENT OF PLANT TOLERANCE TO METAL POLLUTANTS IN SOIL

M.S. Zaman\*, Ketia L. Shumaker, and A.M. Powell,  
Alcorn State University, Alcorn State, MS 39096-7500

Phytoremediation, a green technology, uses vegetation to remove heavy metals or other pollutants from the environment. Phytoremediation depends upon identifying plant species that can tolerate and accumulate high concentrations of these pollutants. The purpose of this study was to investigate the tolerance of *Brassica juncea* (Indian Mustard) to various concentrations of cadmium (Cd) and lead (Pb) in soils. Plants were grown on soils containing various concentrations of Cd or Pb. Since chlorophyll is related to plant production, we studied the leaf chlorophyll

concentrations on day 14 and 21 of plant life. On both days, dose related inhibition of chlorophyll *a*, chlorophyll *b* and total chlorophyll concentrations were observed in several Cd and Pb treated groups. Since this plant species showed tolerance to high concentrations of Cd and Pb in soils, it may be useful for phytoremediation studies. Investigations are being conducted in our laboratory to explore the hyper-accumulation potential of *Brassica juncea* for soil Cd and Pb.

#### PERCEPTIONS OF LOGGERS REGARDING SAFETY PRACTICES AND INJURIES IN MISSISSIPPI

Carey L. Ford\* and Kerrex A. Taylor, Alcorn State University, Alcorn State, MS 39096

Logging in Mississippi is one of the most dangerous occupations in the private sector. Over sixty thousand Mississippians are directly employed in the forestry industry throughout the state. In 1995, the total forest industry impact on the state's economy was over 11 billion dollars. The purpose of this study was to determine the safety practices and types of injuries among loggers in Mississippi. The objectives were to: 1) determine the demographic characteristics of loggers in Mississippi; 2) determine among loggers the safety practices used in harvesting of hardwood and softwood timber; 3) determine among loggers the number and type of injuries sustained in logging; and 4) determine among loggers the effectiveness of safety classes taught by the Mississippi Cooperative Extension Service. Some of the major findings were: 1) the average age of loggers was 45 years and nearly 29% had less than a high school education; 2) a logging operation averaged 4.2 persons; 3) seventy-three percent of the respondents owned their own business; 4) the most frequent accidents among loggers were slips and falls which was 55% of the accidents reported in 1999. Recommendations were: 1) to continue providing safety training programs to educate all persons involved in the logging industry; and 2) safety training modules used by the MCES should include more practical applications and demonstrations to better enable loggers to understand the safety practices and concepts.

#### THE DETERMINATION OF DIURON IN CATFISH BY HPLC WITH UV-VIS DETECTION

Henry E. Outlaw\* and Ernest L. Brothers, Delta State University, Cleveland, MS 38733

A concern among catfish farmers is the "off-flavor" produced by the blue-green algae, which blooms on the ponds during the spring and summer months. Two chemical by-products released by the blue-green algae are Geosmin (GEO) and methylisoborenol (MIB). These chemicals give catfish an earthy or dirt, like taste. When this occurs, catfish is said to have "off-flavor." In order to combat this problem, research is being conducted on the use of a phenyl urea herbicide called Diuron to control the blue-green algae. Diuron currently has an emergency tolerance level for combined residues at 2.0 ppm on catfish.

This emergency tolerance level was established by the Environmental Protection Agency (EPA). If the tolerance level is approved for continued use, an effective and consistent method for determining the residue levels of Diuron on catfish and other matrices will be needed. This method looks at determining Diuron in catfish filets by Accelerated Solvent Extraction (ASE), Liquid-Liquid Partitioning, and detection by HPLC with UV-VIS detection.

#### OBSERVATION OF EARLY INFECTION OF STRAWBERRY BY *COLLETOTRICHUM FRAGARIAE*

Jana B. Avant<sup>1</sup>, Kenneth J. Curry<sup>1\*</sup>, and Barbara J. Smith<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406-5018 and <sup>2</sup>Agricultural Research Service, Small Fruits Research, Poplarville, MS 39470-2005

Anthracnose of strawberry, notable by dark sunken lesions, is a disease caused by several *Colletotrichum* spp. including *C. fragariae*. Penetration of stolons by *C. fragariae* is accomplished by a penetration peg which develops from an appressorium. Once inside the host the penetration peg develops into hyphae that infiltrates the host tissue. The initial invasive hyphae maintain intimate contact with the host wall and perhaps the host plasmalemma. The interaction with the host is crucial for the success of the pathogen, especially an interaction that avoids host defense activation. Several plant pathogens have been found to mask or modify potential elicitors, such as chitin normally present within fungal walls, perhaps to avoid host defenses, such as chitinase. The distribution of chitin in strategic fungal structures, i.e., conidia, germ tubes, appressoria, penetration pegs, and initial invasive hyphae, can be identified with a lectin probe. Strawberry cultivar 'Chandler' was inoculated with *C. fragariae* CF-63, incubated, and observed for the development of anthracnose symptoms. At appropriate stages, infected plant material was fixed and epoxy embedded. Embedded material was sectioned for light microscopy. Few or no fungal cells were found in early lesions. Further study with electron microscopy often revealed stressed host cells in the absence of fungal cells. When fungi were observed they were found more often within cortical tissue than epidermal and subepidermal tissues. Preliminary observations indicate that initial invasive hyphae apparently have less chitin than conidia, germ tubes, and older hyphal cells as measured by relative quantity of probe.

#### CADMIUM ACCUMULATION BY *SESBANIA EXALTATA* DURING PHYTOEXTRACTION

Ketia L. Shumaker\*, Jennifer Ntoni, Susmita Ghosh, and Charles Rhyne, Jackson State University, Jackson, MS 39217

Phytoremediation or green remediation is the use of plants to remediate sites contaminated by heavy metals, which is promising to be cost effective. This study focused on accumulation and the effect of cadmium on *Sesbania exaltata*. A hydroponic system was used to grow the plants

in Hoagland solution alternating with cadmium nitrate  $\text{Cd}(\text{NO}_3)_2$  solution. *Sesbania exaltata* was exposed to 2, 4, 5, 6, 8, 10, 25 and 50 mg/L of cadmium solution. Plants were allowed to grow for four weeks, after which they were harvested and separated into shoots and roots for further metal analysis. *Sesbania exaltata* showed significant reduction in height and biomass when exposed to Cd. The chlorophyll content of the plants was also reduced by Cd exposure. For a plant to be a hyperaccumulator, it has to be able to translocate the metal into harvestable parts. The highest tissue concentration of Cd in the shoots of *S. exaltata* was 526 mg/kg which shows its potential as a Cd hyperaccumulator.

#### INDUSTRIAL WASTEWATER EFFLUENTS EFFECT ON THE GENETIC ENDPOINTS IN *VICIA FABA*: DICHLOROMETHANE AND FORMALDEHYDE

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

This study was done to determine the effect of dichloromethane and formaldehyde, the industrial priority pollutants, on the genetic endpoints, *Vicia faba* seedlings were treated with the chemicals in a randomized block design with four replication. Two concentrations of each of the test chemicals were selected, i.e., 175  $\mu\text{M}$  and 1750  $\mu\text{M}$  of dichloromethane and 100  $\mu\text{M}$  and 1000  $\mu\text{M}$  of formaldehyde. Lateral roots with a length of 1–2 cm were treated with the chemicals for 2 h in the dark. The seedlings were transferred to distilled water for a 24 h recovery period and root tips were harvested after 2 h treatment with 0.05% colchicine. Root tip squashes were stained with feulgen stain and data was collected for mitotic index and chromosomal aberrations. Both dichloromethane and formaldehyde depress mitotic activity in the meristematic tissue of vicia faba root tips in dose-dependent manner. Depressing effect of 1750  $\mu\text{M}$  dichloromethane on mitotic index was significantly higher than 1000  $\mu\text{M}$  of formaldehyde. Dichloromethane and formaldehyde produced significantly more chromosomal breaks than the controls and their effect was dose-dependent. Dichloromethane at both concentrations produced more chromosomal breaks than formaldehyde. Considering total chromosomal aberrations the effect of both chemicals was dose-dependent and dichloromethane being more toxic than formaldehyde. Supported by Department of Education grant # P031B44000-95

#### EFFECTS OF EDTA ON THE PHYTOEXTRACTION OF LEAD FROM A CONTAMINATED SOIL USING COFFEEWEED (*SESBANIA EXALTATA* RAF.)

G.B. Begonia\*, M.F.T. Begonia, G. Miller, E. Dillon\*, and O. Ighoavodha, Jackson State University, Jackson, MS 39217

This study was conducted at the Jackson State University greenhouse to evaluate whether the addition of a synthetic chelate, ethylenediaminetetraacetic acid

(EDTA), can further enhance the effectiveness of coffeeweed (*Sesbania exaltata* Raf.) as a phytoextraction species. Coffeeweed seeds were grown in various concentrations of lead (Pb) and EDTA mixed with a growing medium composed of sieved soil, peat, and sand (4:2:1, v:v:v). After six weeks of growth, the plants were harvested and their Pb contents were extracted using a modified nitric acid-hydrogen peroxide digestion technique. Lead concentrations were quantified by atomic absorption spectrophotometry. Results showed that coffeeweed can tolerate soil Pb levels up to 2000 ppm and that EDTA can significantly enhance the uptake of Pb by both the roots and the shoots. The results further demonstrated that pre-planting application of EDTA caused a greater Pb uptake by the plant compared to the untreated control and plants that were amended with EDTA one week before harvest.

#### PHYTOEXTRACTION OF LEAD FROM CONTAMINATED SOILS USING WHEAT: ROLE OF A SYNTHETIC CHELATE

M.F.T. Begonia\*, G.B. Begonia, K. Seals, A. Butler\*, R. Warren, and M. Burrell, Jackson State University, Jackson, MS 39217

Preliminary studies indicated that wheat (*Triticum aestivum* L.) can tolerate and accumulate significant amounts of lead (Pb) in its shoots when grown in Pb-amended sand. To further evaluate the potential of wheat for phytoextraction, a study was conducted to determine whether the timing of ethylenediaminetetraacetic acid (EDTA) application and acetic acid amendment can further enhance the shoot uptake of Pb. Two seeds were planted in each 150 ml super cell containing top soil and peat (2:1, v:v) amended with various levels of Pb and EDTA. Results revealed that wheat plants can tolerate toxic Pb concentrations as evidenced by the non-significant differences in shoot and root biomass among treatments. An exception to this general observation was the root inhibition of plants grown in 2000 ppm Pb that was amended with EDTA and acetic acid one week before harvest. Generally, root and shoot Pb uptake increased with increasing concentrations of soil-applied Pb. When no EDTA was added to the growth medium, the majority of the Pb was retained in the roots. However, when EDTA was applied one week before harvest, there was an enhanced Pb translocation to the shoots. Application of acetic acid in conjunction with EDTA led to a tremendous increase in shoot Pb uptake.

#### CHELATE-INDUCED PHYTOEXTRACTION OF LEAD FROM CONTAMINATED SOILS USING TALL FESCUE (*FESTUCA ARUNDINACEA*)

M.F.T. Begonia\*, G.B. Begonia, M. Ighoavodha\*, O. Okuyiga-Ezem, and B. Crudup, Jackson State University, Jackson, MS 39217

Tall fescue (*Festuca arundinacea* cv. 'Spirit') had been found to tolerate and accumulate substantial amounts of lead (Pb) in its shoots when grown in Pb amended sand.

To further evaluate the suitability of tall fescue for phyto-extraction, a study was conducted to determine whether the timing of ethylenediaminetetraacetic acid (EDTA) application and acetic acid amendment can further enhance the shoot uptake of Pb. Seeds were planted in 1.9 L plastic pots containing top soil, peat, and sand (4:2:1, v:v:v) amended with various levels of Pb and EDTA. Generally, root and shoot growth of tall fescue were not significantly affected at the two lower Pb levels, but were inhibited at the two higher Pb treatments with preplanting EDTA amendments. EDTA significantly increased shoot Pb uptake. However, there was no difference in Pb uptake whether EDTA was applied before planting or a week before harvest. Addition of acetic acid to the growing medium one week before harvest, further enhanced shoot and root Pb uptake only in plants grown at 1000 ppm Pb.

#### RESPONSE OF CHINESE MELON (*MOMORDICA CHARANTIA* L.) TO DIFFERENT TRELLIS SYSTEMS AND MULCHES

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Chinese melon (*Momordica charantia* L.) yield as influenced by four trellis systems and five different mulching treatments was evaluated. Chinese melon seeds of cultivar Durga an Indian variety were used for trellis systems study and planted on June 2, 1999. Chinese melon plants grown without trellis (control) were the least productive. Maximum yield was obtained with V-shaped trellis system followed by vertical and semi-vertical trellis systems. Harvesting was more convenient with all trellis systems as compared to control where the plants were allowed to trail and spread on the ground. First harvest date was July 23, 1999 (50 days after transplanting) and final harvest date was October 25, 1999 (144 days after transplanting). Chinese melon seeds of an introduction from India were used for mulching study and planted on May 18, 1999. All plants were grown on a vertical trellis system. All mulching treatments were equally effective for the total yield compared to control (no mulch). However, for greater total yield, hay, weed barrier and black plastic were superior to Kenaf matt. Kenaf matt did not differ from control. It was apparent that yield increased with time, peaked in October, and started declining in November. First harvest date was August 5, 1999 (77 days after transplanting and final harvest date was November 6, 1999 (171 days after transplanting).

#### AN ANALYSIS OF POTENTIAL MARKET OUTLETS AND MARKETING OPPORTUNITIES FOR SMALL-SCALE *ECHINACEA* PRODUCERS

Robin Case<sup>1\*</sup>, Kimberly Jones<sup>1</sup>, Cassandra Williams<sup>1</sup>, Liang C. Huam<sup>1</sup>, and Allyson Best<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096 and <sup>2</sup>University of Mississippi, University, MS 38677

Trends toward alternative medicine and natural healing have increased the interest in *Echinacea* cultivation in the U.S. *Echinacea* was the top selling medicinal herb in 1997, accounting for almost 300 million dollars in consumer herb sales. Marketing of *Echinacea* products have increased significantly in the last ten years as more consumers discover the medicinal benefits associated with their use. The actual size of the *Echinacea* product market and its marketing network are unknown, as it has only recently been commercialized for mass production. For small producers to grow the crop profitably, information on market outlets and opportunities must be clearly identified and made available for potential growers. Unlike traditional cash crops where markets have been established, the marketing of herbs, such as *Echinacea*, requires growers to research the markets, identify major buyers, and determine how to market their product. The purpose of this study is to explore market options that are currently available to small-scale producers by identifying existing distribution network and market outlets, including opportunities available for small producers. Data for this study was obtained from a market survey conducted by the University of Mississippi in 2000. Preliminary results indicate that marketing channels where farmers can sell their products depend on production volume, quality of raw products, consistency of supply, and ability to do contract farming with processors or buyers.

#### AN ECONOMIC EVALUATION OF *ECHINACEA* AS A POTENTIAL SMALL FARM CROP

Liang C. Huam<sup>\*</sup>, Patrick E. Igbokwe, and Robin Walker, Alcorn State University, Alcorn State, MS 39096

Increasing the economic viability of small farms requires operators to search for high value alternative crops. One such alternative to the traditional crops is *Echinacea*, which has achieved worldwide popularity for its antiviral properties. While demand for *Echinacea* products has increased, little economic and production information are available locally. Specifically, little is known about the economic returns and costs associated with small-scale cultivation of this crop. The objective of this study is to evaluate and compare the profit margins of two *Echinacea* crop species (*E. purpurea* and *E. angustifolia*) that are adaptable to local climatic conditions. Production data for this study was collected from a field experiment conducted at Alcorn State University over a period of two growing seasons. Preliminary results suggest that both species of *Echinacea* are economically viable; however, *E. purpurea* has higher root yield than *E. angustifolia*. Both species of *Echinacea* show positive gross margins with a two-season crop cycle.

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### FRIDAY AFTERNOON

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Imperial Room



1:15 THE HOST-PATHOGEN RELATIONSHIP BETWEEN *CERCOSPORELLA RUBI* AND BLACKBERRY CULTIVAR 'SHAWNEE' (*RUBUS* SP.)

Melinda R. Lyman<sup>1\*</sup>, Kenneth J. Curry<sup>1</sup>, and Barbara J. Smith<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406-5018 and <sup>2</sup>Agricultural Research Service, Small Fruits Research, Poplarville, MS 39470-2005

The mechanism *C. rubi* uses to obtain nutrients from blackberry may be both saprophytic and parasitic. *Cercospora rubi* is present from the time floral differentiation is initiated until mature flowers become senescent. Throughout floral development, hyphae are dense in crevices among carpels, stamens, petals, and sepals. Host cells appear healthy although hyphae, sheathed by a matrix, are closely appressed to the epidermis. Uninjured host cells would be expected since penetration structures have not been observed. *Cercospora rubi* might absorb plant exudates from the surface of floral organs. Accumulation of exudates within crevices would provide an explanation of why more hyphae are found in crevices. In addition, *C. rubi* might take advantage of moribund tissue. Two ovules are produced during ovary development. One ovule naturally aborts at some point during development. Hyphae are found surrounding the deteriorating ovule and within collapsed tissue. These observations suggest that *C. rubi* expresses a saprophytic phase. Healthy carpels appear further along in development than infected carpels on floral buds of the same diameter. This may be due to hyphae interfering with suture closure during carpel development. *Cercospora rubi* might be accelerating senescence by curtailing floral development. These observations suggest that *C. rubi* is expressing both parasitic and pathogenic phases.

1:30 PESTICIDE UPTAKE IS AFFECTED BY PLANT GROWTH STATUS

Joseph M. Wahome, William C. Mahone, and Roderick Bailey\*, Mississippi Valley State University, Itta Bena, MS 38941

Bean and pea plants grown under controlled conditions were challenged with an organophosphate pesticide at various stages of growth. Pesticide residues were extracted from roots, stems and leaves and analyzed using High Performance Liquid Chromatography. Both plant species accumulated pesticides. The level of accumulation peaked at the maximum growth phase. These findings will be discussed in view of bioremediation and evaluation of food webs and food chains.

1:45 LEAD CONTAMINATION IN URBAN SOILS: DETECTION AND REMEDIATION STRATEGIES

Jennifer McDonald\*, Kawana Alexander, Susmita Ghosh, and Charles Rhyne, Jackson State University, Jackson, MS 39217

Lead contamination in urban soil is a severe

problem in many cities. Lead containing paint, for instance, often falls into urban soils near homes on which it was applied until the mid-1970s. After selecting possible sites for lead contamination, soil, plant and paint samples were taken from various vacant lots on Pearl Street, Jackson, MS. The samples were dried in an oven at 1000°C for 24 hours, ground and tested for lead by using a Niton XRF (X-ray fluorescence) instrument. Of the 28 samples taken, several soil samples had higher than 500 ppm of lead with the highest of 6384 ppm. The highest amount of lead was found at 30 cms away from the foundation where the primary source was fallen paint chips. Lead in plant samples from around the house was found to be below detection levels. Phytoremediation was also studied in the lab as a possible remediation strategy.

2:00 SCREENING FOR LEAD HYPERACCUMULATORS IN PHYTOREMEDIATION STUDY

Nyki Preacely\*, Aaron L. Jackson, Susmita Ghosh, and Charles Rhyne, Jackson State University, Jackson, MS 39217

Phytoremediation is a natural process carried out by plants, especially those that have been able to survive in contaminated soil and water. Plants constitute 99% of all living mass (biomass) on earth and may serve as major sinks for heavy metals released into the environment. Our research objective is based on surveying and identifying wide-ranging plant species as potential hyperaccumulators. A modified hydroponic growing system was used to suspend plants in aqueous solutions of either Hoagland's nutrient medium or varying concentrations of lead nitrate, Pb(NO<sub>3</sub>)<sub>2</sub>. Plants were exposed to Pb concentrations of 50–500 mg/liter of Pb. After three weeks of Pb exposure, plants were harvested and separated into shoots and roots to analyze the accumulations of Pb. Among the ten different plant species tested, three species of mint (*Mentha spicata*, *M. gracilis*, and *M. suaveolens*) and two varieties of tropical spinach (*Basella rubra*) showed high potential as Pb hyperaccumulators. The height and biomass of the plants were also observed.

2:15 MATHEMATICAL MODELING OF LEAD PHYTOREMEDIATION AND WEB DESIGN

Debmallo Shayon Ghosh\*, Susmita Ghosh, Charles Rhyne, and Kunal Ghosh, Jackson State University, Jackson, MS 39217

The problem of lead contamination is a severe one in soil and water in many areas. Some plants, named hyperaccumulators, take up lead in large amounts. However, it is difficult to determine how much lead a plant will accumulate. Each plant's lead uptake depends on the lead concentration in the growth medium, but in exactly what relation is hard to calculate. First part of the purpose of the project is to write a computer program that calculates this relation. Much of the preliminary work, such as the plotting of basic regression lines, was accomplished using Microsoft Excel 2000. The actual program was completed

in FORTRAN and written and compiled on a Jackson State University server. Data from *Ipomoea lacunosa*, *Sesbania exaltata*, and *Triticum aestivum* was used. The second part of this project involved the creation of a web page about the Jackson State University phytoremediation program, basically an Internet-based unified database of information about phytoremediation. This project was completed using Microsoft FrontPage 2000 as a design tool and a HTML editor. Both of these projects will, hopefully, help the growing field of phytoremediation.

2:30 Break

2:45 A NOVEL AND RAPID METHOD FOR ANALYSIS OF NUTRIENT UPTAKE BY THE PLANTS BY USING ION SELECTIVE ELECTRODES

Mudlagiri B. Goli, Nicole Harris, and Brian Smith\*, Mississippi Valley State University, Itta Bena, MS 38941

It is a well-known fact that for chemists, it is not easy to perform the research without an access to instruments like GC, HPLC, AA, Spectrophotometers, NMR, etc. Even if you have some of them it is difficult and a costly affair to keep them updated and running. Many of these instruments are highly technical, trouble prone, accident-prone and are beyond the reach of pocket books of many schools. And important thing is one has to **generate a lot of chemical waste** like in HPLC methods. To analyze a few samples we are forced to create a large amount of liquid waste. Many schools are not in a position to handle the generated waste. Keeping that in mind, we planned to **develop a method** that is, *user friendly, less technical, rapid, no waste generator and reliable*. We saw the possibility of that in ion selective electrodes and in other probes. We have studied a biological system. The author's (*mbg*) familiarity with the lemon grass, a grass good to have in your back yard led him to use it as a system. We planted 12 +12 = 24 of that grass in the green house starting from September 8, 2000. After one month of planting, the plants were separated into two groups. One group was treated with various amounts of calcium nitrate. Similarly the other group was treated with ammonium nitrate in equi-molar amount of nitrate ions. In retrospect that is like ammonium to calcium = 2:1 ratio. The plants were allowed to grow for 16 more days before they were cut down and analyzed for  $\text{Ca}^{+2}$ ,  $\text{NH}_4^{+1}$ ,  $\text{NO}_3^{-1}$ ,  $\text{Cl}^{-1}$  and total dissolved solids. The analysis of uptake of chemicals by the plant will be discussed. These readings are surely interesting and helpful in studying the effect of fertilizers on the growth of the plants.

3:00 A NOVEL AND RAPID METHOD FOR ANALYSIS OF THE MICRONUTRIENTS PRESENT IN VEGETABLES BY USING ION SELECTIVE ELECTRODES (ISE)

Mudlagiri B. Goli, Mississippi Valley State University, Itta Bena, MS 38941

As stated in our earlier paper, our attempt of studying the nutrient uptake by the plants and the analysis of chemicals by Ion Selective Electrodes (ISE) was a success. That led us to apply this ISE method to other plant products, vegetables. So far we have analyzed the green beans and black eyed peas for  $\text{Ca}^{+2}$ ,  $\text{NH}_4^{+1}$ ,  $\text{NO}_3^{-1}$ ,  $\text{Cl}^{-1}$  and total dissolved solid. The analysis was carried out in duplicates. The numbers are reproducible and give us a significant insight into the chemical compositions of many of those ions in the vegetables. We have a plan to study the other vegetables too. We want to thank Vernier Software & Technology for providing us with the valuable tool, the sensors and the interface, LabPro 2.0. We are not promoting any company. We just happened to have Vernier system in our laboratory. The author is fully responsible for the numbers quoted in here. The numbers to be quoted in the presentation are for scientific discussion only. More has to do be done before one can put them as nutrient values.

3:15 PHYTOREMEDIATION OF LEAD IN SOIL

William C. Mahone, Abul B. Kazi, Joseph M. Wahome, and Andrea Cook\*, Mississippi Valley State University, Itta Bena, MS 38941

Previous studies of pesticides with legumes "Lima Beans" have shown them to display vigorous transport and metabolic activity. Subsequent preliminary studies have indicated that they are capable of bio-accumulating lead from soil. Analysis of legumes, grown under exposure to soluble lead, was carried out by dry ashing, extraction, and flame AA techniques. Results of these studies will be discussed.

3:30 BLOOM THINNER WILTHIN DECREASED FRUIT SET AND INCREASED FRUIT YIELD AND QUALITY OF THREE APPLE CULTIVARS

Ejaz Ansari, Frank B. Matta\*, and Liaquat A. Khan, Mississippi State University, Mississippi State, MS 39762

Apple cultivars 'Royal Gala,' 'Blushing Gold,' and 'Ultra Gold Delicious' were sprayed with different concentrations of Wilthin. The trees were sprayed at eighty percent bloom. In 1997, fruit diameter of 'Royal Gala' was increased by 1.5% Wilthin. In 1998, all Wilthin concentrations increased fruit diameter. Fruit diameter of 'Ultra Gold' was increased by all concentrations of Wilthin in 1997 and 1998. Wilthin did not influence fruit diameter of 'Blushing Golden.' Wilthin decreased fruit set in all three apple cultivars. Fruit yield, length, and firmness was increased by Wilthin and the response was concentration and cultivar dependent. In general, Wilthin increased soluble solids concentration (SSC), individual sugars, and reduced fruit juice acidity of all cultivars.

3:45 THE ROLE OF FATTY ACID CONTENT IN PECAN COLD HARDINESS

Jeb Cade\* and Frank B. Matta, Mississippi State University, Mississippi State, MS 39762

A two-year study (1998–99 and 1999–2000) was conducted to determine the relationship between fatty acid content and pecan cold hardiness. Cultivars evaluated were ‘Jackson’ and ‘Owens.’ The predominant fatty acids were linolenic (18:3), linoleic (18:2), oleic (18:1), stearic (18:0), and palmitic (16:0). In both cultivars, total saturated fatty acid content was negatively correlated with cold hardiness and negatively correlated with unsaturated fatty acid content. Total unsaturated fatty acid content was positively correlated with cold hardiness. In ‘Owens,’ 18:2 was significantly correlated with cold hardiness and total saturated fatty acid content. The findings were similar both years, indicating a strong relationship between fatty acid content and cold hardiness.

4:00 Divisional Business Meeting

**CELLULAR, MOLECULAR AND  
DEVELOPMENTAL BIOLOGY**

Chair: Peter Butko, University of Southern  
Mississippi

Vicechair: Roy J. Duhe, University of Mississippi  
Medical Center

**THURSDAY MORNING**

Room 3

8:45 Introduction—Peter Butko

9:00 IDENTIFICATION OF CELLULAR PHOSPHATIDYLCHOLINE SPECIES AND PRODUCTION AND IDENTIFICATION OF CELLULAR PHOSPHATIDYL ALCOHOLS USING ELECTROSPRAY MASS SPECTROMETRY

Patrick B. Kyle\* and Rodney Baker, University of Mississippi Medical Center, Jackson, MS 39216

Phosphatidylcholine is an important membrane phospholipid that plays an integral role as a second messenger in intercellular signaling cascades of most cell types. Phosphatidylcholine is hydrolyzed by phospholipase D to produce phosphatidic acid, a ubiquitous intercellular messenger. Ethanol and other alcohols are utilized by phospholipase D as co-substrates in a transphosphatidyl transfer reaction to produce phosphatidyl(alcohol). The inclusion of phosphatidyl alcohols into the cell alters the normal phospholipid composition and consequently alters phospholipid dependent cell signaling processes. Phospholipase D was used to produce several phosphatidyl alcohols, which were identified using a tandem mass spectrometer (PE SCIEX

API 365, triple quadrupole). We used the same instrument to identify the normal phosphatidylcholine species in a macrophage (RAW 264.7) cell line. This cell line was treated with ethanol, ethylene glycol, and two ethylene glycol ethers to produce phosphatidyl alcohols that compared to the normal phosphatidyl choline species.

9:15 IN VITRO EVOLUTION OF NEW RIBOZYMES WITH THIOESTER SYNTHASE ACTIVITY

Lijun Zhang\* and Faqing Huang, University of Southern Mississippi, Hattiesburg, MS 39406

The ‘RNA world’ hypothesis, which assumes that the chemical processes leading to the appearance of life were carried out by RNA molecules, has stimulated interests in catalytic reactions involving oligonucleotides such as catalytic RNA (ribozyme). Thioesters are important intermediates in the metabolism of modern organisms, and might have played important roles in the origin and early evolution of life. If there had been an RNA world before our RNP (ribonucleoprotein) world, thioester biosynthesis would have been carried out by RNA catalysts in the RNA world. Demonstration of RNA-catalyzed thioester synthesis might provide direct experimental evidence that thioesters could have been synthesized and played important functional roles in the RNA world and possibly in a pre-RNA world. Here an iterative in vitro selection procedure is being performed to isolate a new class of catalytic RNAs with thioester synthase activity from a large pool of 60N random-sequence coenzyme A-linked RNA molecules. Biotinyl adenylate was synthesized chemically and used as the reactant for the thioesterification. The new ribozymes will catalyze the covalent C-S bond formation between a sulfhydryl group and a carboxyl group.

9:30 ISOLATION OF RNA WITH NOVEL CATALYTIC ACTIVITY BY IN VITRO SELECTION

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

The ‘RNA world’ hypothesis claims that ancient life forms employed a variety of different catalytic RNA in their biosynthetic machinery. In the quest for novel catalytic activity, we are investigating the use of polyphosphate as a potential energy source for these life forms. Employing an in vitro selection method, RNA capable of catalyzing its own phosphorylation from polyphosphate is explored using a library with a random region of 60N in length. Following nine rounds of selection, UV shadowing revealed an unexpected band in the gel corresponding to an apparently much larger RNA. This band is found to make up 38% of the total RNA upon selection procedure modification and additional selection cycles. The structure and function of this RNA is being examined.

9:45 EXPRESSION OF FLUORESCENT PROTEIN-FUSION OF RAT JANUS KINASE 2 AND

### HUMAN THIOREDOXIN IN COS-7 CELLS

Sheeyong Lee\*, John K. Smith, J.S. Vig Parminder, and Roy J. Duhe, University of Mississippi Medical Center, Jackson, MS 39216

The Janus protein-tyrosine kinases (JAKs) are important in cytokine signaling. However, because they are widely expressed and have low apparent specific activities, it is difficult to confirm expression of recombinant JAKs by conventional assays. The enhanced green fluorescent protein (GFP)-fusion proteins is a well-developed tool for visualizing the production of recombinant proteins. We constructed a chimeric pEGFP:rat JAK2 (rJAK2) vector in two step steps. First, we generated a cDNA fragment that encodes the amino terminal domain of rJAK2 and subcloned it into pEGFP-C1 vector. Second, we subcloned the cDNA fragment encoding the carboxy terminal domain into the above vector. pEGFP:hJAK3 vector was generated in same strategy. We built red fluorescent protein (RFP):human thioredoxin (hTRX) expression vector for co-transfection to investigate whether the reductive enhancement of JAKs can account for the mitogenic "helper effect" of thioredoxin. We are generating site-directed mutant vectors for GFP-fusion JAKs and RFP-fusion TRXs. These inactive proteins can be used as negative control. Transfection was performed with effective transfection reagents and cells were sorted via fluorescent activated cell sorter. This approach should provide major technical advantages including the easy isolation of transfected cells from non-transfected cells. Furthermore, the expression of mutagenized JAKs can help evaluate physiological function of modified JAKs in signal transduction.

### 10:00 IN VITRO TOOLS TO STUDY REGULATION OF JANUS KINASE

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

Janus Kinases (JAKs) are intracellular receptor-associated tyrosine kinases, essential for cytokine signaling. We constructed three short forms of rat JAK2 with N-terminal GST tags, and successfully used the baculovirus expression system to overproduce them in insect cells. These short forms GST:(NdeltaJH2)rJAK2, GST:(Ndelta661) rJAK2 and GST:(NdeltaJH1)rJAK2, along with full length (GST:rJAK2) and kinase inactive (GST:(Cdelta795) rJAK2) forms are being used to elucidate the molecular mechanisms regulating JAK2 catalytic activity. One study involves the "relief of autoinhibition" hypothesis, based on earlier observations that short forms lacking N-terminal domains appear to be "hyperactive." By sequential immunodepletion, we separated the tyrosine-phosphorylated (PY) pool of purified full-length GST:rJAK2 from the non-PY pool, and compared their kinase activities. Our results indicate that non-PY GST:rJAK2 has negligible kinase activity. We are attempting to determine whether removal of the "autoinhibitory domain" via partial proteolysis is sufficient to

activate the non-PY GST:rJAK2. Complete purification of the three new GST-tagged forms is under way, and will allow rigorous comparison of their tyrosine phosphorylation activities to that of the full-length form, and further study of the apparent JAK hyperactivation phenomenon. Another study concerns sensitivity of full-length JAK2 to redox agents. We found that activity of two short forms is sensitive to ortho-iodosobenzoate(o-IBZ), which is reversible with dithiothreitol (DTT). Assuming that cysteine residues are responsible for such sensitivity, they can be identified using the short forms by site-directed mutagenesis.

### 10:30 Divisional Poster Session

### PATERNITY TESTING AND THE ASSESSMENT OF STICKLEBACK FISH MATING SYSTEM

Fameeka Jenkins\* and Guillermo Orti, Alcorn State University, Alcorn State, MS 39096 and University of Nebraska, Lincoln, NE

This study will characterize the mating system of *Gasterosteus aculeatus*, a territorial fish with parental care. During the mating season, territorial male stickleback compete for females to lay eggs in their nest. But some males adopt an alternative strategy ("sneaker" males) and steal fertilizations from another male's nest and allow that male to raise the offspring. In order to assess the success of these alternative strategies, a collection of 50 nests from a freshwater lake, containing all the fertilized eggs and their guarding males will be tested for paternity. Success will be measured as the proportion of the offspring in a nest inferred to be actually fertilized by the guarding male. Paternity tests for 20 eggs per nest based on microsatellite genotyping will determine the proportion of illegitimate offspring per nest. Five or more of the 50 nests were assayed over an eight-week period. The preliminary results show that the percentage of illegitimate offspring range from 0% to 56%. This value will be correlated to variation of body form and external features of the guarding males.

### INHIBITION OF ESTROGEN INDUCED PROLIFERATION OF BREAST CANCER CELLS BY INDIRECT-ACTING ANTIESTROGENS

Beverly N. Cruthirds<sup>1</sup>\*, Emely Casto-Rivera<sup>2</sup>, and Stephen Safe<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217 and <sup>2</sup>Texas A&M University, College Station, TX 77801

Breast cancer cells in culture have been used as a model to understand the effect of 17 $\beta$ -estradiol (E2 or estrogen) on cell growth. In addition, we have also investigated the inhibitory interaction of several compounds. They developed as indirect acting antiestrogens. These compounds which include 9-cis-retinoic acid (9CRA), All-trans-retinoic acid (ATRA), Indole-3-carbinol (I3C) and diindolylmethane (DIM) analogues do not bind to the estrogen receptor (ER), but block E2 action through cross talk between signaling pathways. Results of initial studies showed that 10 nM E2

induced a 4 to 90 fold increase in proliferation in MCF7 and ZR75 human breast cancer cells. In contrast, the 9CRA, ATRA, I3C and DIM analogues alone exhibited minimal estrogen-like activity in the cell lines. In cell lines co-treated with 10 nM E2 plus different concentration (10 nM to 10  $\mu$ M), inhibition (~90% to 30%) of cell proliferation was observed for all compounds. Current studies on the mechanism associated with this inhibitory cross talk are currently being investigated in these cell lines.

#### INHIBITION OF PROLIFERATION BY VINCA ALKALOIDS IN P19 AND MCF-7 CELL LINES

Erin A. Propst\*, LaSharon D. Mosley, Barbara P. Rogers, and Sharon Lobert, University of Mississippi Medical Center, Jackson, MS 39216

Previous in vitro drug receptor experiments demonstrate differential activity for five vinca alkaloids. The purpose of this research was to determine IC<sub>50</sub> values in two cell lines for five vinca alkaloids. The experiments were conducted by plating the cell lines in 96-well and 24-well plates, and exposing the cells to a range of drug concentrations from 30 nM to 1 nM. The P19 cells were exposed to each drug for 24 hours. The MCF-7 cells were exposed to each drug for 48 hours. The proliferation assay used was a standard NADH assay. The drug titration data were fit by exponential decay to obtain the IC<sub>50</sub> values. Activity against both cell lines was found to be similar and will be presented.

#### QUANTITATION OF PROSTATE APOPTOSIS RESPONSE-4 (Par-4) IN RAT COLONIC TISSUE

Lauretta A. Ansah<sup>1\*</sup>, Laurie Davidson<sup>2</sup>, and Robert S. Chapkin<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217 and <sup>2</sup>Texas A&M University, College Station, TX 77843

Colon cancer is the third leading cancer diagnosed in both men and women in the United States. Scientists are currently investigating why this cancer is so prevalent in our society. Inhibition of apoptosis is now thought to be an integral component of the genesis of colorectal adenomas and carcinomas. Apoptosis is a programmed cell death that is needed to destroy cells that are a threat to the integrity of the organism. It has also been suggested that reduced apoptotic ability may predispose individuals to an increased risk for cancer, implying that apoptosis rates may be useful in identifying "at risk" subjects. Par-4 is a pro-apoptotic protein that plays a pivotal role in the down-regulation of cancer cell formation with respect to the regulation of apoptosis. However, Par-4 localization and expression within the colon has not been determined, therefore, we quantified patterns of Par-4 expression during colonic tumorigenesis. Sprague-Dawley rats were provided with one of two diets (fish oil or corn oil) and animals were injected with the carcinogen, azoxymethane, and the distal colon was removed at 0 and 9 hr later. Immunohistochemical analysis for Par-4 was performed using paraffin-embedded colonic sections. Fifteen crypts

(divided into tertiles) from each animal were taken and quantified using fluorescence microscopy. The results showed an increase of Par-4 protein in the colonic sections from carcinogen-treated animals ( $P < 0.05$ ). In addition, carcinogen-treated colon sections had the highest levels of apoptosis in the bottom one-third of the crypt compared with the non-carcinogen treated colon sections, which had higher levels of expression in the top one third of the crypt ( $P < 0.05$ ). This is significant since stem cells develop in the bottom one-third of the crypt, and apoptosis could therefore delete damaged/mutated cells before they divide and populate the crypt. These results are consistent with previous findings that show apoptosis plays a major role in the development of colon cancer.

#### CELLULAR RESPONSE, CYTOTOXICITY, AND P53 EXPRESSION OF ARSENIC AND ATRAZINE USING HEPG2 CELL LINES

Reshuna Y. Durden\*, Barbara Wilson, Paul Tchounwou, and Ali Ishaque, Jackson State University, Jackson, MS 39217

Atrazine and arsenic are among the leading chemicals that are used in America for agricultural purposes. Atrazine is a manmade herbicide used for the control of broadleaf and grassy weeds. It is persistent in the environment and contaminates ground waters and surface waters that are sources for human consumption and recreation. Lifetime exposure to atrazine, at levels above 0.003 mg/L, has the potential of causing cancer. Arsenic is a carcinogen not only for skin, but also for internal organs such as the lung and bladder. Health effects associated with arsenic exposure include diabetes, cardiovascular disease, hearing loss, and neurological and neurobehavioral effects. The maximum contaminant level for arsenic exposure is 50  $\mu$ g/L. The goals of this project were: 1) to determine the toxicity of arsenic trioxide and atrazine using the Lactate dehydrogenase (LDH) assay and 2) to determine the cellular response mechanism of arsenic and atrazine in human hepatic carcinomal cell (HepG2) lines. To conduct this experiment, HepG2 cells were seeded at 10<sup>6</sup> cells/ml and exposed to the chemicals for 48 hours. LDH analysis was used to determine the lethal concentration at which fifty-percent of the cell population (LC<sub>50</sub>) would die. Total protein concentration was determined using the Bradford Assay, and Western Blot Analysis evaluated p53 cellular protein expression. The results indicated that atrazine alone was non-toxic to HepG2 cells in the concentration ranges tested. The LC<sub>50</sub> value for arsenic trioxide was shown to be 12ppm. The tumor suppressor gene product p53, which is a critical mediator of the cellular response to DNA damage, was expressed after treatment of HepG2 cells with 12 ppm of arsenic. This research was supported by NIH- RCMI Grant G122RR13459 and NIMH-COR grant MH-16926.

#### CHARACTERIZATION OF METAL BINDING TO A SINGLE AMINO ACID RESIDUE MUTANT, C11G CADC; A METAL-RESPONSIVE TRANSCRIPTIONAL

**REPRESSOR FROM *STAPHYLOCOCCUS AUREUS* P1258**

Patricia Gordon<sup>1\*</sup>, Laura Busenlehner<sup>2</sup>, and David Giedroc<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217 and <sup>2</sup>Texas A&M University, College Station, TX 77843

*Staphylococcus aureus* p1258 CadC is a metal-responsive transcriptional repressor of the cad operon. In vivo, Cd(II), Pb(II), Zn(II), and Bi(III) all stimulate the expression of an efflux pump to efficiently remove toxic metal ions. C11G CadC is a protein that is produced by changing the 11<sup>th</sup> amino acid in CadC from cysteine to glycine, a mutation from a metal binding residue to one which can not bind metal. CadC is derived from a spherical bacterium called *Staphylococcus aureus*. This bacterium contains strains that are capable of producing a highly heat-stable protein toxin that causes illness in humans. The CadC protein from the CadA cadmium resistance operon of *Staphylococcus aureus* plasmid p1258 regulates transcription of this metal detoxification system in vivo. The C11G CadC protein was over-produced in *Escherichia coli* cells and purified. Titrations with known aliquots of Cd(II), Pb(II), and Bi(III) reveal that, compared to wild type CadC, C11G CadC binds less equivalents of metals, as well as having less metal-to-ligand charge transfer absorbance which indicates that cysteine 11 is a metal binding residue. Further experiments in which all cysteines are mutated should reveal which residues are involved in metal binding, and whether or not cysteines play a role in metal specificity.

**MOVEMENT OF tmRNA GENE FRAGMENTS IN THE *SALMONELLA* GENOME**

Shenekia A. Wells\* and Kelly Williams, Alcorn State University, Alcorn State, MS 39096 and Indiana University, Bloomington, IN 47405

*Salmonella*, a well-known pathogen with widespread effects, has affected many lives throughout recent years. This study takes a closer look at tmRNA gene fragments that have been identified in genome sequencing projects for multiple *Salmonella* species and strains. tmRNA is a recently discovered bacterial RNA with characteristics of both tRNA and mRNA, which helps cells solve problems from stalled ribosomes. This gene is often used by bacteriophages as an attachment site. While this is true in *Salmonella*, what is unusual is that many of 45 nucleotides at the 3' end fragment of the gene have also been found at different sites in the genome, but are always flanked on at least one side by bacteriophage related sequence. This project's aim is to analyze these fragments and their locations through a series of tests. These tests are run to see if there is a specific pattern of sequences for why these tmRNA fragments are in those locations. To further explore the distribution of this fragment throughout the *Salmonella* genome, 37 DNA from different strains of *Salmonella* are being tested along with an *Escherichia coli* strain. In a series of polymerase chain reactions (PCR), *Salmonella* sequences will be amplified, by cycles of

denaturing, primer annealing, and extension by Taq DNA polymerase. For the tmRNA gene and each of the gene fragment sequences available from the genomic projects, PCR primers were designed, and the expected PCR product sizes were tabulated. Genomic DNA was prepared from 37 *Salmonella* strains that span the diversity of the genus. All 10 PCRs will be performed on each DNA sample. This work will reveal the pattern of distribution of tmRNA gene fragments among *Salmonella* and may allow reconstructing of the sequence of bacteriophage mobilization.

**mRNA EXPRESSION OF AGGREGAN IN NEURONAL AND ASTROCYTIC CULTURES IN CHICK BRAIN**

Quartrisa Douglas<sup>1\*</sup>, Miriam Domowicz<sup>2</sup>, and Nancy Schwartz<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096 and <sup>2</sup>University of Chicago, Chicago, IL 60637

Expression patterns of aggrecan, other major chondroitin sulfate proteoglycans (CSPGs) and tenascin-C, which has been reported to be glia product, were investigated in brain tissue sections via in situ hybridization. Expression of aggrecan and brevican was low in early cultures, doubled days later, and declined by day seven. Some cultures were treated with chondroitinase ABC, an enzyme that digest chondroitin sulfate chains. The expression of each CSPG increased with chondroitinase treatment. Astrocytic cultures were also in situ hybridized. The expression patterns differed with the various CSPGs in that expression was more or less based on morphology. Taken together, these experiments offer a possible explanation to the discrepancy observed in the spatial-temporal pattern of expression of aggrecan in vivo and the presence of aggrecan in neuronal and astrocytic cultures.

**MONOCLONAL ANTIBODY PURIFICATION: REDUCTION OF CONTAMINANT CONCENTRATIONS TO LESS THAN ONE PART PER MILLION OF ANTIBODY**

Steve Blaisdell and Kristi Isaac\*, Schering-Plough Research Institute, Union, NJ 07108

Monoclonal antibodies are proteins of a single known specificity and homogeneous structure that are produced in tissue culture. These antibodies are produced from hybridomas of an antibody-secreting cell and a myeloma cell. Monoclonal antibodies are very important in medicine. Antibodies are used in a number of different treatments fighting diseases such as autoimmune diseases, cancer, and asthma. Animal and plant proteins required for the production and purification of the antibody need to be reduced to non-detectable levels. This can be done by using a series of chromatography and filtration steps.

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**THURSDAY AFTERNOON**


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Room 3

1:45 bis-ANS BINDING AND SURFACE HYDRO-

#### PHOBICITY OF *BACILLUS THURINGIENSIS* d-ENDOTOXIN CYT1A

Slobodanka D. Manceva\* and Peter Butko, University of Southern Mississippi, Hattiesburg, MS 39406

In order to elucidate mode of action of the toxin Cyt1A from *Bacillus thuringiensis* var. *israelensis*, we studied changes in its surface hydrophobicity as a function of pH and ionic strength, using a polarity-sensitive fluorescence probe bis-ANS (4,4'-dianilino-1,1'-binaphthyl-5,5'-disulfonic acid). An increase in the bis-ANS fluorescence was observed upon lowering the pH, with an apparent pK of 4.5, which is indicative of increased surface hydrophobicity. Scatchard plots were biphasic at both pH 7.5 and 4.2. In accord with previous studies on bis-ANS binding to many other proteins, the plots were interpreted in terms of two classes of binding sites. At pH 7.5, the two sites bound  $0.8 \pm 0.1$  and  $5.7 \pm 3.0$  bis-ANS molecules per molecule of Cyt1A (dissociation constants  $3.4 \pm 0.4$  and  $70 \pm 30$  mM, respectively). At pH 4.2, these values were  $1.6 \pm 0.1$  and  $9.1 \pm 9.8$  ( $0.3$  and  $18 \pm 15$  mM, respectively). These results support the hypothesis that decreased pH induces conformation changes in the toxin that make the latter more hydrophobic, with increased affinity toward lipid membranes. In contrast with the smooth, two-state transitions observed in the pH titration, fluorescence of Cyt1A-bound bis-ANS varied with ionic strength in a complex multiphasic manner. This suggests that the probe fluorescence is simultaneously modulated by several processes, such as electrostatic effects on the probe/protein binding and salt-induced unfolding of the protein.

#### 2:00 HYDROPHOBIN Sc3 SELF-ASSEMBLES AT INTERFACES VIA $\alpha$ -SHEET STACKING

Justin P. Buford\*, J. Shawn Goodwin, Paul Stroud, Charles L. McCormick, Gordon C. Cannon, and Peter Butko, University of Southern Mississippi, Hattiesburg, MS 39406

Amphipathic fungal proteins called hydrophobins are able to self-assemble into insoluble supramolecular structures at hydrophobic/hydrophilic interfaces, but the molecular mechanism and underlying protein conformation changes are not known. Many amyloidogenic proteins self-assemble into insoluble amyloid fibrils while undergoing a change to an all- $\alpha$  conformation. Stacked  $\alpha$ -sheets can be very specifically detected by binding of two dyes, thioflavin T (ThT) and Congo red (CR). Secondary-structure prediction and circular dichroism data indicated that hydrophobin Sc3 is an all- $\alpha$  protein. In this study, spectral changes in fluorescence of ThT and in absorption of CR were measured in the presence of Sc3, amyloid  $\alpha$  peptide (as a positive control) or an all- $\alpha$  protein apolipoprotein-III (as a negative control). It was found that ThT interacts with Sc3 assemblies in the same manner as with the amyloid  $\alpha$ -sheet fibrils. CR did not show a discernible signal at neutral pH. However, when the electrostatic repulsion between Sc3 and CR was decreased by low pH, CR exhibited the same spectral changes in the presence of assembled Sc3 as those observed in the presence of assembled amyloid  $\alpha$  peptide.

It is concluded that Sc3, and probably other hydrophobins too, self-assemble at interfaces in the same manner as amyloidogenic proteins, i.e., through  $\alpha$ -sheet stacking.

#### 2:15 PURIFICATION AND CHARACTERIZATION OF RECOMBINANT GLUTAMINYL CYCLASE PRODUCED IN *DROSOPHILA* SCHNEIDER 2 CELLS

Rachell E. Booth\* and Robert C. Bateman, Jr., University of Southern Mississippi, Hattiesburg, MS 39406-5043

Peptides including neurotransmitters and hormones are processed along the secretory pathway by processing enzymes. For example, glutaminyl cyclase (QC) cyclizes N-terminal glutamine to pyro-glutamine to produce a biologically active peptide. In an effort to determine the mechanism of action and important structural characteristics of QC, we have expressed human QC in *Drosophila* Schneider 2 cells (DES QC). In this system, the protein is secreted into the media at levels approaching 50 mg/L. This recombinant form of the protein has been purified by anion-exchange chromatography and characterized to validate its representation of the native form. The pH activity optimum and kinetic constants for DES QC were found to be similar to that of the native bovine pituitary enzyme. Thus, the recombinant QC is a good representation to be used as a model for further structural studies. Preliminary gel shift assay studies indicate that the DES QC is glycosylated and phosphorylated. We are currently examining the specific sites where these post-translational modifications occur and determining if they are essential for activity or correct structure formation.

#### 2:30 INHIBITION STUDIES OF GLUTAMINYL CYCLASE

Stephanie A. Misquitta\* and Robert C. Bateman, Jr., University of Southern Mississippi, Hattiesburg, MS 39406-5043

Glutaminyl cyclase (QC) catalyzes the conversion of N-terminal glutamine to pyroglutamic acid in certain peptide hormones and neurotransmitters. We sought to obtain inhibitors for glutaminyl cyclase with a view to understanding the mechanism of enzyme action and as a tool for investigating the role of QC in cell culture. We studied the inhibition of the recombinant human QC using a series of imidazole derivatives. We determined the type of inhibition and the inhibitor constant for those that were found to inhibit the enzyme, with the best inhibitors exhibiting  $K_i$  values in the low micromolar range. Finally we are immobilizing these inhibitors in order to develop an affinity column for the rapid purification of QC.

#### 2:45 IDENTIFICATION OF THE CHLOROPLAST NUCLEOID PROTEIN, DCP68, AS A SULFITE REDUCTASE

Cecilia L. Chi-Ham\*, Gordon C. Cannon, and Sabine Heinhorst, University of Southern Mississippi, Hattiesburg,

MS 39406

Plastids are semiautonomous organelles that perform different functions depending on the cell type in which they reside. Their specific function is closely coordinated with the replication and expression of its DNA, which may be correlated to changes in nucleoid structure. In an effort to understand how the dynamic changes of the nucleoid may affect the organelle's function we have begun to characterize nucleoid proteins. We have previously shown that one of these proteins, DCP68, is able to compact DNA and inhibit DNA synthesis in vitro. N-terminal amino acid analysis and the absorption spectrum of the purified protein suggest that DCP68 is a sulfite reductase, a siroheme enzyme involved in the assimilation of sulfur for amino acid biosynthesis. The association of DCP68 with the nucleoid has been confirmed by in organello formaldehyde crosslinking of protein/DNA complexes and immuno-colocalization using antibodies against recombinant sulfite reductase from *Arabidopsis thaliana*. These findings suggest that DCP68 may be a bifunctional protein that plays a role in plastid DNA compaction and sulfur assimilation.

3:00 Break

3:15 A cDNA CLONE OF DCP68, A MAJOR DNA-BINDING PROTEIN OF SOYBEAN CHLOROPLAST NUCLEOIDS

Mignon A. Keaton\*, Gordon C. Cannon, and Sabine Heinhorst, University of Southern Mississippi, Hattiesburg, MS 39406

Chloroplasts, like mitochondria, are semi-autonomous organelles that contain their own DNA while also relying on nuclear encoded gene products. The chloroplast genome is associated with proteins into compact structures called nucleoids. During organellar development, nucleoid morphology and protein composition vary suggesting that nucleoid structure plays a role in the regulation of replication and transcription of the chloroplast genome. Therefore, identifying proteins that regulate nucleoid structure may lead to a better understanding of these processes. Previously in our lab, a 68 kDa DNA-binding protein (DCP68) was isolated from chloroplast nucleoids of *Glycine max* (soybean). Purified DCP68 is able to compact DNA and inhibit DNA synthesis in vitro. N-terminal sequencing and heme absorption peaks identified this protein as a sulfite reductase. The purpose of this project is to isolate a cDNA clone of DCP68 for further studies. Plant sulfite reductase cDNA sequences were used to design primers for the isolation and amplification of the cDNA of the soybean sulfite reductase. To date, approximately half of the corresponding sequence has been identified, cloned, and sequenced. The deduced amino acid sequence, which shows over 90% homology with other plant sulfite reductases, contains a potential transit peptide and the N-terminal sequence previously obtained by microsequencing of purified DCP68.

3:30 AMPLIFICATION, CLONING, AND SEQUENCING OF EXONS ENCODING THE HUMAN ANDROGEN RECEPTOR

Christopher H. Wyatt\*, Randall S. Hines, and Steven T. Case, University of Mississippi Medical Center, Jackson, MS 39216

Mutations in the gene encoding the androgen receptor, an androgen activated, DNA-binding protein, frequently result in synthesis of a dysfunctional receptor and clinical manifestations termed androgen insensitivity syndrome (AIS.) The objective of this work was to develop and validate a method to screen human androgen receptor exons for mutations. About 2.5 µg of genomic DNA was extracted from 240 µL of whole blood. DNA was precipitated and resuspended at a concentration of 7.8 ng/µL. 100 µL PCR reactions were constructed using the genomic DNA as template. Pairs of opposing PCR primers corresponding to intron sequences flanking exons were designed. PCR parameters were optimized for each primer pair using a 15:1 mixture of KlenTaqI and Pfu thermostable DNA polymerases. Successful PCR amplification resulted in a single band corresponding to the known exon length. PCR products were purified using a Wizard Plus Miniprep Kit (Promega), quantified, and cloned into the blunt-end plasmid vector, pT7Blue-3. Confirmation of cloning was provided by PCR. Plasmid DNA was subsequently prepped from the remainder of liquid cultures exhibiting PCR products whose size corresponded to that expected for each corresponding exon. Cycle DNA sequencing was performed on each strand using Sequitherm Excel II DNA Polymerase (Epicentre) and opposing infrared-labeled M13 primers. Products were analyzed on a LICOR Model 4000L Automated DNA Sequencer. Resulting sequences were compiled and compared using DNASIS (Hitachi). Using the above method, all the exons from control DNA had 100% sequence identity with wild-type androgen receptor exons.

3:45 TRANSLATIONAL REGULATION MEDIATED BY THE PROXIMITY OF AN RNA APTAMER-LIGAND COMPLEX TO THE INITIATION CODON

Arpna Vajpayee\* and Charles Wilson, University of California, Santa Cruz, CA 95060

Previous research has shown that after the insertion of a malachite green binding motif into a pRS306-derived plasmid, progression through the cell cycle was dramatically slowed. The malachite green binder was cloned into the 5'-untranslated region of CLB2 gene, which codes for a cell cycle protein that directs transition from G2 to mitosis. The aptamer-ligand decreased transcript translatability of the CLB2, but not its stability. This confirmed that translational initiation is blocked by ligand-induced conformational changes in the 5'-UTR. The purpose of the experiment was to confirm that aptamer-mediated translational regulation depends upon the proximity of the malachite green aptamer to the start



codon. The first step was to design, synthesize, and purify malachite green oligosaccharides. Next, the pGem-3Z-luciferase was digested with the restriction enzyme BamHI. Then, the malachite green aptamer was ligated into the expression vector. After isolating the plasmid construct, an analytical agarose gel confirmed that the thirty-one nucleotide malachite-green aptamer insert was present. Another restriction enzyme digestion was performed using the enzymes NarI and XhoI. After isolating the two colonies of the digestion, the in vitro transcription procedure was performed. Future experiments will involve optimizing in vitro translation tests with the construct.

#### 4:00 MOLECULAR GENETIC ANALYSIS OF trqB FUNCTIONS

Lee R. Peebles III\*, and David Kehoe, Alcorn State University, Alcorn State, MS 39096 and Indiana University, Bloomington, IN 47405

Complementary chromatic adaptation is the ability of some cyanobacteria to alter the synthesis of certain proteins that make up the outer portion (rods) of their light harvesting complex (phycobilisome) with changing light quality. Several mutants have been characterized and complemented, revealing a putative sensor-RcaE. It is believed that this sensor receives photons of light and autophosphorylates, and passes this signal to different response regulators. This ultimately results in altered synthesis of phycocyanin and phycoerythrin, the pigmented phycobiliproteins that make up the rods of the phycobilisome. A novel class of mutants to the cyanobacterium *Fremyella diplosiphon* has been characterized. Unlike wild type cells, which produce the red pigment phycoerythrin when exposed to green light, these mutants are turquoise in color, revealing a change in the production of phycoerythrin. DNA sequencing has found there to be an insertion in the gene trqB for some of these mutant. It is believed that the lesion in trqB is the cause of this mutant phenotype. Therefore, by complementing the mutants with trqB from wild type, the hope is to discover if polymorphism in trqB is the cause of these turquoise mutants.

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### FRIDAY MORNING

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Room 3

8:45 Introduction—Peter Butko

#### 9:00 PLASMID SEQUENCES OF *EDWARDSIELLA ICTALURI*

VeeYang Tan\* and John Boyle, Mississippi State University, Mississippi State, MS 39762

*Edwardsiella ictaluri* causes enteric septicemia in channel catfish. It is responsible for loss of about 10% of the catfish crop in Mississippi each year. The molecular cause of the virulence is unknown. We have sequenced the

two plasmids of this bacterium in order to search for putative virulence factors. The sequences show that one plasmid is of the p15a family while the other is related to colE2 in *E. coli*. There are multiple open reading frames and one has a leu rich repeat domain seen in a virulence factor found in *Salmonella* and *Shigella* species.

#### 9:15 INTERFERON-GAMMA (IFN-g) PRODUCTION BY MURINE CD8 AND CD4 CELLS IN RESPONSE TO SPECIFIC ANTIGEN AND NON-SPECIFIC FACTORS FROM *TRYPANOSOMA BRUCEI RHODENSIENSE*

Caleph B. Wilson<sup>1\*</sup>, Karen Demick<sup>2</sup>, and John M. Mansfield<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096-7500 and <sup>2</sup>University of Wisconsin, Madison, WI 53706

Lymphocytes from uninfected and *Trypanosoma brucei rhodensiense* infected mouse strains were examined for the production of IFN-g following in vitro exposure to (1) the major surface antigen, variant surface glycoprotein (VSG), (2) a non-antigenic stimulating factor present in trypanosome whole cell extracts (Tex), and (3) a pan-specific T cell antigen, Concanavalin A (Con A). Spleen cells from four murine strains were cultured onto 96 well nitrocellulose microtiter plates as well as in 24-well tissue culture plates. The nitrocellulose plates were processed for the ELISPOT assay, which detects the number of cells secreting IFN-g; after various incubation periods at 37°C. The 24-well tissue culture plates were incubated at 37°C and supernatant fluids were harvested and examined for IFN-g via the enzyme-linked immunosorbent assay (ELISA). Data indicated that the most effective stimulant for IFN-g; in uninfected splenocytes (expect the RAG-1 mice) was Con A. Tex was the second most effective stimulant in the uninfected cells. In the infected splenocytes, Con A and Tex presented comparable stimulation levels, while VSG induced the least. The overall results suggest that CD8 T lymphocytes may contribute to overall IFN-g; levels after exposure to factors(s) present in trypanosome cells.

#### 9:30 PEPTIDOGLYCAN FROM GROUP B *STREPTOCOCCUS* AS A TARGET FOR NATURAL IgM ANTIBODIES IN MICE

Andrea A. Krell\* and Peter Butko, University of Southern Mississippi, Hattiesburg, MS 39406

Group B *Streptococcus* (GBS) bacteria can colonize healthy adults without causing infection, but when present in newborn infants, the elderly, and immunocompromised adults the bacteria can cause sepsis and meningitis, resulting in disability and sometimes death. It has been discovered previously that normal mouse serum (NMS) contains natural IgM antibodies to GBS. This work is part of a project aimed at identification of the molecular target for these antibodies. Potential binding sites include fibrous C and R proteins on the cell surface, the peptidoglycan cell wall, and the cell's polysaccharide capsule. Previous research indicated that the most probable of these

suspects is the peptidoglycan cell wall. Peptidoglycan (PG) from GBS was isolated and its potential for binding anti-GBS IgM was determined. Cell walls were prepared by treatment with DNase, RNase, and sodium dodecyl sulfate, followed by homogenization. A modified Enzyme-Linked Immunosorbent Assay (ELISA) was used to determine the extent of antibody binding to the whole GBS cells and to PG. Results indicate that the isolated PG bound the mouse anti-GBS IgM as efficiently as whole bacterial cells. Furthermore, serum preabsorbed with PG exhibited approximately 20% lower activity than NMS in ELISA. The results thus support the notion that GBS cell wall is the antigenic target for natural anti-GBS IgM in mice.

9:45 Break

10:00 CLONING AND OVER-EXPRESSION OF A MOLD-SPECIFIC GENE IN THE PATHOGENIC FUNGUS *HISTOPLASMA CAPSULATUM*

Xianbin Tian\* and Glenmore Shearer, Jr., University of Southern Mississippi, Hattiesburg, MS 39406

Mold/yeast dimorphism is an important feature in pathogenesis of the fungus *Histoplasma capsulatum*. The multicellular mold form, which is found in soil, shifts to the pathogenic yeast form in people who inhale spores or mold fragments. Thus an understanding of the molecular genetics of dimorphism is valuable from a developmental biology aspect as well as for potential development of therapeutic and diagnostic tools. Here we report the cloning of MS8, a single copy gene strongly upregulated in the mold form but transcriptionally silent in the yeast. The MS8 cDNA was 1250 bp long with an open reading frame of 612 bp. A GenBank homology search revealed no genes in the database with significant similarity to MS8. Forced expression of MS8 in the yeast form was accomplished by transforming cells with a vector carrying MS8 fused to the strong constitutive Tef1 promoter. Yeast cells expressing MS8 maintained the yeast morphology but exhibited clumping in liquid media and altered colony texture on agar plates. MS8 knockouts are being constructed to further study the role of this gene in dimorphism.

10:15 ANALYSIS OF THE rDNA CLUSTER IN THE PATHOGENIC FUNGUS *HISTOPLASMA CAPSULATUM*

Sally L. Faherty\* and Glenmore Shearer, Jr., University of Southern Mississippi, Hattiesburg, MS 39406

The dimorphic fungus *Histoplasma capsulatum* (Hc) is the etiologic agent of the common and serious disease histoplasmosis which infects an estimated 500,000 Americans each year. The organism grows in soil as a saprophytic multicellular mold. When mold fragments or spores are inhaled, the organism shifts to a unicellular budding yeast form in the lungs. This mold-to-yeast shift is required for the disease to progress. In our studies to understand the molecular genetics of this dimorphic

process, we have isolated several dimorphism regulated genes. Unfortunately, genetic knockouts are quite difficult to construct in *Histoplasma*, which makes experiments to test the role of these genes very expensive and time consuming. We are exploring the use of antisense ribosomes, containing small sections of target gene antisense, as a post transcriptional gene silencing alternative to gene knockouts. Here we report the first step in these studies: the isolation and analysis of the *Histoplasma* rDNA cluster. In contrast to most organisms, Hc appears to have a single copy of the rDNA. By comparison of the Hc rDNA sequence to other organisms, we have identified several putative dispensable regions suitable for target gene antisense insertion.

10:30 ANALYSIS OF THE MOLD-SPECIFIC GENE M46 AND THE YEAST-SPECIFIC GENE Y56 FROM *HISTOPLASMA CAPSULATUM*

Vani Naraharisetty\* and Glenmore Shearer, Jr., University of Southern Mississippi, Hattiesburg, MS 39406

The dimorphic fungus *Histoplasma capsulatum* is the etiologic agent of the respiratory disease histoplasmosis which infects an estimated 500,000 people each year in the United States. The organism grows in the soil (or in the lab at 25°C) as saprophytic multicellular mold and converts to the pathogenic unicellular yeast form in the infected host (or in the lab at 37°C). In the attempt to understand the molecular biology of this morphological conversion, genes specific to the yeast and mold phase are being isolated in our lab. Two such genes, M46 specific to the mold phase and Y56 specific to the yeast phase, were isolated from a subtracted cDNA library, prepared with a PCR based normalizing method, which enriches for differentially expressed low abundance sequences. Northern blots showed M46 was expressed in mold form but undetectable in yeast cells. Y56 was expressed in yeast cells but was undetectable in mold phase cells. Partial sequence of M46 showed no homology to any sequence in the GenBank database. Y56 however is a gene previously shown to encode a strongly antigenic protein in *Histoplasma*. Genetic knockout experiments are underway to help determine the role of these genes in dimorphism.

10:45 Divisional Business Meeting

**CHEMISTRY AND  
CHEMICAL ENGINEERING**

Chair: Lovell E. Agwaramgbo, Tougaloo College  
Vicechair: David Creed, University of Southern  
Mississippi

THURSDAY MORNING

## Room 1

## 9:00 TEMPLATING LYOTROPIC LIQUID CRYSTALLINE STRUCTURE ONTO POLYACRYLAMIDE VIA PHOTOPOLYMERIZATION

Shannon M. Smith\*, Christopher L. Lester, and C. Allan Guymon, University of Southern Mississippi, Hattiesburg, MS 39406

Polyacrylamide gels are common media for electrophoretic separation techniques in biological chemistry. This study investigates the improvement of polyacrylamide gels by templating the regular nanostructure of various lyotropic liquid crystalline (LLC) phases of surfactant/water mixtures onto polyacrylamide via photopolymerization. Acrylamide has been shown to sequester into the aqueous and interfacial domains of LLCs. Photopolymerization of such systems proceeds slowly in isotropic solutions of acrylamide and water, but as surfactant is added to solutions, isotropic micellar phases form and polymerization rate increases. Further increases in surfactant concentration yields bicontinuous cubic mesophases which exhibit the most enhanced rate of polymerization. High concentrations of surfactant produce inverse micellar phases and polymerization rates similar to that of micellar phases. Polymerization rate enhancements are attributed to both segregational phenomenon and to diffusional limitations imposed by ordered LLC phases. Initial studies indicate that original LLC structure is templated onto polyacrylamide and that compressive modulus and swellability are impacted by system design.

## 9:20 THE EFFECTS OF LIQUID PENETRATION ON THE LAYER STRUCTURE OF POCAHONTAS #3 COAL

Tolecia Clark-Turner\* and David L. Wertz, Mississippi University for Women, Columbus, MS 39701 and University of Southern Mississippi, Hattiesburg, MS 39406

Hydrocarbons, found between coal layers, if extracted could be used as fuel sources. Studies are currently being performed on several coal samples to find the organic solvents that provide maximum separation between the coal layers, and thus, facilitate hydrocarbon extraction. This study focuses on Pocahontas #3 (POC) coal. POC samples were treated with seven organic solvents. Treated coal samples were analyzed by wide-angle X-ray scattering (WAXRS) to note any distance change of spacing between the coal layers. The average distances of the interlayer spacing of the treated POC samples was compared to that of the untreated POC samples. Preliminary results show that highly aromatic solvents with hydrogen-bonding capabilities produced the greatest change in interlayer spacing.

## 9:40 EFFECTIVE INTERFACIAL-TENSION-INDUCED CONVECTION (EITIC) IN

## MISCIBLE FLUIDS

John A. Pojman<sup>1\*</sup>, Yuri A. Chekanov<sup>1</sup>, Jonathan Masere<sup>1</sup>, Vitaly Volpert<sup>2</sup>, Thierry Dumont<sup>2</sup>, and Hermann Wilke<sup>3</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406; <sup>2</sup>Universite Lyon, Lyon, France; and <sup>3</sup>Institute of Crystal Growth, Berlin-Adlershof, Germany

Using spinning drop tensiometry, we confirmed that an effective interfacial tension (EIT) exists between miscible fluids, which is necessarily transient. We studied glycerin and water and dodecyl acrylate with poly(dodecyl acrylate). Using the concept of the Korteweg stress induced by concentration and temperature gradients, we show with numerical simulations that convection should occur in miscible systems with sharp but non-uniform concentration and/or temperature gradients, analogous to surface-tension induced convection in immiscible fluid layers. The parameter for the stress was estimated by comparing the Cahn-Hilliard formula for the interfacial tension to experimental data from the spinning drop tensiometer. Simulations with a variation in the width of the concentration gradient were compared to simulations for a standard immiscible interface in which the variation of interfacial tension was equivalent to the initial variation in EIT.

## 10:00 AB INITIO STUDIES OF SILYL COMPOUNDS MAY PROVIDE A NEW PARADIGM FOR THE SILICON BETA EFFECT

Lovell E. Agwaramgbo, Tougaloo College, Tougaloo, MS 39174

The stabilization of beta-silyl cation 1 and the regio-chemistry of the ring-opening reactions of alpha, beta-epoxysilane 4 have been well documented and widely accepted. However, it has not been very clear why alpha, beta-epoxysilanes cleave alpha to silicon even under acidic conditions which would facilitate SN1-like process. This process should lead to beta-cleavage because cations beta to silicon are known to be stabilized. To dramatize and understand this varying silicon effect, we decided to conduct theoretical calculations on compounds such as 1-4 below using Hartree Fock method and 6-31G(d) basis set to examine the following properties: thermochemistry, charge distribution, and bond lengths. The Hartree Fock theoretical results of some of these compounds may support our experimental data or provide a new paradigm for the silicon alpha and beta effects. R-CH<sub>2</sub> 1; R = Me<sub>3</sub>Si-CH<sub>2</sub> 2; R = Ph 3; R = Me<sub>3</sub>C 4. alpha-trimethylsilyl styrene oxide

## 10:20 Break

## 10:30 BEHAVIOR OF TWO ARGONNE PREMIUM COALS IN THE PRESENCE OF PYRIDINE

Stephen B. DuBose\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

Depending upon the rank of a coal, its molecular composition can vary greatly. It is known that coals of a lower rank possess a higher percentage of free water,

hydroxyl, carboxyl, and in general, electron-rich groups than their higher-ranked counterparts. It is believed that these groups allow for effective hydrogen bonding between polycyclic aromatic (PCA) layers in the coal matrix. Solvents, especially those that are polar and planar in nature, have been shown to disrupt the hydrogen bonding occurring between adjacent layers. In effect, this disruption swells the PCA layers, allowing for the inclusion of a solvent molecule between PCA layers. In this experiment, two coals from the Argonne Premium Coal Samples program are allowed to undergo solvent swelling using pyridine. The first, Beulah Zap lignite (APC 801), is a low ranked coal with many functional groups quite capable of hydrogen bonding. The second, Pocahontas #3 (APC 501), is a low-volatile bituminous coal having fewer functional groups available for hydrogen bonding. Via wide angle X-ray scattering, preliminary results show that pyridine affects APC 801's short-range PCA layer stacking long after all solvent has evaporated from the sample. APC 501's layer stacking is also affected by pyridine; however, the effect is more subtle, seemingly affecting its long-range structure more so than its short-range structure.

#### 10:50 ADSOLUBILIZATION OF STYRENE BY NON-IONIC SURFACTANTS ON SILICA

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 polyethoxylated alkylphenols (Triton X) series surfactants on amorphous precipitated silica was investigated. The Triton X surfactants used vary from 8.5 ethoxylated (EO) groups to 12.5 ethoxylated (EO) groups. The results show that at concentrations below the critical micelle concentration (CMC), adsolubilizations decreased with increasing numbers of EO groups, especially at the higher styrene loading levels. With the addition of lipophilic linkers (long chain linear alcohols, vary from C8 to C16) the adsolubilization of styrene increased with increasing alcohol concentration. Lipophilic linkers increase the interaction between the styrene and the hydrophobic group of the surfactants, increasing the solubilizing capacity of the adsorbed surfactant aggregates.

#### 11:10 X-RAY DIFFRACTION SPECTRA OF W.O.M.B.A.T. AND BEAD WIRE POWDERS

Erin L. Fewell\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

In the Wertz Oxidative Molecular Bombardment at Ambient Temperatures (WOMBAT) process, the rubbery parts of scrap tires are cleaved from the steel belts and beads and converted to an easily collected high carbon pulp by reaction with the liquid phase chemical. The pulp is then dried in order to obtain an analyte suitable for testing. This

WOMBAT powder is combusted and then analyzed by X-ray diffraction. Separately, another tire is dissected and the bead wire strips held together by a gummy resin are acquired. The bead wire strips are sliced into cross-sectional pieces approximately 0.25 inches thick and combusted. The combustion yields metal pieces and a coarse powder which are separated using a WOMBAT separation device. The bead wire powder is analyzed in the same manner as the original WOMBAT powder—by X-ray diffraction. The spectra obtained from the two powders reveal the materials comprising them. A comparison of the spectra will be discussed.

#### 11:30 TITRATION OF NITRIC ACID USED IN WOMBAT PROCESS

Kristi Budzinski\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

The Wertz Oxidative Molecular Bombardment at Ambient Temperature (WOMBAT) process uses nitric acid to oxidize shredded pieces of tire. The length of time the nitric acid has been used in the WOMBAT ranges from three days to ten days. After a given length of time, a sample of nitric acid has been removed from the WOMBAT and filtered to remove any residual powder left from the tires. The filtered nitric acid is then titrated with 0.1 molar KOH. Graphing the results of the titration, one can calculate the mole percent of the used nitric acid at the end point of titration (pH = 7). The mole percent of used nitric acid is compared to the mole percent of unused nitric acid, again at the end point, which has also been titrated using the same method. This comparison reveals the relative strength of nitric acid after it has been used in the WOMBAT process. The results of this titration provide an optimal scope of time for which the nitric acid effectively breaks down the greatest amount of tire scraps. Specific results will be discussed.

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### THURSDAY AFTERNOON

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Room 1

#### 1:30 CORRELATING WAVELENGTH-DISPERSIVE X-RAY FLUORESCENCE SPECTRA FROM MODEL COMPOUNDS WITH WDXRF SPECTRA OF VARIOUS EXPERIMENTS RELATED TO THE WOMBAT PROCESS

Ashley D. Trahan\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

Model compounds of various solid-state metal salt mixtures were prepared by weight percent and homogenized. The mixtures were designed to represent standardized elemental compositions of tire-derived powder samples. The mixtures range from 1%–5% of each component in graphite, which is the expected weight percentage range of these components in tires. Wavelength-dispersive X-ray fluorescence spectra of the mixtures

provide comparisons between metal salt abundance and K-alpha peak intensity for the particular component. The abundance to intensity correlation of the model compound mixtures is compared with WDXRF spectrum of other WDXRF spectrum of interest that have been processed by the WOMBAT methods.

1:50 POLYMERIZATION KINETICS OF TEMPLATED POLYMERIZATIONS IN LYOTROPIC LIQUID CRYSTALS

Colleen D. Colson, Christopher L. Lester, and C. Allan Guymon, University of Southern Mississippi, Hattiesburg, MS 39406

The polymerization behavior of oil and water-soluble monomers, as well as monofunctional and difunctional monomers, in a cationic surfactant/water lyotropic liquid crystal (LLC) system is detailed in this work. The LLC morphologies have a direct effect on the polymerization kinetics of monomers with different polarities. The polar monomers exhibit much faster polymerization rates in the higher ordered lamellar mesophase. This is a result of the depressed termination rates. For nonpolar monomers the polymerization rate due to the morphology has an opposite effect. The nonpolar monomers have an enhanced polymerization rate in the micellar aggregates. This is a result of higher local concentrations of monomer in the micelles which causes the rate of propagation to increase. Initial results indicate that the original LLC morphologies are retained after polymerization, especially in the highly ordered lamellar mesophases.

2:10 CHARACTERIZATION OF THE REACTION OF NITRIC ACID WITH MATERIALS USED IN THE WOMBAT PROCESS

Eric R. Smith\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

Bead wire and tire residuals were reacted with nitric acid in a reactor flask. Measurements were made of the speed of reaction when performed under differing temperatures. The acid was reused several times in order to determine the general drop in pH after a cycle of reaction, as the acid is reused in the actual WOMBAT reactor. After each cycle, a sample of acid was titrated to determine the pH of acid. The time measurements were combined with pH measurements to determine a general rate of decomposition of the acid in the reaction with the bead wire and residuals. The results of the experiment will be used to further develop the WOMBAT process.

2:30 AB INITIO STUDY OF THE STABILIZATION OF ANIONS BY ALPHA TRIMETHYL-SILYL AND PHENYL GROUPS

Chinyere E. Agwaramgbo<sup>1\*</sup>, Lovell E. Agwaramgbo<sup>1</sup>, Eucharia Agwaramgbo<sup>1</sup>, Ilya Yanov<sup>2</sup>, and Jerzy Leszczynski<sup>2</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174 and <sup>2</sup>Jackson State University, Jackson, MS 39217

Beta-silyl cations and alpha-silyl anions are known to be stabilized. It is also known that benzyl group tends to stabilize both cations and anions. However, there has been no theoretical studies done on the regiospecific deprotonation of systems I & II, which contain both alpha silyl and alpha phenyl methylene hydrogens. Ab initio calculations were done using Hartree Fock and B3LYP methods and 6-31G\* basis set. The results showed varying stabilities between the trimethylsilyl and phenyl groups. Ph-CH<sub>2</sub>CH<sub>2</sub>SiMe<sub>3</sub> Ph-CH<sub>2</sub>COCH<sub>2</sub>SiMe<sub>3</sub> I II. Acknowledgments: Tougaloo College Title III Curriculum Enhancement/Academic Support NSF CREST Program

2:50 Break

3:00 CAN TWO HEADS BE BETTER THAN ONE? A STUDY ON CHIRAL RESOLUTION USING MIXTURES OF THE CHIRAL SELECTORS VANCOMYCIN AND RISTOCETIN A

Colette Rabai\*, Richie Sumrall\*, and Timothy J. Ward, Millsaps College, Jackson, MS 39210

Through utilization of capillary electrophoresis, a powerful method for the separation of chiral compounds is available. Within the area of chiral separations, the macrocyclic antibiotics have emerged as one of the most prominent and widely applicable chiral selectors. Two glycopeptide antibiotics frequently employed in chiral separations are vancomycin and ristocetin A, both of which have proven individually to be rapid and efficient separation tools for many classes of chiral compounds. In this study, the effect on resolution using various mixtures of vancomycin and ristocetin to resolve certain chiral compounds was examined. It was found that greater enantioselectivities could be obtained using the mixture of the chiral selectors versus using either of the chiral selectors alone.

3:20 PARTICLE IMAGE VELOCIMETRY APPLIED TO MISCIBLE POLYMER SYSTEMS

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

Convective fluid motion induced by miscible polymer/monomer interfacial surface tension and thermal gradients can be measured using particle image velocimetry (PIV). PIV uses a sheet of laser light passing through a sample to illuminate neutrally buoyant tracer particles that scatter the laser light and follow the convective motion. The miscible polymer/monomer interfaces were created by the photopolymerization of half of the sample using a high intensity fiber optic UV light source. Studies have been carried out involving the formation of the interface and the creation of thermal gradients within the interface by heating the sample. Video images of the reactions and the resultant fluid flow were analyzed using particle tracking software provided by NASA.

### 3:40 ISOTHERMAL FRONTAL POLYMERIZATION: THE USE OF SHADOWGRAPHY IN DETECTING FRONTS

Lydia L. Lewis\* and John A. Pojman, University of Southern Mississippi, Hattiesburg, MS 39406

Isothermal Frontal Polymerization (IFP) is a method that utilizes the Trommsdorff effect to convert monomer into polymer through a self-sustaining propagating front. IFP is used in industry to produce gradient materials, but a conclusive study of the parameters affecting its mechanism has not been published to our knowledge. We have studied the effects that the parameters of initiator concentration, initiator decomposition rate, and temperature have on the IFP system of Poly(methyl methacrylate)/Methyl methacrylate using the optics technique of shadowgraphy to determine the extent of propagation. Detection methods that disrupt the gelation process of IFP do not produce reproducible results but do support a general trend: Increasing any of the three parameters increases the rate of propagation and decreases the length and time of propagation. Shadowgraphy does not disrupt the gelation process yielding more reproducible results than previous detection methods.

4:00 Divisional Business Meeting

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## FRIDAY MORNING

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Room 1

8:20 Divisional Poster Session

### THE APPLICATION OF THE COMET ASSAY TO DETECT DNA DAMAGE IN MAMMALIAN CELLS

Henry E. Outlaw\*, A.L. Burlison, R.L. Maddux, M.L. Snell, and M.L. Cunningham, Delta State University, Cleveland, MS 38733; North Carolina State University, Raleigh, NC 27695; and National Institute of Environmental Health Sciences, Research Triangle Park, NC 27709

The comet assay, also known as the alkaline single cell gel (SCG) assay, was developed by N.P. Singh in 1988. This assay uses biochemical techniques in alkaline conditions to detect DNA single strand breaks, alkali-labile sites, and crosslinking. The advantages of the comet assay includes: (1) data collection at the level of the individual cell; (2) small sample sizes (<10,000 cells); (3) highly sensitive for detecting DNA damage; (4) most eukaryotic cells can be used; (5) the assay is economical, simple, fast, and easy to integrate. The comet assay is used in many different areas of scientific study such as DNA repair studies, genetic toxicology, environmental biomonitoring, and human epidemiology. We are establishing this assay in our laboratory to assess mammalian cell DNA damage produced by chemicals tested by the National Toxicology Program.

### NMDA RECEPTOR MODULATION INFLUENCES PERFORMANCE OF AN ATTENTIONAL SET-SHIFT TASK IN THE RAT

Henry E. Outlaw, Delta State University, Cleveland, MS 38733

Pharmacological agents that antagonize the NMDA glutamate receptor have been shown to produce cognitive deficits similar to those observed in patients with schizophrenia. In order to develop an animal model to study schizophrenia, we assess the effect of MK-801, a noncompetitive NMDA receptor antagonist, on attentional set-shifting ability in rats, by the use of a plus-maze task analogous to the Wisconsin Card Sort Task. MK-801 produces a significant impairment in learning in injected animals compared to controls.

### DETERMINATION OF BUSULFAN IN PLASMS USING GC-MS

Henry E. Outlaw\*, Asia Ivery, John Rodman, Sandy Call, and Charles Rose, Delta State University, Cleveland, MS 38733 and St. Jude Children's Research Hospital, Memphis, TN 38105

Interpatient variability in the pharmacokinetics of chemotherapy agents is an important determinant of treatment outcome and arises from age-related differences in drug disposition and from the effects of disease and concomitant therapy on hepatic and renal function. Busulfan is a preferred myeloablative agent for pediatric patients undergoing bone marrow transplantation and is both hepatically metabolized and hepatotoxic. The results of our previous work, which showed a 2- to 3- fold higher rate of systemic clearance in children than in adults, motivated studies to control systemic exposure to busulfan of assure efficacy and minimize the risk of toxicity for pediatric bone marrow transplantation. A recently initiated study with a novel investigational parenteral formulation of busulfan has shown that induction of metabolism and variability in systemic exposure. Moreover, individualized dosage regimens based on measured concentrations of busulfan on day 1 of therapy have been shown to further control for interpatient pharmacokinetic variability. This ongoing work will determine pharmacodynamic relationships between systemic exposure to busulfan, risk of toxicity, and timely engraftment for children undergoing bone marrow transplantation.

### STRUCTURE AND SUBSTITUENT EFFECTS IN THE STABILIZATION OF CATIONS: IMPLICATIONS TO SUBSTITUTION REACTIONS

Lovell E. Agwaramgbo<sup>1\*</sup>, Hinda Ahmed<sup>1</sup>, and Jerzy Leszczynski<sup>2</sup>, <sup>1</sup>Tougaloo College, Tougaloo, MS 39174 and <sup>2</sup>Jackson State University, Jackson, MS 39217

The rate and pathway of many reactions depend on the structure of the reacting substrates. Whether a reaction will be thermodynamically or kinetically controlled depends on the nature of substrates, solvent, etc. Substituents can greatly control the outcome of a reaction,

not only on product distribution, but also on the regio and stereo chemistry. We therefore wanted investigate the theoretical studies of the conversion of ortho, meta, and para substituted benzylbromides to the corresponding alcohols and their deprotonation. The effect of structure (primary, tertiary, and resonance) on the energies, bond lengths and charges was examined. The results of this investigations may aid in understanding the role silicon plays in many cationic and anionic reactions.  $RX \rightarrow ROH \rightarrow RO$

#### A DRIFT STUDY BASED ON THE AERIAL APPLICATION OF ANTHRAQUINONE WITH ANALYSIS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

April Robinson<sup>1\*</sup>, Jason Corbitt<sup>1</sup>, Edwin Tullos<sup>1</sup>, Marcus Steele<sup>1</sup>, Phelesia Foster<sup>2</sup>, Dennis Elmore<sup>2</sup>, and Joe Mulrooney<sup>2</sup>, <sup>1</sup>Delta State University, Cleveland, MS 38733 and <sup>2</sup>Application Technology Research Unit, USDA-ARS, Stoneville, MS 38776

In December, 1998, the Environmental Protection Agency authorized the use of anthraquinone, as a goose repellent for terrestrial areas around airports, commercial sites, industrial sites, golf courses, plant nurseries, landfills, and building sills and ledges. Historically, anthraquinone has had a variety of applications as varied as that of a textile dye to that of a herbal laxative. This study examines the horizontal drift of the repellent as it is applied from an aerial platform. Spray droplets were collected at selected sampling sites on flat Mylar sheets, drinking straws, and pipe cleaners. The droplets were removed from each of these collection devices using HPLC grade chloroform. Subsequently, the samples were analyzed with a HPLC system composed of a Waters LC Module 1 controlled by Waters Millennium 2000 software using a C18 column, a mobile phase consisting of 65% methanol and 35% water, and UV/VIS detection at 254 nm. A grid of the spray area and adjacent drift impacted area will be presented.

#### A BREAKDOWN OF THE WATSON-TYPE HAMILTONIAN FOR SOME ASYMMETRIC TOP MOLECULES

Kazushige Yokoyama, Jackson State University, Jackson, MS 39217

The Watson-type Hamiltonian is commonly used to model the rotational levels of the vibrational ground state of polyatomic molecules. However, the validity of the Watson-type Hamiltonian breaks down when it is applied to the interaction between the vibrational ground state and vibrationally excited state of certain type of molecules. The breakdown can be understood as a non-negligible centrifugal distortion coupling between the rotational levels of vibrationally excited states and nearby rotational levels of the vibrational ground state. We studied propadienyldiene, H<sub>2</sub>CCC, with high-resolution autodetachment spectroscopy and revealed that the centrifugal distortion coupling occurs between  $v = 0$  and a

nearby CCC out-of-plane bending mode and between  $v = 0$  and CCC in-plane bending mode in the excited electronic state of H<sub>2</sub>CCC anion. This observation motivated us to rederive the centrifugal distortion coupling term for spin-multiplet states and to interpret the autodetachment spectrum of H<sub>2</sub>CCC anion. We take an approach to calculate the non-vanishing matrix elements of the centrifugal distortion coupling terms for multiple states.

#### SOLID STATE SYNTHESIS OF LANTHANUM STRONTIUM MANGANESE OXIDE

Jared Gilmore<sup>1\*</sup>, LaQuinta Kennon<sup>2</sup>, and Lamartine Meda<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096 and <sup>2</sup>Florida State University, Tallahassee, FL 32310

Lanthanum Strontium Manganese Oxide, a vital powder that can be useful in a number of ways, has gained the interest from scientists, as well as consumers. Because of its various properties and the direct need for the mechanical property, we found it necessary to produce the stress-free La<sub>67</sub>Sr<sub>33</sub>MnO<sub>3</sub>. The interest in LSMO began with the need for a compound that would advance consumers in a number of areas. In terms of the national defense (military), it would help produce more sophisticated sensor devices. Of course, the need there is evident, being that it would affect our well being in protection. On another extreme, just as important as the previous mentioned, would be the effects it would bare on the Ozone Layer. The way this comes into play, is that the LSMO would serve as a cathode in fuel cell. This would inevitably be an alternative for car fuel, in turn, changing fuel economy for the 21<sup>st</sup> Century. It doesn't stop there. Also used in MicroElectroMechanical Systems and in the technology of Grant Magnetic Resistance, LSMO is used to modify computer chips, small mechanical devices, and recording equipment, respectively.

#### SYNTHESIS OF CHIRAL DIRADICAL FOR MOLECULAR MAGNETIC MATERIALS

Natalie M. Ballard<sup>1\*</sup>, Teerapat Rojsajakul<sup>2</sup>, Jun Li<sup>2</sup>, and Andrzej Rajca<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096 and <sup>2</sup>University of Nebraska-Lincoln, Lincoln, NE 68588

Radical molecules are an important class of molecules in organic chemistry, and recently their potential for obtaining magnetic materials is of great interest. Currently, the Rajca research group has been studying radical compounds and have found that organic chemistry introduces a method in delineating theoretical, computational, and experimental strategies for designing magnetic properties by developing radicals. One of the tactics is to produce a diradical molecule that will be used for complexation with metal ions to form molecular magnets. The magnets may be used to create computer chips, identification strips, and new health care products. The diradical used in this synthesis was made by Teerapat Rojsajakul in the Rajca laboratory prior to the current research. The purpose of this research is to prepare a pure

enantiomer of the diradical, which is a precursor to a novel chiral molecular magnet. The initial step in the synthesis is to produce a hydroxyl amine compound which will be oxidized to form the diradical. If this process is successful, the diradical will be tested for purity using infrared spectroscopy, nuclear magnetic resonance, mass spectroscopy, and X-ray crystallography.

#### GLUTATHIONE SYNTHETASE

Kesmic Jackson<sup>1\*</sup>, Mary E. Anderson<sup>2</sup>, and Walter Hamrin<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096 and <sup>2</sup>University of Memphis, Memphis, TN 38126

Glutathione is a tripeptide consisting of three amino acids: glutamic acid, cysteine, and glycine. An  $\alpha$ -peptide bond attaches glutamic acid and cysteine, and glycine is attached to cysteine by a  $\alpha$ -peptide bond. Glutathione has a molecular weight of 307.3 Daltons. Two enzymes are used in the synthesis of glutathione:  $\gamma$ -glutamylcysteine synthetase ( $\gamma$ -Glu-CysSyn), and glutathione synthetase (GS). Glutathione synthetase is a homodimer, and is made up of 474 amino acids.  $\gamma$ -glutathione is formed when  $\gamma$ -glutamylcysteine synthetase joins glutamic acid and cysteine at the expense of ATP (adenosine triphosphate). Then glutathione synthetase attaches a glycine to the  $\gamma$ -glutamylcysteine molecule, also at the expense of ATP, to give glutathione, ADP (adenosine diphosphate), and a phosphate ion. A magnesium ion is required in both reactions. Glutathione is found in living cells. Some of its functions are to protect the cell from toxicity, prevent damage caused by oxidation, and the maintenance of thiol groups in the reduced state 2. A deficiency in glutathione has been linked to several diseases. Some of the diseases are AIDS, hepatitis C, neurological disorder, and ulcerative colitis. Studies have found that mutations in glutathione synthetase cause glutathione deficiencies. The aim of this study is to mutate a site on the glutathione synthetase molecule by replacing one residue, which shares a hydrogen bond with glutathione (in this case, Arginine 450) with a lysine residue, which may or may not affect the activity of the molecule. The mutated glutathione synthetase will be used to see how the hydrogen bond between lysine and glutathione will differ from the original bond between arginine and glutathione as well as to observe how the activity of the molecule will be affected.

#### MEMBRANE SEPARATIONS FOR LIGNOCELLULOSIC BIOMASS-FOR-ETHANOL

Oscar L. Griffin<sup>1\*</sup>, Jeffery Knutsen<sup>2</sup>, and Robert Davis<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096 and <sup>2</sup>University of Colorado, Boulder, CO 80302

Due to depleting energy reserves, alternative to non-renewable fossil-fuels are being investigated. Ideally, what is sought is a liquid fuel that can be inexpensively produced from renewable resources. Fuel-ethanol derived from agriculture or industrial lignocellulosic biomass is one such alternative. To be economically competitive, however,

ethanol production costs must be significantly less than that of gasoline. One of the most significant production expenses is the cost of cellulase enzyme, which converts cellulose into glucose, a fermentable sugar. Because the current pilot plant design incorporates no downstream separation and recycling of cellulase, the thrust of this research is to study ultrafiltration membranes suitable for the separation of cellulase and glucose. Priorly, an ultrafiltration membrane has been found and characterized which can efficiently separate cellulase from glucose. In this research, empirical studies were expanded to include crossflow, hollow fiber, and potentially spiral wound ultrafiltration setups. Key parameters explored include the relative fluxes and degree of foulage of each membrane. Crossflow ultrafiltration experiments to separate enzyme from glucose or other small molecules are the main features being investigated in this research. Also, permeate fluxes were measured for different operating and feed conditions. Enzyme and sugar concentrations in the permeate and retentate were monitored by spectrophotometry and refractometry.

#### CHEMISTRY OF Cu(II) COMPLEX OF DI-2-PYRIDYL KETONE 4-PHENYL THIOSEMICARBAZONE. ISOLATION AND STRUCTURAL CHARACTERIZATION

Brian Napolian<sup>1</sup>, Hernando C. Payne II<sup>1</sup>, Ramaiyer Venkaraman<sup>1\*</sup>, Jeffrey D. Zubkowski<sup>1</sup>, and Edward J. Valente<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217 and <sup>2</sup>Mississippi College, Clinton, MS 39058

Copper (II) complex of di-2-pyridyl ketone 4-phenyl thiosemicarbazone has been synthesized and characterized by spectroscopic methods. Structure of the copper complex has been determined by single crystal X-ray diffraction. The title compound,  $[\text{Cu}(\text{NCS})_2(\text{C}_{18}\text{H}_{13}\text{N}_5\text{S})] \cdot 2\text{C}_2\text{H}_6\text{SO}$ , has a distorted square pyramidal coordination geometry about Cu(II) with one pyridine N atom, the S atom and the imino N atom from the thiosemicarbazone ligand, together with the N atom from an isothiocyanato ligand, in the basal plane. The pyridyl N atom of an adjacent moiety occupies the apical position, serving as bridge to form a centro-symmetric dimeric structure.

#### TERNARY Ni(II) AND Cu(II) COMPLEXES OF PHENYLALANINE WITH SALICYALDEHYDE AND IMIDAZOLE AND METHYLIMIDAZOLE

Carissa Caban, Booker Spurlock, and Ramaiyer Venkaraman<sup>\*</sup>, Jackson State University, Jackson, MS 39217

Ni(II) and Cu(II) complexes of salicylidene-phenylalanine  $[\text{H}_2(\text{sal:phyala})]$  with imidazole or 2-methylimidazole (B) have been synthesized and characterized by conductance measurements, electronic and IR spectra. The complexes are tetra-coordinate of general formula  $\text{M}(\text{sal:phyala})\text{B}$ . The salicylideneamino acid ligand acts as a divalent tridentate Schiff base, where imidazole or 2-methylimidazole acts as a monodentate ligand. The



structure of the complexes suggested to be square-planar for both Ni(II) and Cu(II) complexes.

#### QUANTUM MECHANICAL STUDIES ON MOLECULAR STRUCTURE AND STABILITY OF BIURET, THIO-, AND DITHIOBIURET

Isaac Orton\*, Ali Jabalameli, Aminatu Issaca, Ramaiyer Venkatraman, Andrzej Nowek, and Richard H. Sullivan, Jackson State University, Jackson, MS 39217

In continuation of studies on ureic systems (urea, its derivatives and analogs) we report results of quantum mechanical study on molecular structure and stability of biuret and its sulfur analogs;  $H_2NCXNH CXNH_2$ , X= O, S. Three isomeric forms, e.g., cis-cis, cis-trans, and trans-trans, and trans-cis forms with respect to the orientation of oxygen and/or sulfur atoms against central NH bond were considered. Only the cis-trans form of biuret was characterized experimentally. Molecular geometries of the studied species were optimized at the DFTBecke3LYP and MP2 levels of theory using 6-31 G(d,p) and 6-311G(2df,2pd) basis sets. All forms are minimum energy structures and cis-trans correspond to the global minimum. Higher energy isomeric forms lay 4-16 kcal/above. Also barrier heights to internal rotation of amino groups were calculated.

#### A HIGH LEVEL QUANTUM MECHANICAL INVESTIGATION OF CO...CIBr, CO...BrCl, OC...BrCl, AND OC...CIBr COMPLEXES

Isaac Orton, Ali Jabalameli, Aminatu Issaca\*, Ramaiyer Venkatraman, Andrzej Nowek, and Richard H. Sullivan, Jackson State University, Jackson, MS 39217

An existence of linear OC...BrCl complex was detected and characterized by microwave spectroscopy. In the present study also other mutual orientations of component molecules are investigated. Triple-zeta quality augmented with sets of polarization functions were applied. Molecular geometries were optimized at the MP2 and QCISD levels of theory using 6-311G(2df) and cc-pVTZ basis sets. Additionally, single point calculations applying 6-311+G(2df) and aug-cc-pVTZ basis sets were performed. Global minimum energy corresponds to experimental OC...BrCl structure. Other forms, i.e. linear CO...CIBr, OC...CIBr, and parallel OC...BrCl are a higher energy (~1-2 kca/mol above) species. Calculated interaction energies strongly depend on level of theory and/or basis set applied and vary in the range  $\Delta E=0.01-2.00$  kca/mol.

#### CONVERSION OF WOMBAT ACID

Megan L. Johnson\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

Useful compounds such as potassium nitrate and ammonium nitrate were synthesized from the used WOMBAT nitric acid. When the WOMBAT acid was titrated with potassium hydroxide to the endpoint, the resulting solution contained solvated potassium ions and solvated nitrate ions. When the water was allowed to

completely evaporate from the solution, needle-shaped potassium nitrate crystals were formed. By a similar process, the WOMBAT acid was titrated with ammonium hydroxide to the endpoint and dried to obtain ammonium nitrate crystals. Both potassium nitrate and ammonium nitrate were made using unused concentrated nitric acid in the same method. This was done so that the compounds made from the WOMBAT acid could be compared to a standard. The four compounds' structures have been confirmed using X-ray diffraction. The compounds have also been tested for trace metals using X-ray fluorescence spectroscopy. Insignificant amounts of iron, zinc, and sulfur were found in the compounds produced from the WOMBAT acid that were not found in the compounds produced from unused acid.

#### INVESTIGATION OF THE NATURE OF TRANSCRIPTION TERMINATION DEFECTS IN TWO BIOCYCLOMYCIN-RESISTANT RHO FACTORS FROM *ESCHERICHIA COLI*

Larrious E. Collins<sup>1\*</sup>, Brandt R. Bruggess<sup>2</sup>, and John P. Richardson<sup>2</sup>, <sup>1</sup>Alcorn State University, Alcorn State, MS 39096 and <sup>2</sup>Indiana University, Bloomington, IN 47405

This research investigates some of the biochemical properties of two mutant forms of the transcript termination factor Rho protein from *Escherichia coli*. These mutant Rho proteins, L208R and S266A, were chosen for isolation and further study because they conferred resistance to the antibiotic bicyclomycin, which kills *E. coli* bacteria by inactivating their Rho factor. Bacteria need Rho factor to be able to grow and divide. Besides exhibiting greater resistance to inhibition by bicyclomycin, both of these mutant Rhos are less effective in causing ATP-dependant RNA transcript termination. The purpose of this work is to identify which step in the termination mechanism is defective for both of these mutants. This was done by running assays that measured ATP hydrolysis using mixtures of polynucleotides that activate Rho's ATPase activity. The experiments consisted of mixing single-stranded DNA, poly(dC), which can bind to the primary nucleic acid-binding site on Rho, and a small RNA oligonucleotide, ribo(C8), which interacts with the secondary site on Rho, and is necessary for eliciting Rho's ATPase activity. I measured the activation of the ATPase activity as a function of the concentration of the small RNA for both mutant and the wild-type protein. My data was analyzed to measure the Michaelis constant (Km) for the small RNA. I then interpreted these data and made conclusions on the nature of the defects of the two mutant Rho proteins. From this research I can conclude that these mutants are not very effective in the secondary-site interaction, they must be defective in some other step such as a step involve in the coupling of ATP hydrolysis to actions on a nascent RNA transcript that is necessary for termination.

Divisional Lectures Begin

9:30 AN EXPERIMENTAL MODEL FOR THE REMOVAL OF METAL IONS FROM UNPROCESSED WOMBAT POWDER

Callie E. Bounds\* and David L. Wertz, University of Southern Mississippi, Hattiesburg, MS 39406

The purpose of this project was to find an inexpensive, yet effective way to remove metal ions, specifically iron and zinc, from unprocessed WOMBAT powder in a timely manner. Several methods were used to remove the unwanted materials from the WOMBAT powder. The most effective method included washing the powder in water for a specified amount of time and then removing the WOMBAT powder through filtration. X-ray Fluorescence was used to analyze all the samples obtained from each separation method, and the results were evaluated against standard analysis curves. These results indicate that the amount of iron and zinc in the powder may be decreased but not removed entirely.

9:50 ORGANIC-INORGANIC COMPOSITES FROM PHOTOPOLYMERIZATION OF LYOTROPIC LIQUID CRYSTALLINE SYSTEMS

Jeanne Norton\* and C. Allan Guymon, University of Southern Mississippi, Hattiesburg, MS 39406

In order to formulate a coating for polycarbonate with good flexibility and scratch resistance, a series of organic-inorganic composite materials were created. These materials consist of an inorganic polymer phase templated by organic liquid crystals. The inorganic monomer used was TEOS and was polymerized via a sol-gel reaction at a pH of 2. The organic liquid crystals were both non-polymerizable and polymerizable surfactants. Cationic (CTAB, DTAB, C-12MA and C-16MA) and non-ionic (Brij 58 and Brij 58MA) surfactants were chosen. In the case of the non-polymerizable surfactant systems, optical microscopy and small angle X-ray scattering were used to characterize the phase behavior. In the case of the polymerizable surfactant systems, photo differential scanning calorimetry was used to characterize the polymerization behavior both before and after the sol-gel reaction was carried out. The phase behavior was also characterized by optical microscopy and SAXS. A hybrid monomer with vinyl groups and silicate moieties was also investigated.

10:10 INVESTIGATING THE INCORPORATION OF 5-HYDROXYTRYPTOPHAN: AN INTRINSIC FLUORESCENCE PROBE

Justin M. Turner, Allison Waldenstrom\*, Aron Fenton\* and Gregory D. Reinhart\*, Texas A&M University, College Station, TX 77843 and Jackson State University, Jackson, MS 39217

The intrinsic fluorescence of *Bacillus stearothermophilus* phosphofructokinase (BsPFK) is not sensitive to ligand binding. Therefore, the intrinsic fluorescence of BsPFK cannot be used to determine ligand binding constants. However, the fluorescence of amino acid analogs

can be more sensitive to ligand binding. This study investigates the incorporation of a unique tryptophan analog, 5-hydroxytryptophan. Its significance is its absorbance between 310–320 nm, which allows it to behave as an exclusive fluorescence probe in protein mixtures containing a large number of tryptophan residues. Purified BsPFK from *E. coli* cells on a bacillus plasmid, grown in the presence of 5-hydroxytryptophan, shows a characteristic shoulder from this analog's absorption spectrum. Along with the emission spectrum, fluorescence confirms incorporation of 5-hydroxytryptophan.

10:30 SYNTHESIS OF BIS-(6-HYDROXYHEXYL)-TRANS-4,4'-STILBENE DICARBOXYLATE, A PRECURSOR FOR PHOTOREACTIVE LIQUID CRYSTALLINE POLYESTERS

Alline P. Somlai\* and David Creed, University of Southern Mississippi, Hattiesburg, MS 39406

Bis-(6-hydroxyhexyl)-*trans*-4,4'-stilbene dicarboxylate will be copolymerized with a known alkyl malonyl chloride. Reaction of the latter with a bis-hydroxyalkyl substituted azobenzene monomer is reported to produce a main chain liquid crystalline polymer with low transition temperatures and enhanced mesophase stability. Obtaining low transition temperatures in an analogous stilbene containing polymer would permit a detailed investigation of the polymer photochemistry in the different mesophases. In a three-step synthesis, *trans*-4,4'-stilbene bis-(carboxylic acid) was refluxed with thionyl chloride producing the diacid chloride. The acid chloride was refluxed with anhydrous ethanol under basic conditions to give the diethyl ester. The diethyl ester was transesterified in the melt with an excess of 1,6-hexanediol using catalytic amounts of titanium IV-tetraisopropoxide to give the desired product. The stilbene monomer was recrystallized from 20% hexane in chloroform. The structure was verified using <sup>1</sup>H-NMR, <sup>13</sup>C-NMR, FT-IR, UV-VIS and fluorescence spectroscopy.

10:50 Break

11:00 SYNTHESIS AND PHOTOPHYSICS OF MODEL COMPOUNDS CONTAINING ARYL CINNAMATE CHROMOPHORES

Rabih O. Al-Kaysi\* and David Creed, University of Southern Mississippi, Hattiesburg, MS 39406

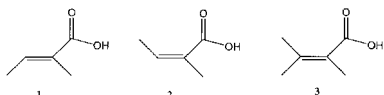
Aryl cinnamate chromophores show different absorption spectra that are dependent on the distance and orientation of the aggregating chromophores. This is evident in liquid crystalline polymers that contain aryl cinnamates as the mesogenic group. The spectra of cast films of these polymers have a blue shifted absorption with a red shifted tail as compared to the spectra of the polymers in a good solvent. This behavior suggests a K-aggregate in the polymer film. We have synthesized several model compounds that contain two modified aryl cinnamate chromophores rigidly bonded to one side of the molecule to

assume a parallel orientation. The free end of the modified chromophores can associate intramolecularly through hydrogen bonding. The spectrum of the model compound in hexane, a bad solvent, is red shifted compared to the spectrum of another model compound with a single unassociated chromophore in the same solvent.

11:20 COMPARISON OF THE EFFECT OF SOLVENT DIELECTRIC CONSTANT ON THE PEREPOXIDE INTERMEDIATES FORMED IN THE ENE REACTIONS OF TIGLIC ACID, ANGELIC ACID, AND 2,3-DIMETHYL-2-BUTENOIC ACID WITH SINGLET OXYGEN

Jason A. Payne\*, Alexa N. Ivancic\*, and Kristina L. Stensaas, Millsaps College, Jackson, MS 39210

Photooxidations of tiglic acid (1), angelic acid (2), and 2,3-dimethyl-2-butenoic acid (3) with singlet oxygen were carried out in solvents/or solvent mixtures with dielectric constants varying from 2.3 to 56.6. Deuterated solvents were used to increase the lifetime of singlet oxygen thereby decreasing reaction times. Proton nuclear magnetic resonance spectroscopy was used to monitor the product formation in each reaction. The results show an increase in the formation of the minor ene product as the solvent dielectric constant increased for both angelic acid and 2,3 dimethyl-2-butenoic acid. We attribute this increase of minor ene product to the stabilization of the polar intermediate perepoxide by the more polar solvent. The tiglic acid perepoxide intermediate was found to be insensitive to the dielectric constant of the solvent.



11:40 SPECTROSCOPY IN GENERAL CHEMISTRY LABORATORIES

Edward J. Valente, Mississippi College, Clinton, MS 39058

Incorporating spectroscopy in the general chemistry (first) year laboratories can be an important way to increase the technological base of the course and prepare for other spectroscopic analyses later in the chemistry curriculum. With the assistance of the National Science Foundation, the Department of Chemistry at Mississippi College has begun to use modest ultraviolet-visible spectrometers in a series of laboratory exercises in the first year labs. Modules include colorimetry and spectrometer use, separation of biopigments and their spectroscopic identification, quantitation of a transition metal complex by spectrometric titration. Students have generally responded favorably as judged by surveys and examinations. Additional modules on equilibrium concentrations and bioanalysis using spectroscopy are to be introduced next. Use of the spectrometers and simple, effective graphical software is quickly mastered by students. Such spectroscopic labs also help to increase biochemical content in the curriculum. The equipment, laboratories, student-

directed design approach, and student evaluations will be presented.

FRIDAY AFTERNOON

Room 1

1:10 ANALYTICAL AND COMPUTATIONAL STUDIES OF SOME TETRACYCLINES AND THEIR METAL COMPLEXES

Wedad R. Hussein<sup>1\*</sup>, Christopher G. Walker<sup>1</sup>, Zenaida Peralta-Inga<sup>2</sup>, and Jane S. Murray<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217 and <sup>2</sup>University of New Orleans, New Orleans, LA 70148

Tetracycline, although not the first to be discovered, is considered the parent of the group of tetracyclines for nomenclature purposes. Tetracyclines have a common skeleton made of four fused six membered rings, (A, B, C, & D) one of which, the D, is aromatic. It has been suggested that metal chelation plays a role in the tetracycline antibiotic action. In our studies of the complexation of tetracycline with selected metal ions, potentiometric methods are used in an attempt to determine: 1) the metal ion:tetracycline ratio and 2) the formation constant of the complex. Also, the electrostatic potentials and average local ionization energies computed on the molecular surfaces of four tetracyclines have been investigated with the objective of identifying common features as well as subtle differences that may be related to their biological activities.

1:30 THE CALCULATION OF RO-VIBRATIONAL ENERGIES OF HOCl

Amy Creel\* and Joseph A. Bentley, Delta State University, Cleveland, MS 38733

We report the accurate calculation of ro-vibrational eigenstates of the ground electronic state of hypochlorous acid, HOCl. The Jacobi coordinate system is used. The discrete variable representation (DVR) [Z. Bacic and J. C. Light, *Annu. Rev. Phys. Chem.* **40**, 469 (1989)] is used as a basis for both radial coordinates leading to a sparse Hamiltonian matrix. The eigenvalues are then obtained by using the Implicitly Restarted Arnoldi Method (IRAM). This is part of a recently developed numerical package (ARPACK) designed to solve large scale eigenvalue problems. The energies are calculated using a new potential energy surface for HOCl [S. Skokov, K.A. Peterson, and J.M. Bowman, *Chem. Phys. Lett.* **312**, 494 (1999)].

1:50 EFFECTS OF CADMIUM ON THE GONADS OF THE JAPANESE MEDAKA (*ORYZIAS LATIPES*)

I.J. Williams\*, S.C. Thompson, and C.M. Foran, University of Mississippi, University, MS 38677

The effects of cadmium (Cd) on the testes of

Japanese Medaka (*Oryzias latipes*) were investigated using histological methods and techniques. Effects of cadmium had previously been recorded as damage to liver, kidneys, and gills. Adult male medaka were exposed to 0 (control) and 10 ppb Cd as hemi(pentahydrate) CdCl<sub>2</sub> in nanopure-filtered balanced salt solution for 7 weeks. At the end of the 7-week exposure period, fish were fixed using a 10% neutral buffered formalin for 24–28 h prior to embedding in paraffin wax. Body weights of each eleven medaka were recorded. Deparaffinized and dehydrated sections were stained using hematoxylin and eosin stains, and the areas of each fish's gonads recorded and analyzed. Observed results showed no significant difference in body weight of control males versus 10 ppb males. No significant difference was seen in average area of the possible degeneration/decrease in size of seminiferous tubules and possibly degeneration of spermatocyte cells. Because, sublethal amounts of Cd exist both in drinking water and some dietary supplements, effects on reproductive organs of other organisms are being investigated.

2:10 EFFECTS OF INTRACEREBRO-VENTRICULAR INFUSION OF THE STEREO-ISOMERS OF TETRAHYDROPAPAVEROLINE ON ALCOHOL PREFERENCE IN RATS

Chris Strawbridge\*, Kenneth D. McMurtrey, and John G. McCoy, University of Southern Mississippi, Hattiesburg, MS 39406

Previous research suggests a role for tetrahydro-papaveroline (THP) in the neural control of volitional alcohol consumption. Either an overabundance of THP, or an increase in receptor affinity for THP have been proposed as important factors in the etiology of alcoholism. Further evidence suggests that one site of action for eliciting this behavior is the mesolimbic dopamine (DA) reward circuit, located in the basal forebrain. DA is normally metabolized to dopaldehyde by monoamine oxidase (MAO). Aldehyde dehydrogenase then converts dopaldehyde to dopacetic acid. However, acetaldehyde, the major metabolite of ethanol, acts as a competitive inhibitor for aldehyde dehydrogenase. The addition of acetaldehyde, which has a high affinity for aldehyde dehydrogenase, presumably results in the condensation of dopaldehyde with intact DA to form THP. THP is a necessary precursor in the biosynthesis of morphine in *Papaver somniferum*, the opium poppy. In this experiment, adult male Sprague-Dawley rats are screened for alcohol preference using a 12-day protocol that allows animals to choose between water and a solution of gradually increasing alcohol concentration. Following the screening test, a cannula will be implanted into the lateral ventricle of each animal using a stereotaxic apparatus. This cannula allows for the intracerebroventricular infusion of the racemic mixture of THP and THP's two optical isomers. Stereochemical effects on volitional alcohol consumption will be described.

2:30 QUANTIFICATION OF THE EFFICIENCY OF

FENTON DEGRADATION REACTIONS

Abul B. Kazi, William C. Mahone, and Naci Powell\*, Mississippi Valley State University, Itta Bena, MS 38941

Fenton's reagent is known for its widespread application for remediation of hazardous chemicals in the environment. The efficiency of the Fenton reaction depends on its ability to degrade organic compounds to smaller fragments and ultimately, to CO<sub>2</sub> and H<sub>2</sub>O. In our previous studies, we measured the efficiency of Fenton degradation by determining the extent of disappearance of the parent compounds after treatment with Fenton's reagent. In this study, we are measuring the efficiency of the Fenton reaction by quantifying the amount of CO<sub>2</sub> generated as a result of such degradation reactions. The quantification technique is based on generating CO<sub>2</sub> in a sealed compartment and measuring the pressure of CO<sub>2</sub> with a gas pressure sensor. Preliminary results indicate that this method can be effectively used for quantification of the efficiency of Fenton degradation reactions.

2:50 PROFILING VAPORS FROM SELECTED ASPHALTS WITH THE USE OF SOLID PHASE MICROEXTRACTION AND GC/MS

Edwin Tullos<sup>1\*</sup>, Marcus Steele<sup>1</sup>, Kyle Lott<sup>1</sup>, Gaylon Baumgardner<sup>2</sup>, and Mary Stroup Gardiner<sup>3</sup>, <sup>1</sup>Delta State University, Cleveland, MS 38733; <sup>2</sup>Ergon, Inc., Jackson, MS 39215; and <sup>3</sup>Auburn University, Auburn, AL 36849

The volatile components of fumes from samples of Huntway and Paramount asphalt, neat and containing odor reducers, were examined using solid phase microextraction (SPME) and gas chromatography-mass spectrometry (GC/MS). The neat asphalt and odor reducer containing asphalt samples were obtained from the National Center for Asphalt Technology. In our study, a vial containing the asphalt sample was placed in an oil bath maintained at a temperature of 170°C. A SPME fiber was exposed to the vapor for 5 minutes, the fiber was retracted and inserted into the GC/MS. A Hewlett-Packard Model 5890 gas chromatograph with a 5971 mass selective detector and interfaced with an HP ChemStation was used in all analyses. This procedure produces a detailed analysis that includes saturated and unsaturated hydrocarbons as well as the odor reducers.

**GEOLOGY AND GEOGRAPHY**

Chair: Terry Panhorst, University of Mississippi  
 Vicechair: Ezat Heydari, Mississippi Office of Geology

**THURSDAY MORNING**

Room 706

8:30 Symposium: ACTIVE TECTONICS IN NORTHERN MISSISSIPPI

8:30 SOME COMMON TYPES OF GROUND FAILURE AND TESTS TO DETERMINE THEIR SEISMIC OR NON-SEISMIC ORIGIN

Stephen Obermeier, EqLiq Consulting, Rockport, IN 47635

Liquefaction-induced features are being used in widely differing seismotectonic settings to prove paleoseismic strong shaking, and to approximate epicentral locations and levels of shaking and magnitudes (e.g., Obermeier and Dickenson, 2000, BSSA, v. 90; Obermeier et al., in press, 2000, USGS Open-File Rept., Paleoliquefaction studies in continental settings: geologic and geotechnical factors in interpretations). Using liquefaction effects is a preferred method for paleoseismic interpretation in many places. In regions of nonliquefiable deposits, other ground-failure types have been used with limited success to evaluate paleoseismicity. Interpretations (and misinterpretations) have been based on plastically deformed fine-grained sediment, clastic infillings from above, landslides, rockslides, precariously balanced rocks, weathering features, frost effects, plus others. Concepts and analysis procedures for their application commonly are only crudely developed or only crudely sensitive. But for some (many?) of these types of features the question of seismic origin could be addressed better by using principles for proving the origin of liquefaction-induced features, with minor modifications. For suspected liquefaction-induced features, a seismic origin must accord with regional and local patterns, must have proper morphology and timing, and, additionally, the possibility of nonseismic mechanisms must be eliminated (Obermeier, 1996, *Engr. Geol.*, v. 44). For assessing a seismic origin to other feature types (as above), the criteria would be essentially the same as for seismically induced liquefaction, and only the possible nonseismic triggering mechanisms would differ.

9:30 LIQUEFACTION IN MEMPHIS AND SHELBY COUNTY, TENNESSEE

Roy B. Van Arsdale, University of Memphis, Germantown, TN 38139

Reconnaissance along major streams in Shelby County, Tennessee, revealed earthquake-induced sand dikes in cut banks of the Wolf and Loosahatchie rivers. Most of the dikes are near the mouths of these rivers within the city limits of Memphis, but one dike occurs 36 km upstream in the bank of the Wolf River in Collierville. The dikes range in width from 1 to 50 cm and at some localities can be traced vertically as much as 4 m from their source bed to within 50 cm of the flood plain surface. The age of the dikes is unknown, but they are interpreted to be from the great 1811–1812 New Madrid earthquakes. The larger number of dikes and upstream extent of liquefaction along the Wolf River suggest that liquefaction susceptibility is greater in the Wolf River flood plain than in other flood

plains in Shelby County. This greater liquefaction susceptibility of the Wolf River flood plain appears to be due to the abundance of sand in its basal point-bar sequence and a relatively thin overbank silt/clay cap. Channelization of the Wolf River in 1964, and subsequent river entrenchment has reduced flooding along the lower reaches of the river thus permitting flood plain development. However, the channelization has also increased susceptibility for earthquake liquefaction and associated lateral spreading of the Wolf River flood plain and increased earthquake risk due to building development on the flood plain.

10:00 Break

10:15 LIQUEFACTION AND OTHER POSSIBLE SEISMOGENIC FEATURES SOUTHWEST OF THE NEW MADRID SEISMIC ZONE IN EASTERN ARKANSAS

Robert E. Lemmer\*, Haydar J. Al-Shukri, Jeffrey B. Connelly, and Hanan H. Mahdi, University of Arkansas, Little Rock, AR 72204

Aerial and surface reconnaissance has discovered earthquake-related features approximately 44 to 100 km southwest of Marked Tree, Arkansas. A detailed subsurface investigation was conducted at three sites, two near Marianna, Arkansas and one near Parkin, Arkansas. Three trenches were excavated revealing three large (>107 m X 55 m) elliptically-shaped liquefaction features resembling those within the NMSZ. Each of the excavations exposed a fine-medium grained sand blow deposit overlying a thick, plastic clay layer. The sand blows were fed by numerous vertical to shallow dipping sand dikes <1 cm to 20 cm thick. Forty-five near vertical dikes were logged at one site whereas only 3–5 dikes were exposed at a second site. A 1.5 km long linear feature near Parkin was also investigated. The lineament trends N56°E and has a ground surface that is 2.75 meters higher to the southeast. No fault was seen in the trench, however, sand and clay layers tilted to the northwest were exposed suggesting possible faulting farther to the east. A geophysical survey is planned to investigate this possibility. The size of the liquefaction features and the distance of 100 km from the active NMSZ require either a major New Madrid earthquake or another seismogenic source. In either case, the seismic hazard in the region south of the active NMSZ may be underestimated.

10:45 SHALLOW SEISMIC REFLECTION IMAGING OF THE BIG CREEK FAULT ZONE: IMPLICATIONS FOR SEISMIC HAZARD IN NORTHWEST MISSISSIPPI

James B. Harris<sup>1\*</sup>, Randel Tom Cox<sup>2</sup>, Seth A. Berman<sup>3</sup>, and Brant W. Cole<sup>4</sup>, <sup>1</sup>Millsaps College, Jackson, MS 39210; <sup>2</sup>University of Memphis, Memphis, TN 38152; <sup>3</sup>Fairfield Industries, Sugar Land, TX 77478; and <sup>4</sup>New Mexico Tech, Socorro, NM 87801

Shallow seismic reflection imaging was used to identify, characterize, and evaluate the significance of near-surface (late Tertiary and Quaternary) tectonic deformation associated with the northeast-striking Big Creek fault zone (BCFZ) in the Lower Mississippi Valley (LMV). Shear-wave seismic reflection profiles were collected at two sites: (1) southwest of Helena, Arkansas, across the Big Creek escarpment; and (2) at Porter Gap, Tennessee, across the margin of the Chickasaw bluffs of the Mississippi River. The interpreted seismic profile across the Big Creek escarpment shows that the scarp is underlain by several high-angle faults, with a principal fault extending upward into Quaternary sediments (shallower than 45 m). Warping of shallow reflections indicates compression and suggests that the principal fault has been active as a reverse or transpressional fault in the LMV's contemporary (east-west compressional) stress field. The Porter Gap profile exhibits strong, continuous, reflections at depths of 50-75 m and 90-120 m. Both reflections are disrupted by a near-vertical fault coincident with the west-facing bluff margin. Separation on the fault is up-to-the-west, although structural relief along the line is higher on the east (consistent with topography). Therefore, the fault is interpreted to have been structurally inverted during late Tertiary or Quaternary time. This is similar to the deformational history suggested by the reflection profile across the Big Creek escarpment near Helena. Future seismic investigations are planned to evaluate the possible extension of the BCFZ into northwest Mississippi and the Memphis metropolitan area.

#### 11:15 MISSISSIPPI EARTHQUAKES

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

Mississippi's known earthquake history spans over 300 years. The greatest risk to the state from earthquakes is from the New Madrid Seismic Zone, but 42 events are known to have occurred within Mississippi, scattered throughout the state. There is a diffuse cluster of epicenters in the northwestern quadrant of the state, the quadrant closest to the NMSZ. There is a tight cluster in Clarke County, where a third of Mississippi's known earthquakes have occurred. The earliest known Mississippi earthquake was felt in Biloxi in 1853. The strongest earthquake within the state was the 1931 event in the Batesville-Charleston area; it was felt over 65,000 square miles in five states. The next strongest was the 1967 earthquake near Greenville; though only magnitude 3.8, it was felt over 25,000 square miles in four states. Southern Mississippi was shaken by a 1955 earthquake that was felt all along the Coast. There are few seismic instruments in and around Mississippi, so epicentral locations and depths are poorly constrained. Thus we have inadequate information to assign these earthquakes to specific structural features. It may be speculated that the earthquakes in northwestern Mississippi may be associated with features related to the Reelfoot Rift. The proximity of the Pickens-Gilbertown fault zone to the

Clarke County earthquakes must be considered. Other features that have been suggested as causes of earthquakes in Mississippi include the southern Appalachians and the White River fault zone.

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### THURSDAY AFTERNOON

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Room 706

1:30 Divisional Poster Session

#### INVESTIGATION OF POSSIBLE PALEOLIQUEFACTION FEATURES IN MISSISSIPPI

Hanan H. Mahdi<sup>1\*</sup>, Haydar J. Al-Shukri<sup>1</sup>, Robert E. Lemmer<sup>1</sup>, Jeffrey B. Connelly<sup>1</sup>, and Michael B.E. Bograd<sup>2</sup>,  
<sup>1</sup>University of Arkansas, Little Rock, AR 72204 and  
<sup>2</sup>Mississippi Office of Geology, Jackson, MS 39289

Mississippi is in a mid-plate region of infrequent strong earthquakes. The active New Madrid Seismic Zone, close to northwestern Mississippi, poses the greatest risk to the state from earthquakes. In a region of infrequent earthquakes and a short historical record, we must resort to a search for physical evidence of past strong earthquakes. Investigation is under way in northwestern Mississippi of possible paleoliquefaction features (old sand blows resulting from earthquake-induced liquefaction). Sites in Tunica County, Mississippi, bear the same signature on satellite imagery as sites in Arkansas confirmed to be paleoliquefaction features. Agricultural fields on 1962 aerial photographs of Tunica County show circular patches of light color that could be more reflective sand surrounded by darker alluvial soils. Field investigations during the dry summer of 2000 screened sites worthy of further work. The next step will be profiling each feature with hand-auger and collecting ground-penetrating radar data. If these investigations indicate possible sand-blow features, the sites will be trenched, and attempts will be made to determine the age of the features. If these are indeed earthquake-induced sand blows, the implications for earthquake risk to Mississippi are significant. Perhaps the New Madrid earthquakes of 1811-1812 were stronger than now understood, or there was a strong earthquake farther south than any now known.

#### IDENTIFICATION OF SURFACE LINEAMENTS UTILIZING LANDSAT IMAGERY AND EVALUATION OF THEIR POTENTIAL ASSOCIATION WITH TECTONIC FEATURES IN NORTHWEST MISSISSIPPI

James Alan Barck, University of Mississippi, University, MS 38677

In 1811 and 1812 a series of violent earthquakes occurred near New Madrid, Missouri. These events were associated with tectonic activity along what has come to be known as the New Madrid Seismic Zone (NMSZ) which is currently one of the most seismically active regions in North America. Due to the size of the area affected by the

1811–1812 earthquakes, the presence of the NMSZ has become a major concern for the central continental region including northwest Mississippi. Through the use of remote sensing and geographical information systems (GIS) analysis, a number of linear surface features (lineaments) have been identified in northwest Mississippi which are believed to be related to buried faults within this region. Identification of these features has been performed primarily using Landsat 7 thematic mapper satellite imagery. Geologic evidence has been accumulated which supports a relationship between these observed lineaments and buried tectonic features. Of continuing concern is the intersection of a number of these lineaments with vital infrastructure features in northwest Mississippi.

#### NATURALLY OCCURRING RADIOACTIVE MATERIALS (NORM) IN PRODUCED WATER FROM MISSISSIPPI OIL WELLS: AN OVERVIEW

Julie Kelley<sup>1\*</sup>, John C. Matthews<sup>1</sup>, Joel S. Kuszmaul<sup>1</sup>, Charles T. Swann<sup>1</sup>, and Rick L. Ericksen<sup>2</sup>, <sup>1</sup>University of Mississippi, University, MS 38677 and <sup>2</sup>Mississippi State Board of Registered Professional Geologists, Jackson, MS 39225-2742

Large quantities of formation waters are co-produced with hydrocarbons. Formation waters, or brines, contain high concentrations of dissolved minerals and salts. Some of these brines contain significant concentrations of radionuclides especially radium and its decay products. The radioactive elements in the brines are commonly referred to as naturally occurring radioactive materials (NORM). This study involved the sampling of brines from 262 oil wells across Mississippi. The concentrations of radionuclides (<sup>228</sup>Ra, <sup>226</sup>Ra, and <sup>228</sup>Ac) were measured in each sample, where detectable concentrations were present, using methods that varied for each isotope. Additional measurements of the chemistry of each of the sampled brines were also made; these include pH, Cl<sup>-</sup>, total dissolved solutes, and density. The data was integrated into a Geographic Information System (GIS) database. This database has been used to characterize the nature of the variation in NORM concentrations of each of the producing fields and basins as well as chemical trends across Mississippi. Important findings include that unlike studies of researchers in other areas, such as Fisher (1995, Texas Bureau of Economic Geology, Geological Circular 95-3) working with brines of Texas, there was not a strong correlation of NORM concentrations and Chloride (Cl<sup>-</sup>) concentrations. This relation was true within each production basin and across Mississippi as a whole. Another important finding has been that the differences in NORM concentrations within the brines are not as varied from one region to another as might be expected. While these results alone do not provide sufficient information for a complete analysis of the potential risks associated with these NORM, the characterization of the NORM concentrations across Mississippi will assist with such an analysis.

#### 2:00 UNUSUAL ASPECTS OF THE HEADWATERS OF THE TOMBIGBEE AND HATCHIE RIVERS AND POSSIBLE NEOTECTONIC IMPLICATIONS

Randel Tom Cox, University of Memphis, Memphis, TN 38152

Regional analysis of transverse drainage-basin asymmetry of the northeastern Mississippi embayment reveals a region of pronounced asymmetry in northeastern Mississippi such that streams preferentially occupy the southeastern side of their basins. In this area of basin asymmetry (the headwaters of the Hatchie River) low order tributaries flow southeastward before making 180° bends to join northwestward-flowing higher order tributaries and the trunk channel of the Hatchie River. The anomalous flow direction of these low order streams is the same as the southeastward flow direction of the Tombigbee River and its tributaries immediately southeast of the Hatchie basin. One process that might give rise to this drainage pattern is capture of Tombigbee headwaters by the Hatchie River. However, comparison of the elevation of confluences of equivalent order streams in the headwaters of the Tombigbee and Hatchie Rivers shows the Tombigbee River to be incised ~25 meters deeper than the Hatchie River. Thus, it is implausible that the Hatchie River has captured Tombigbee tributaries. As an alternative hypothesis, southeastward Quaternary ground tilting may have shifted preexisting Hatchie headwater tributaries to the southeastern side of their basins and may have led to the development of new (lowest order) southeastward-flowing Hatchie tributaries. In addition, tilting would reduce original northwestward Hatchie basin stream gradients and thus reduce incision rate. In the Tombigbee basin, southeastward tilting would steepen gradients and increase incision rate. This episode of ground tilting also may have contributed to changes in the ancestral course of the Tennessee River.

#### 2:30 PRELIMINARY EARTHQUAKE ANALYSIS OF MISSISSIPPI STATE UNIVERSITY

David H. Snodgrass and Darrel W. Schmitz\*, Mississippi State University, Mississippi State, MS 39762

Mississippi State University's main campus is located approximately 250 kilometers from the southern end of the New Madrid Seismic Zone. Given the history of the New Madrid Seismic Zone and the evidence of seismicity in the State of Mississippi, the risk for a potentially significant earthquake in the region that includes Mississippi State University (MSU) is perceivable. Although there had been no investigation on the MSU campus concerning the potential risk of seismic-induced ground motion, it was clear from other studies conducted in Mississippi that one was needed. A preliminary ground-surface response evaluation of three sites on the MSU campus was conducted using a response analysis software WESHAK5. Dynamic soil models and acceleration data were determined for use in WESHAK5. Results of the analysis suggested spectral peak ground accelerations to

range from 0.57 g to a 0.65 g generated from a 6.2 and a 8.25 magnitude earthquake event at an epicentral distance of approximately 250 kilometers. The highest spectral amplifications were consistent at one of the sites for both the 6.2 and 8.25 magnitude events. Low-strain values and the dynamic site periods were calculated which suggest possible damage to the MSU campus on the order of ten percent or less. It is believed that the stratigraphic units on campus are relatively homogeneous and that the other buildings on the campus would fall within the same general low-strain values and thus the same ten percent order of damage.

3:00 Break

Divisional Lectures Begin

3:15 MISSISSIPPI'S CLOSED DEPRESSIONS REVISITED: THEIR RELATIONSHIP TO SIMILAR FEATURES ELSEWHERE ON THE COASTAL PLAINS

David M. Patrick\* and James H. May, University of Southern Mississippi, Hattiesburg, MS 39406 and U.S. Army Engineer Research and Development Center, Vicksburg, MS 39180

Reconnaissance-level digital elevation model studies of parts of southern Mississippi, Alabama, and the Florida Panhandle were conducted in order to document the occurrence and significance of depressions in areas beyond those previously described in George County. The depressions in George County are sinkhole-like, topographically closed, and occur on surfaces underlain by siliclastics currently mapped as the Citronelle Formation. Our studies indicated that, in Mississippi, these depressions are mainly limited to George and Greene counties where they occur at elevations which range from approximately 210 to 310 feet above sea level and their longest dimensions range from a few hundred feet to over 4000 feet. Isolated occurrences were found near Biloxi, Mendenhall, Ovette, and Wiggins. In southwestern Alabama, the depressions were similar to those in adjacent George County; however, their surface elevations ranged from 150 to 320 feet and they are smaller in size. Similar depressions may be seen in Santa Rosa, Okaloosa, and Walton counties in Florida where the depression occur at elevations between 100 and 150 feet and they are formed in Holocene sands overlying sands and gravels mapped as the Citronelle Formation. We speculate that these Gulf Coast depressions have resulted from localized volume reduction due to leaching and desilicification of coarse- and fine-grained clastics during periods of lowered ground water level during the Pleistocene. As such, the origins of these depressions also bear some similarity to the Carolina Bays of the Atlantic Coastal Plain.

3:30 GEOLOGIC FACTORS USED IN HGM MODELS IN WETLAND MITIGATION IN

SOUTH MISSISSIPPI

Suzanne A. Boyd\* and David M. Patrick, University of Southern Mississippi, Hattiesburg, MS 39406

Hydro-geomorphic models (HGM's) are tools being adopted for wetlands permitting, mitigation and banking. These models depend upon the identification of native plant populations upon specific geomorphic surfaces and hydrologic conditions. These models require understanding of local stratigraphy, geomorphology, hydrology and soils; particularly if the area has been modified. Pitcher plant areas at Camp Shelby provide an excellent example. We studied selected areas having reduced silt loams such as the Bibb or Trebloc soils developed upon the fine-grained Hattiesburg and Pascagoula formations, and characterized by flat to nearly flat topography and shallow ground water tables. These sites included areas cleared for training activities, and those areas that had naturally reverted to or been planted with pines. We found that areas that are cleared for line-of-site or other purposes, contain high numbers of pitcher plants and rare plant species, while geographically adjacent and geologically similar unmodified areas contained less biodiversity. The key to understanding and modeling these two conditions is stratigraphic; that is, the development of sufficiently high water tables after clearing in Hattiesburg or Pascagoula soils. Modified areas underlain by more permeable soils of the Citronelle Formation also have higher water tables than unmodified areas; but, these water levels generally are deeper than those of the Hattiesburg or Pascagoula formations and less amenable to pitcher plants except where water tables are perched.

3:45 A METHOD FOR QUANTITATIVE DETERMINATION OF <sup>226</sup>Ra AND <sup>228</sup>Ra IN PRODUCED FORMATION WATERS (BRINES) FROM OIL AND GAS WELLS

John C. Matthews<sup>1\*</sup>, Catrina Bogan<sup>1</sup>, Charles T. Swann<sup>1</sup>, and Rick L. Ericksen<sup>2</sup>, <sup>1</sup>University of Mississippi, University, MS 38677 and <sup>2</sup>Mississippi State Board of Registered Professional Geologists, Jackson, MS 39225-2742

A method is described for quantifying <sup>226</sup>Ra and <sup>228</sup>Ra, at levels down to 1 Bq/L, from produced formation waters (brines) from oil and gas wells. The method corrects for the high and variable solute concentrations and compositions encountered in brines, and for Ra that becomes insoluble during storage. The method employs isolation of Ra on Empore<sup>TM</sup> Ra Rad Disks, which selectively bind Ra and isolate it from its decay products. This allows quantification of freshly isolated <sup>226</sup>Ra by counting its 186-keV gamma emission. The Rad Disks are then aged to allow <sup>228</sup>Ac, the first decay product of <sup>228</sup>Ra, to grow in and equilibrate, followed by quantification of its 911-keV and 969-keV gamma emissions. Prior to the Rad Disk step, Ra along with other divalent and multivalent cations from the brines are collected by carbonate precipitation. These are redissolved in 2 N HNO<sub>3</sub> and



passed through the Rad Disks. The carbonate precipitation step removes K and other monovalent cations, which interfere with Ra adsorption by the Rad Disks. This method was developed as part of a project to survey the radioactivity of hydrocarbon-production byproducts from Mississippi. The samples have shown Ra ranging from 1.1 Bq/L (0.9 Bq/100g of solute) to 120 Bq/L (50.3 Bq/100g of solute). The isotope distribution in the high sample was  $34.7 \pm 0.6$  Bq/L ( $8.50 \pm 0.14$  pmole/L) of  $^{226}\text{Ra}$  and  $85 \pm 52$  Bq/L ( $74 \pm 45$  fmole/L) of  $^{228}\text{Ra}$ . The low sample was below the detection limit for  $^{226}\text{Ra}$  and  $1.1 \pm 0.5$  Bq/L ( $0.94 \pm 0.39$  fmole/L) for  $^{228}\text{Ra}$ . The average values were 188.2 g/L solute, 12.6 Bq/L ( $3.1$  pmole/L) of  $^{226}\text{Ra}$ , and 15.1 Bq/L ( $13.1$  fmole/L) of  $^{228}\text{Ra}$ .

4:00 Divisional Business Meeting

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## FRIDAY MORNING

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Room 706

8:30 FIRST ABSOLUTE DATES FROM PLEISTOCENE-HOLOCENE COASTAL PLAIN UNITS AND SURFACES IN MISSISSIPPI

Ervin G. Otvos, Gulf Coast Research Laboratory, Ocean Springs, MS 39566-7000

Optical and thermoluminescence (OSL and TL) are now being routinely used to date barrier, alluvial, and eolian deposits, some as old as 800 ka. These new methods succeed where other means of absolute dating often fail in nonfossiliferous sandy-silty deposits of poorly constrained relative ages; whether younger or older than the upper limit of the radiocarbon method. In recent years, for the very first time late Quaternary Mississippi coastal plain units have been dated by these methods. Remnants of the second oldest coastal terrace (the alluvial "Big Ridge" unit and surface), correlatable with the Montgomery in SW Louisiana and east Texas occur east and west of the Pascagoula River. Recently, the OSL and TL methods produced consistent ages of 176.5–220 ka BP. They fit well within the global time frame of the penultimate interglacial stage, associated with high eustatic sea levels. In conformity with known Sangamon Interglacial ages worldwide, in particular Oxygen Isotope Substage 5e of a record-high sea level, most alluvial Prairie alluvial and Gulfport barrier samples were dated between 116.6–124.0 ka BP. Samples from intermediate Pearl River valley terraces, formed during Late Pleistocene Wisconsinan low sea level (glacial) substages, dated between 34.7 and 55.2 ka BP. Mississippi-Louisiana coastal dates contribute significantly to the chronostratigraphic reconstruction of Late Pleistocene and Holocene climatic episodes, sea level events, and terrace development episodes on the northern coastal plain of the Gulf of Mexico.

8:45 DETERMINING ARTIFICIAL VS NATURAL

## HOLOCENE SEDIMENTATION, HANCOCK COUNTY, MISSISSIPPI

Keil Schmid, Mississippi Office of Geology, Jackson, MS 39289

The recreational, esthetic, and cost benefits of sand beaches have made renourishment an attractive protection option in Mississippi Sound. Thus, nearshore sediment volumes and projected beach life spans are important information to local and state planners. Quantifying volumetric change and shoreline retreat values is an important first step; however, the unique aspects of fill deposition also provide an opportunity to clarify long-term sediment transport. Naturally, this is made easier by the use of "unique" fill sediment; or, alternately, with highly accurate bathymetry prior to and following renourishment. Unfortunately, use of both fill sediment and bathymetry in Hancock County were limited by sediment source and time, respectively. Although the fill sediments were not unique, trace fossils, the sediments filling them, changes in shell content, and faint contacts helped distinguish discreet sedimentary sequences. The differences were subtle enough, however, to raise questions as to their origins. To increase confidence in the elevation of Fill/Holocene contacts an 'if then' logic, using both profile and sediment data was employed. Short-term depositional patterns determined from profiles were used to validate or reject individual sedimentary sequence contacts as the Fill/Holocene boundary. The volume of the calculated fill thickness agrees well with historical fill additions and suggests that most of the sediment stays within the nearshore system. This technique, while taking some purity out of the interpretation, helped increase confidence and repeatability in determining the Fill/Holocene boundary.

9:00 STRATIGRAPHIC TEST HOLES ALONG HIGHWAY 6 IN NORTH MISSISSIPPI DIFFERENTIATE THE LOWER PALEOGENE SECTION

David E. Thompson, Mississippi Office of Geology, Jackson, MS 39289

The outcrop pattern in north Mississippi on the current Geologic Map of Mississippi (1969) displays an extensive Tallahatta Formation outline and a thin Wilcox Formation. The Naheola Formation is not represented. Numerous investigators, including Cleaves (1980), have recognized the sandy character of the upper Wilcox in north Mississippi; however, that interval has been included genetically with the overlying Meridian Sand. This assignment likely accounts for the widespread Tallahatta pattern on the 1969 map. Additionally, a convention chosen by most investigators in north Mississippi is to pick the base of the Wilcox at the lowest sand above typical Porters Creek shale. Previous and current mapping of the Midway-Wilcox outcrop belt from the Mississippi-Alabama state line into northern Mississippi indicates that certain "lower Wilcox" sands belong to the Naheola Formation. A series of test holes was drilled along Highway 6 from western

Pontotoc County to eastern Panola County to differentiate Midway, Wilcox, and Claiborne units down dip. Lignite and clay units of the middle Wilcox were useful as control data in this correlation. Mapping units include, in ascending order, the Porters Creek Formation, the Oak Hill and Coal Bluff Members of the Naheola Formation, the Gravel Creek and Grampian Hills Members of the Nanafalia Formation, the Tusahoma Formation, the Hatchetigbee Formation, the Meridian Sand, and the Tallahatta Formation.

9:15 GEOLOGY OF THE OXFORD SOUTH 7.5 MINUTE TOPOGRAPHIC QUADRANGLE LAFAYETTE COUNTY, MISSISSIPPI

Stephen L. Ingram, Sr.\* and Charles T. Swann, University of Mississippi, University, MS 38677-1848 and Mississippi Mineral Resources Institute, University, Mississippi 38677

Although Lafayette County and the Oxford area is undergoing rapid urbanization, the only existing geological maps consists of two fifteen minute quadrangles mapped in 1952. Reliable geological data are essential for well planned growth and industrial development. Review of the 1952 map identified the need for revision and updating of the lithostratigraphy, and the availability of 7.5 minute topographic maps allows the fine-tuning of outcrop belts based on the 1952 fifteen minute maps. The Oxford South quadrangle was chosen because revision of stratigraphy and geological needs due to urbanization could be met simultaneously. Lithostratigraphic units cropping out within the quadrangle include the Eocene Hatchetigbee Formation (Wilcox Group), the Meridian Sand (Claiborne Group), Tallahatta Formation (Claiborne Group), high elevation terraces deposits (Pleistocene (?)), minor loess deposits (Pleistocene), and modern flood plains. The Ackerman stratigraphic name has been dropped in favor of the standard Wilcox Group nomenclature of Alabama. Outliers of Kosciusko Formation that were mapped in 1952 have also been reassigned to the Tallahatta Formation.

9:30 SEDIMENTOLOGIC CHARACTERISTICS AND CLIMATICALLY CONTROLLED REDOX CYCLES IN THE DEMOPOLIS AND MOOREVILLE FORMATIONS, MISSISSIPPI

Ezat Heydari, Mississippi Office of Geology, Jackson, MS 39298

The Mooreville Formation and the Lower Member of the Demopolis Chalk consist of numerous redox cycles, ranging in thickness from 0.3 to 5 m (1–15 feet). Each cycle is composed of a basal dark, laminated section, grading upward into a gray, wispy laminated interval, and capped by a white, bioturbated layer. The basal laminated section indicates sedimentation under anoxic bottom water conditions, hostile to burrowing organisms. The wispy laminated interval indicates that bottom waters became slightly oxygenated and organisms tolerant of low oxygen conditions were sparsely present. The bioturbated layer at the top of each cycle is indicative of deposition under fully oxygenated conditions. Wet climate initiated deposition of

the laminated layer at the base of each cycle by delivering a large volume of siliciclastics and terrestrial organic matter to the basin, resulting in bottom water anoxia. The subsequent arid climate promoted precipitation of carbonate-rich, bioturbated strata capping each cycle. The middle member of the Demopolis Formation is a massive, highly bioturbated chalk. It contains abundant trace fossils including *Thalassinoides*, *Planolites*, *Chondrites*, *Teichichnus*, and *Zoophycos*. A very shallow burrowing event generated a background-mottled texture apparent in all samples. *Thalassinoides* was one of the earliest burrows to form, as evidenced by its reworking by other trace fossils. It was followed by *Planolites*, *Teichichnus*, and *Zoophycos*. *Chondrites* reworked all other trace fossils and was the last bioturbation episode to have influenced the chalk.

9:45 Break

10:00 THE BASAL EOCENE SECTION AT THE SUPER WAL-MART CONSTRUCTION SITE IN MERIDIAN, MISSISSIPPI

David T. Dockery III, Mississippi Office of Geology, Jackson, MS 39289

Excavations and some 51 soil borings at the Super Wal-Mart construction site in Meridian, Mississippi, show the following sequence of sediments above the Paleocene-Eocene boundary at the Tusahoma-Bashi Formation contact. Lowstand deposits (lacking fossil shells) in the lower Bashi Formation (exposed in a 100-foot-long by 20-foot-high, stepped cut at a bridge-site excavation leading to the I20 East Frontage Road) rest unconformably on dark-gray, clayey silts and sands of the Tusahoma Formation and include in ascending order: (1) a 2-foot-thick, basal, white sand, (2) a 3.5-foot-thick, thinly-bedded, clayey silt containing plant fossils, and (3) a 5-foot-thick white sand with cross stratification and *Ophiomorpha* burrows. Lowstand deposits are overlain by a concretionary, 4-foot-thick, very fossiliferous, transgressive-marine, brown sand, in the upper Bashi Formation. Above the Bashi marine sand is a highstand-regressive, deltaic sequence in the Hatchetigbee Formation, including: (1) a 14-foot-thick, dark-gray, thinly bedded, prodelta, clayey silt, (2) a 25- to 35-foot-thick, cross-bedded, distributary-channel sand, and (3) a 15- to 20-foot-thick (truncated at surface elevations), dark brownish-gray to light brown, delta-plain, clayey silt. Cross-bed sets in the distributary-channel sands of the Hatchetigbee Formation show a flow direction from north to south. Elevations taken from borings of the top of the prodelta shale show an abrupt 10-foot-drop in datum along the site's northwestern corner, an area that required a dewatering trench.

10:15 LINGUISTIC CURIOSITIES IN THE PUBLICATIONS OF THE MISSISSIPPI GEOLOGICAL SURVEY

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

Scientists appreciate “elegant literature.” They also make use of technical jargon in their writing, and that has its place. When geologists write for the public and specialists in other fields, as they often do, communication is enhanced when they write simply and clearly. The advice in Strunk and White’s *The Elements of Style* is as useful to a geologist writing a professional paper as it is to a journalist. The publications of the Mississippi Geological Survey (now the Mississippi Office of Geology) are used by engineers, environmentalists, biologists, and hobbyists, as well as by geologists. The geological information they contain is important for a myriad of applications, including agriculture, road-building, water resources, and siting sanitary landfills. The first publications were printed in the 1850s, though most date from 1907 and later. The writing styles of the various authors run the gamut from formal to casual. Some of the text written in an “earlier time” sounds odd to readers today, but may reflect the times in which it was written, or perhaps the author’s exuberance or frustration. Reading these publications provides interesting examples of effective, quaint, and sometimes amusing literature. One can learn which report was called “a literary, linguistic and scientific curiosity,” or read a poem about the sand problem, or learn which now-endangered species was considered good eating. Studying examples of good, and bad, writing can serve to illustrate the importance of writing plainly and clearly.

10:30 MICROBIAL AND IODINE ANALYSIS OF SURFACE SOIL SAMPLES PREDICT OIL AND GAS FROM AN 18,000-FOOT RESERVOIR IN A WILDCAT WELL IN COVINGTON COUNTY, MISSISSIPPI

Jack S. Moody\* and Robert Ervin, Mississippi Office of Geology, Jackson, MS 39289-1307

This study tests the ability of various surface sampling techniques and analyses to detect the presence of oil and gas reservoirs for wildcat wells. Surface samples were collected in a grid pattern using GPS. Samples were collected by Mississippi Office of Geology staff and sent to labs for analysis and interpretation; the labs had no well location information. Both iodine and microbial analyses predicted that hydrocarbons would be present. Sampling for this well was spread out over several months and surface conditions changed from very dry to wet. The time and condition change affected one of the two microbial methods. The Roundtree #1 Robertson 21-9 well was drilled to 18,725 feet. The well was completed from a Cotton Valley reservoir at 17,976 feet flowing 321 barrels of oil (BO) and 471,000 cubic feet (471 MCF) of gas per day. As of August, 2000, the well had flowed 26,948 BO and 22,570 MCF and no water. In August, the daily flow rate was 163 BO. The successful prediction by microbes and iodine of the resulting production suggests their usefulness as another tool in oil and gas exploration.

10:45 THE MISSISSIPPI OFFICE OF GEOLOGY

ENERGY INTERNET SITE: USING XML AND OTHER INTERNET STANDARDS FOR DATA PUBLISHING

Peter Hutchins, Mississippi Office of Geology, Jackson, MS 39289

The Mississippi Office of Geology (MOG) Energy Internet Site is a project funded through the Petroleum Technology Transfer Council and Mississippi Department of Economic and Community Development. Well listing and production data come from the Mississippi Oil and Gas Board. The site represents an attempt to bring availability, access and usefulness of energy data to its highest potential using the latest in computer and Internet technology. Using open standards and technologies such as eXtensible Markup Language (XML), the potential use of the data is not limited to a web page but can be used directly from any application capable of working with the Internet and/or XML, a combination that is catching on fast. The site provides a search engine to locate one or more wells or field names; from this a document can be provided containing all that is known on the well or field of interest. Various other data sources that MOG provides are listings from the core library and several scout card image collections scanned in by the office staff. The scanning of logs and various other reports is in progress. Also provided are interactive maps and charts. This site was designed around the XML support provided in Microsoft Internet Explorer web browser, version 5, which is a free tool. Other browsers are supported with use of simple HTML. The site can be accessed at <http://library.geology.deq.state.ms.us/energy>.

11:00 THE USE OF DIGITAL INTERACTIVE COUNTY OIL AND GAS PRODUCTION INDEX MAPS ON THE MISSISSIPPI OFFICE OF GEOLOGY’S ENERGY LIBRARY WEB SITE

Stephen D. Champlin, Mississippi Office of Geology, Jackson, MS 39289

The Energy Section of the Mississippi Office of Geology has an ongoing project to create county oil and gas production index maps to show the location of oil and gas fields and, by the use of color coding, indicate the producing geologic formations for each field. Maps for 43 counties are planned. The software program used is AutoDesk’s AutoCad 14 on a 450 MHZ Pentium III PC. As of October 2000, 15 county maps were completed and available as color plot hard copy. The digital maps are used on the Office of Geology Web site as an interactive link to online searchable oil and gas databases, which include field/well production and other well data the office may have such as cores, samples or images (scout information, logs, or mud logs). Using AutoCad, URL addresses are attached to the field outlines and names on each map. The digital maps are then exported as dwf files and incorporated into the Office of Geology’s web site. To view the county maps the user must install the Autodesk WHIP! tool. This

free download tool allows real-time pan and zoom, printing from within your Web browser, and enables the embedded links to the searchable oil and gas databases. The planned final product of the project is a state oil and gas production map, which may also be available on the Internet. The site can be reached at <http://library.geology.deq.state.ms.us/energy>.

#### 11:15 OBTAINING CLEAN SAMPLES OF PLYGORSKITE CLAY FOR MINERALOGICAL EVALUATIONS

Harold D. Robinson\* and E. Schrader, University of Mississippi, University, MS 38677 and Shorter College, Rome, GA 30165

Palygorskite, also known as, attapulgite, is a clay mineral mined from Miocene strata north of Tallahassee, Florida. Used in various commercial applications ranging from suspension agents to adsorbents, the mineralogy of the mined clays often directly relates to the physical properties of the clay. As part of previous undergraduate work at Millsaps College, Jackson, MS, and a thesis project at the University of Mississippi, Oxford, MS, obtaining an ultra pure sample of clay was a necessary step in the process of describing the mineralogy of the various strata of clay mined in the region. As mined, the palygorskite always contains low levels of quartz, calcite, and dolomite. Various methods were researched for use in producing relatively pure samples of clay to be used in both XRD and whole rock analyses. When investigating the mineralogy of this clay mineral, exceptionally clean samples are required to compare the mineralogical properties of these samples with published descriptions. Preparation methods researched included gravity settling, centrifuging, dispersants, and acid washing. Utilizing a combination of the selected methods, a technique was developed to reduce or eliminate these contaminants from the clay samples. Results from both XRD and whole rock analyses indicate the effectiveness of process.

#### HEALTH SCIENCES

Chair: Aaron D. Puckett, University of Mississippi  
Medical Center  
Vicechair: Ibrahim O. Farah, Jackson State  
University

#### THURSDAY MORNING

Room 2

8:30 SEARCH FOR NATURAL PRODUCT INHIBITORS OF SECRETED ASPARTIC PROTEASES FROM *CANDIDA ALBICANS*

Keyana R. Mitchell\*, M. Logan, M. Jacob, A. Nimrod, D. Pasco, L. Walker, and A. Clark, University of Mississippi, University, MS 38677

*Candida albicans* invades the tissues of the body via the SAP (secreted aspartic protease) enzymes. The proteolytic activity of the SAP enzymes lyses cell membranes, allowing the yeast to cause infection. Therefore, the SAP enzymes are important virulence factors and reasonable targets for drug therapy in the treatment of yeast-borne diseases. The SAP assay screens natural products for inhibition of the SAP enzyme. The assay is rapid and is done in a 96-well plate. Due to the large number of natural product extracts available to the NCNPR (National Center for Natural Products Research), an elimination strategy is used in the assay. Samples of the natural product extracts are first tested at 50 µg/mL. The active samples are then tested in a secondary assay to determine the IC<sub>50</sub>. Samples are then prioritized and fractionated until a pure compound is obtained that shows appreciable SAP inhibitory activity. A second assay with pepsin is used to determine the specificity of the samples that inhibit SAP. A third assay is utilized to determine if the sample activity is due to the presence of tannins. The pure compounds that specifically inhibit SAP activity are potential sources for drugs to treat *Candida* infections. As of August 29, 2000, 3,784 plant extracts had been tested in the SAP assay. Approximately 5% of these extracts were tested in the secondary assay. 122 of the extracts had IC<sub>50</sub>s of less than 50 µg/mL. Two pure compounds have been isolated from plant extracts of *Miconia myriantha* which have IC<sub>50</sub>s in the range of 7–10 µg/mL.

#### 8:45 TRENDS IN MISSISSIPPI VITAL STATISTICS: A FIFTEEN YEAR CHRONOLOGY

Reid Jones\* and Carol Jones, Delta State University, Cleveland, MS 38733

Fifteen years of vital statistics data were obtained from the Mississippi State Department of Health. Primary emphasis was placed on causes of death and on pregnancy-related issues. Each of fifteen variables was tracked chronologically over the 15 year period. To better display trends, data were presented using three year averaging as well as without averaging. When meaningful, data were aggregated by county averages to identify regions of the state where problems were most serious. Incidence and prevalence data were also analyzed with regard to population density and demographics of the county. While most vital statistics rates remained stable during the 15 year period, there has been improvement in pregnancy-related problems.

9:00 ORAL INGESTION OF NOREPHEDRINE, CAFFEINE AND THEOPHYLLINE IN THE RAT: EXACERBATION OF BEHAVIORAL EXCITATION, HYPOTENSION AND TACHYCARDIA BY YOHIMBINE

LaShondra Powell<sup>1\*</sup>, J. Cameron<sup>1</sup>, and Rob Rockhold<sup>2</sup>,

<sup>1</sup>Jackson State University, Jackson, MS 39217 and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216-4505

Adipokinetix™, a dietary supplement advertised as a “Fat Burner,” contains the phenylethylamine, 1R, 2S norephedrine HCl (NEP; 25 mg), the methylxanthines caffeine (C) and theophylline (T) (each 50 mg), and the  $\alpha$ -2-adrenoceptor antagonist, yohimbine (Y; 3 mg). The purpose of this study was to evaluate the degree to which Y altered the circulatory response to the remaining components of this supplement. In conscious male rats, intravenous injections of norephedrine (0.001–1.0  $\mu$ g/kg) dose-dependently elevated arterial blood pressure (BP) and elicited reflex bradycardia. Y (1 mg/kg, i.v.) pretreatment elevated heart rate (HR) and lowered BP, while blunting the circulatory responses to NEP. In contrast, oral ingestion of a mixture of NEP (1 mg/kg), C (10 mg/kg) and T (25 mg/kg) produced a sustained (>1 hr for recovery) and marked (+100 beats/min) elevation in HR and a modest (10–20 mm Hg) hypotension. Addition of Y (1 mg/kg) to the mixture produced a much more marked behavioral excitation and extended the duration (>2 hr for recovery) and magnitude of the circulatory responses. The results are indicative of potentially adverse consequences to the use/abuse of a readily available, but unregulated dietary supplement. (Supported in part by the Minority Institutional Research Training Program, NHLBI HL07635)

9:15 INFLUENCE OF 2,3 BUTANEDIONE AND RELATED ANALOGUES ON THE GROWTH AND ENTEROTOXIN A PRODUCTION BY *STAPHYLOCOCCUS AUREUS*

I.O. Farah<sup>1\*</sup>, S.R. Tatini<sup>2</sup>, and M.M. Pullen<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217 and <sup>2</sup>University of Minnesota, St. Paul, MN 55108

Influence of diacetyl and certain related compounds on growth and enterotoxin A production by *Staphylococcus aureus* (*S. aureus*; FRI-100) in NZ-amine broth at 37°C was studied under both aerobic and static incubation using microbiological, serological, gas chromatographical, and spectrophotometric techniques. Diacetyl exists naturally in starter distillate and is usually added to enhance the flavor at the end of the fermentation process. Our objective was to evaluate these compounds for their potential effect on growth specifically on enterotoxin A production by *S. aureus*. Once produced, enterotoxins (proteins) are extremely heat stable and unaffected by proteolytic enzymes. This fact warrants the search for practical and feasible measures of control. Of the compounds tested (5), only diacetyl (2,3 butanedione) was found to be both bacteriostatic (50–100 ppm) and bacteriocidal (>250 ppm). Delay in growth was dependent upon the concentration of diacetyl and the initial inoculum. Lag periods ranging from 12–192 hours were seen with different diacetyl levels and incubation conditions. Diacetyl also delayed enterotoxin A production (SEA/unit growth)

by 66 and 50% of that of the control for 10 and 50 ppm respectively. This process has been more effective under static as compared to aerobic conditions (78 vs. 50%). Colony forming units (CFU/mL) and levels of diacetyl showed a corresponding decline for both with the resultant resumption of growth at the end of the lag period especially at levels <250 ppm. Data also showed the accumulation AMC, acetate and ethanol with the corresponding decrease of diacetyl levels. Despite this volatility, it is concluded that diacetyl is a potential candidate for the control of growth and enterotoxin A production at level of 10–50 ppm. This study suggests the use of diacetyl during the early stages of meat fermentation.

9:30 ENHANCEMENT OF THERMAL DESTRUCTION OF THREE EPIDEMIC STRAINS OF *LISTERIA MONOCYTOGENES* IN MILK PRODUCTS BY 2,3 BUTANEDIONE AND STARTER DISTILLATE

I.O. Farah<sup>1\*</sup>, S.R. Tatini<sup>2</sup>, and M.M. Pullen<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217 and <sup>2</sup>University of Minnesota, St. Paul, MN 55108

Thermal inactivation of three epidemic strains of *Listeria monocytogenes* (Scott A, V7 and Jalisco) in 30% sucrose-containing tryptic soy broth and milk products (Ice cream, egg nog and milk chocolate) at 55, 60, and 80°C was studied using standard heating procedures, microbiological and statistical techniques. Diacetyl (2,3 Butanedione), and starter distillate (SD) are natural products that are produced by *Streptococcus diacetylactis*. Both are used commercially to enhance the flavor of fermented food products. The objective of this study was to evaluate the effect of these natural products on the enhancement of thermal destruction of three epidemic strains of *Listeria* in media and milk products at subpasteurization temperatures. Results showed enhancement of heat inactivation (time/temperature) of all three strains in the presence of diacetyl or SD (0.1% and 7% respectively). A 5-log reduction in *Listeria* was noted in the presence as compared to 3-log reduction in the absence of both products after 45 minutes at 60°C. Two epidemic strains of *Listeria* (Scott A and Jalisco) have survived heat inactivation in screw-capped tubes at 80°C for 60 seconds. SD was found to be more effective at 55°C than diacetyl when using end point determination (F-values). With 10<sup>7</sup> organisms/ml, the end point of inactivation was 1 hour (h) with SD, between 2 and 3 h with diacetyl and >6 h for the control. Both diacetyl and SD were found to be ineffective in enhancing the thermal destruction of *Listeria* at 60°C in commercial chocolate coating due to their inactivation by the enzymes contained in the lecithin component of the chocolate. It is concluded that diacetyl and SD have the potential of enhancing the thermal destruction of epidemic *Listeria* in foods with specific reference to milk products.

9:45 Break

10:00 THE RELATIONSHIPS AMONG HEALTH PROMOTING BEHAVIORS, LOCUS OF CONTROL, AND LIPID LEVELS IN A UNIVERSITY COMMUNITY

Kathryn L. Riffle\*, Reid Jones, Debra Allen, and Lisa Julius, Delta State University, Cleveland, MS 38733

A university-based student health service and a local hospital collaborated to provide lipid screening for 121 university and community members in a rural university town. Subjects paid a nominal fee for the lipid screening and agreed to participate in a research study initiated by the School of Nursing. Research survey instruments included the Health Locus of Control (II) and the Health Promoting Lifestyle Profile, plus demographic items on physical characteristics, diet, and exercise. MANOVA showed significant ( $p < .05$ ) differences in lipid levels between subjects reporting high and low amounts of exercise. Also, MANOVA showed that female subjects had significantly higher ( $p < .05$ ) levels of high density lipids. While various sub-scales in the research surveys were significantly ( $p < .05$ ) inter-correlated, there were no clear associations with lipid levels. Regression models were presented to explore the significant relationship between exercise and lipid levels.

10:15 A COMPARATIVE STUDY OF FOUR SEROLOGICAL TUMOR MARKERS FOR THE EARLY DETECTION OF BREAST CANCER

Shawn R. Clinton<sup>1\*</sup>, Kevin L. Beason<sup>1</sup>, Margot Hall<sup>1</sup>, Sabrina Bryant<sup>1</sup>, James T. Johnson<sup>1</sup>, Cynthia Wilson<sup>2</sup>, Kay Holifield<sup>3</sup>, and Charlton Vincent<sup>3</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406; <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216; and <sup>3</sup>Laurel Clinic for Women, Laurel, MS 39442

Breast cancer is currently the third most common cause of cancer in the world. Circulating tumor antigens are often used as a minimally invasive tool for noting breast cancer progression. The objective of this study was to compare four tumor antigens (CA 15-3, carcinoembryonic antigen (CEA), alpha-fetoprotein (AFP), and CA 27.29) for their diagnostic efficacy in breast cancer patients. It was hypothesized that CA 15-3 would prove to be superior to CA 27.29, CEA, and AFP in assay performance. Tumor marker assays were performed according to the manufacturers' directions. Assays used in this study were CA 15-3 and CA 27.29 (Fujirebio Diagnostics/Centocor Inc.), AFP (Abbott Inc.), and CEA (Hybritech Inc.). A total of 554 patient samples were obtained from an area hospital, plus 200 healthy adult samples for determining normal reference intervals. Percent sensitivities for each marker were: CA 15-3 (64%), CA 27.29 (39%), CEA (22%), and AFP (22%). Specificities for each marker were comparable, ranging from 80–88%. We concluded that CA 15-3 was the best tumor antigen for use as a diagnostic aid and monitoring agent. The hypothesis was supported by results in the study.

10:30 A COMPARATIVE STUDY OF FOUR SEROLOGICAL TUMOR MARKERS FOR THE DETECTION OF STOMACH CANCER

Kevin L. Beason<sup>1\*</sup>, Shawn R. Clinton<sup>1</sup>, Margot Hall<sup>1</sup>, Sabrina Bryant<sup>1</sup>, James T. Johnson<sup>1</sup>, Cynthia Wilson<sup>2</sup>, Kay Holifield<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

Cancer is the second leading cause of death in the United States. Stomach cancer comprises ten percent of cancers in the US, but is the greatest percentage in developed countries. Non-invasive tests are sought to aide in the early diagnosis of cancer and serological tumor markers are an excellent source. The objective of this study was to compare carcinoembryonic antigen (CEA) (Hybritech), Fujirebio Diagnostics/Centocor's CA15-3 and CA27.29, and alpha-fetoprotein (AFP) (Abbott) for the detection of stomach cancer. It was hypothesized that CEA would be the superior tumor marker for gastric (stomach) cancer. Serum samples were obtained from patients with gastrointestinal cancer, other cancer, benign and no disease, totaling 554, along with 200 normal subjects used to determine normal reference intervals. All samples were analyzed according to the manufacturers' specifications. The diagnostic sensitivities were the following: CEA 50.00%, CA15-3 45.45%, CA27.29 and AFP less than 30%. The diagnostic specificities were comparable, ranging from 75–87%. Based on sensitivity and specificity, it is concluded that CEA was the best indicator of stomach cancer, which supports the hypothesis. It should be noted that CA27.29 had the best specificity (81.63%) and sensitivity (40.00%) of the markers tested for pancreatic cancer.

10:45 RELATIONSHIP OF SOIL-LEAD TO HOUSE DUST-LEAD IN TWO INNER-CITY NEIGHBORHOODS IN JACKSON, MISSISSIPPI (PATHWAYS OF LEAD POISONING)

Margaret C. Butler, Jackson State University, Jackson, MS 39217-0125

The study's objective was to verify pathways of lead-poisoning and test the null hypothesis that there is no relationship between soil-lead and house dust-lead in and about dwellings located in Census Tracts 25 and 31 in Jackson, MS. Thirty sites targeted were located in West Jackson north (Tract 25) and south (Tract 31) of Jackson State University. At each site five soil samples were taken from the street and along the house's drip-line along with five dust wipe samples from the entrance, center floor, floor under a window, window sill and well. The samples were digested using microwave digestion preset for USEPA-SW846-3015 method. Analyses of samples were performed using Flame Furnace Atomic Absorption Spectrometry according to SW846-7421 method. The concentration of soil-lead taken at the street in CT-25 ranged from 17 to 168

ppm with a median concentration of 90 ppm. The drip-line soil-lead ranged from 18 to 21,080 ppm with a median of 831 ppm. In CT-31 the soil-lead at the street was 37 to 222 ppm with a median of 125 ppm; drip-line soil-lead was 39 to 14,532 ppm with 831 median. The range of dust-lead loading 4 to 89,921  $\mu\text{g}/\text{ft}^2$  in CT-25 compared to 2 to 21,068  $\mu\text{g}/\text{ft}^2$  in CT31. The Mann-Whitney U Test revealed positive relations between soil-lead and dustlead. The null hypothesis was rejected.

11:00 A STUDY OF THE WATER QUALITY OF NATURAL WATER SOURCES NEAR SELECTED CHICKEN PROCESSING PLANTS IN MISSISSIPPI

Bridget Minor\*, Dustin Addy\*, Edgar Bradford, Ernie Brown, Johnny Ray Cook, Ramona Corkern, Hal Davis, Ben Dear, Carol Ann Edwards, Karla McMahan, Rebecca Massengale, Jason Myers, Asylbek Osmonov, and Betty Sue Hennington, East Central Community College, Decatur, MS 39327

Having clean water is extremely important to life. Located near free-running fresh water sources in many counties of Mississippi are numerous chicken processing plants. Three of these chicken processing plants were selected in the counties of Scott and Leake. Samples were gathered from six fresh water sources, adjacent to the plant sites, between the hours of 8 a.m. and 12 noon, Monday through Friday, over a period of 8 weeks. Six fresh water sources were selected for control sites. The following parameters were tested for each site: coliform, salmonella, nitrate ammonia, nitrogen, total phosphate, pH, turbidity, temperature, D.O. and B.O.D. Following the testing of the fresh water sources, city water associations surrounding the sampling sites were selected, and water analyses were run. Findings are varied, but generally coliform was positive at each fresh water site and two of the city sites. Nitrates and phosphates were generally within normal range for all sites.

11:15 Divisional Business Meeting

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THURSDAY AFTERNOON

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Room 2

1:00 Divisional Poster Session

COMPARISON OF MACROPHAGE POPULATION IN RETREIVED FIBROUS TISSUES FOLLOWING SUBCUTANEOUS AND INTRAPERITONEAL IMPLANTATION OF TCP CERAMICS AND UHMW-POLYETHYLENE USING ADULT MALE RATS  
Kenneth Butler\*, Hamed Benghuzzi, Aaron Puckett, and Michelle Tucci, University of Mississippi Medical Center, Jackson, MS 29216

It is well demonstrated in the literature that polyethylene (PE) and tricalcium phosphate (TCP)

materials are highly compatible and non-immunogenic with host tissues. However, the role of macrophages and the extent they are involved in the biocompatibility of these materials, when used in soft tissue applications, is poorly understood. The purpose of this investigation was to study the macrophage response resulting from the implantation of ultra-high molecular weight polyethylene (UHMW-PE) and TCP at 90 days post-implantation. In this investigation, implants (n = 2 implants) of UHMW-PE and TCP were implanted into 10 adult male rats. One implant was inserted subcutaneously (S/C), and one implant was implanted intraperitoneally (I/P) (n = 5/group). At 90 days post-implantation, the animals were euthanized following standard lab protocol. The implants and the fibrous capsules surrounding them were harvested and evaluated by routine histologic methods. The number of macrophages and thickness of the fibrous tissue matrix was compared according to the type of material and site of implantation. Evaluation of routinely stained sections (5  $\mu\text{m}$ , Hematoxylin & Eosin) of the fibrous tissue capsules surrounding the UHMW-PE and TCP implants revealed the following: 1) all the devices had fibrous connective tissue capsules of slightly varying degrees of thickness surrounding them at the time of sacrifice, 2) the thickness of the fibrous tissue capsules surrounding the subcutaneous devices differed markedly than those retrieved from the peritoneal cavity, and 3) there were statistically significant differences (T-test,  $p < 0.05$ ) in the macrophage population surrounding the implants with respect to both implantation site and type of material. Based on these findings, the mean number of macrophages in the fibrous tissue capsules surrounding TCP bioceramics is much higher and than that observed surrounding UHMW-PE devices. \*Graduate Student

CYTOHISTOLOGIC CORRELATION OF ABNORMAL CERVICAL LESIONS IN NATIVE AMERICAN FEMALES IN MISSISSIPPI

Chedaphne Alexander\*, Zelma Cason, Hamed Benghuzzi, and Leanne Martin, University of Mississippi Medical Center, Jackson, MS 39216

Earlier studies have reported that cervical cancer mortality and incidence rates in Native American women are one of the highest in the United States. In recent years, the rate of abnormal cervical lesions in this group has been a public health concern. The objective of this study was to evaluate a cytohistologic correlation of abnormal cervical lesions in Native American women in Mississippi. The cytohistologic results from 77 Native American women with an abnormal diagnosis were reported to the University of Mississippi Medical Center during 1993-1996. The cases were divided into four groups; which included 7 (9%) atypical squamous cells of undetermined significance (ASCUS), 51 (66%) low grade squamous intraepithelial lesions (LGSIL), 19 (25%) high grade squamous intraepithelial lesions (HGSIL), and no invasive carcinomas. Out of the study cases, 57 women presented with an

abnormal gynecological history. The mean age was 29.97 years with a range of 14 to 87. The results were tallied and evaluated using SPSS. Only 57 cases had a histologic evaluation with an overall correlation rate of 84% (48/57). The histopathologic diagnosis confirmed 12 negative, 26 CIN I, 17 CIN II/CIN III, and 2 invasive carcinomas.

	NEGA-TIVE	CIN I	CIN II/III	Invasive Ca	Total
ASCUS		2			2
CIN I	11	20	7		38
CIN II/III	1	4	10	2	17
TOTAL	12	26	17	2	57

The results of this study conclude that cervical intra-epithelial lesions are significant among Native American women in Mississippi. Fifty-six (98%) of the patients with histologic evaluations presented with an abnormal gynecologic history; therefore, education and routine cytologic screening is imperative for the detection of cervical cancer in high-risk groups. \*Undergraduate Student in Cytotechnology

#### CYTOLOGIC EVALUATION OF THE INCIDENCE OF INFECTIOUS DISEASES IN PATIENTS WITH ABNORMAL CERVICOVAGINAL SMEARS

Sharon Coach\*, Zelma Cason, and Hamed Benghuzzi, University of Mississippi Medical Center, Jackson, MS 39216

Despite all studies of infectious disease of female genital tract, there have been a few studies of the many different types of infectious organisms on Pap smears that contain abnormal cells. The purpose of this study is to evaluate the significance of infectious organisms in women with a cytologic diagnosis of atypical squamous cells of undetermined significance (ASCUS). This study utilizes 398 cervicovaginal smears and concurrent cervical biopsies (test and control cases) obtained from the Mississippi State Department of Health (MSDH) from January to December 1993 and 1995. The cases were randomized, assigned a study number and reviewed for the presence of infectious organisms. The age range for the patients consisted of 15 to 62 for the ASCUS test group (mean 24) and 13 to 64 for the matched control group (mean 24). The results of the microscopic review were entered into SPSS for evaluation. Infectious organisms were identified in 101 (25.4%) of the test and control cases. The type of organisms identified in the ASCUS and matched control cases were normal vaginal flora 42 (21.2%) and 48 (24.0%), *Actinomyces* one (.3%) case, *Candida albicans* in 2 (1%) and 4 (2%), *Trichomonas vaginalis* in 10 (5.1%) and 9 (4.5%). Herpes virus effect was not identified in the test cases but was identified in 2 of the control cases. The cytopathic effect of human papilloma virus was identified in 68 (34.3%) and 3 (1.5%) of the test cases. Data collected in this study indicate that infectious organisms, other than the effect of the human papilloma virus, are not as common in the ASCUS cases as the matched control cases. Human papilloma virus effect was

more commonly associated with the squamous intra-epithelial lesions. \*Undergraduate Student in Cytotechnology

#### DELIVERY OF rhuMab HER2 FROM CERAMIC DRUG DELIVERY DEVICES AND THE NON-INVASIVE DETECTION OF ANTIBODY IN THE SALIVA OF ADULT RATS

Curt Branch\*, William Umphlett, Hamed Benghuzzi, Michelle Tucci, Lenora Bigler, and Charles Streckfus, University of Mississippi Medical Center, Jackson, MS 39216

The use of intravenous (i.v.) administration of recombinant rhuMab HER2 in combination with cisplatin has been used in phase II and phase III clinical trials in patients that have HER2/neu-overexpressing metastatic breast cancer. The objectives of the present study were first, to design a biodegradable drug delivery device to deliver a sustained dose of rhuMab HER2 for long durations in animals, and secondly to develop a sensitive and non-invasive saliva collection method to determine the level of rhuMab HER2. A total of 10 male Sprague Dawley rats weighing 200–300 g were divided into three groups. Group I animals (n = 4) were implanted with ceramic drug delivery systems (CDDS) containing high dose (500 µL) of rhuMab HER2, group II animals (n = 3) were implanted with (CDDS) containing low dose (200 µL) of rhuMab HER2, and group III animals were implanted with an uncharged CDDS. The capsules were designed to release their contents for 8 weeks. Saliva was collected weekly and the amount of rhuMab HER2 was analyzed by antibody capture ELISA. The results showed that the CDDS released their contents in a sustained manner for 8 weeks without drug side effects or increases in drug toxicity. The high dose CDDS delivered two fold higher levels of rhuMab HER2 for the eight-week period. The results of this experiment show CDDS is an acceptable alternative to i.v. administration of rhuMab HER2, and the levels can be detected non-invasively via the saliva using a specific and sensitive ELISA antibody capture technique. \*Second Year Dental Student

#### DEVELOPMENT OF A MODEL FOR THE ASSESSMENT OF THE RESORBABILITY RATE OF VARIOUS BIOCERAMIC DEVICES

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

Over the past decade, numerous studies have implicated wear particle debris generated by everyday wear of ceramic implants as the essential contributors to implant failure. We investigated the interactions of ceramic particles (TCP and HA) on cell viability, cell damage and respiratory burst in a macrophage cell line (RAW 264.7) for a duration of 24, 48 and 72 hours. The results show that there were no difference detected in cellular protein. MDA measures the amount of lipid peroxides formed at the



cellular membrane. Differences in MDA were not detected at the early time point (24–48 hours). There were no differences detected in nitric oxide production between TCP and the control at all phases. The amount of nitric oxide produced by cells treated with HA increased at 48 and 72 hours when compared to the control. Morphological evaluation revealed that cells treated with TCP contained irregular membrane boundaries, and appeared to have cytoplasmic extensions. Many of the macrophages consisted of large vacuoles containing TCP particles. Cells treated with HA also contained irregular cytoplasmic borders with an increase in vacuolization. At 72 hours, many of the cells treated with TCP and HA began to lyse. Overall, RAW 264.7 macrophage cells are capable of ingesting particles of TCP and HA, and after three days in culture the cells begin to show the effects of increased retention of ceramic particles. The results of this investigation can be used as a model for the assessment of the resorbability rate of implantable devices. \*Undergraduate Student in Cytotechnology

#### EXAMINATION OF SYNOVIAL TISSUES OBTAINED FROM PATIENTS WITH NERVE DYSFUNCTION RELATED TO ISCHEMIA AND MECHANICAL COMPRESSION

Michelle Tucci\*, Vipul Sud, Hamed Benghuzzi, and Alan Freeland, University of Mississippi Medical Center, Jackson, MS 39216

Tolerance of neural tissue to external compression has been shown to depend on several factors. The mechanism by which acute compression alters peripheral nerve conduction is not completely understood. Ischemic and mechanical factors have alternatively been implicated as the primary causes of nerve dysfunction in compression syndromes. An ischemic etiology for acute nerve compression would be favored if there were changes in pressure within the carpal canal. Upon excision of the synovial tissue from within the canal it has been recognized that the tissue can absorb media and swell to three times its original size. This investigation compares the synovial tissue obtained during carpal tunnel surgeries with synovial tissue collected from control patients presenting with injuries not related to carpal tunnel syndrome. A total of twenty-seven carpal patients and six control patients were included within the study. The synovial tissue was obtained, weighed and placed in a 2 ml of sterile phosphate buffer saline (pH 7.3). The rate of fluid uptake was determined at intervals of 15 minutes for the first two hours and then hourly for an additional four hours. The results indicate an increase in fluid uptake ranging between 0.004 mg/min to 0.011 mg/min for the first hour in the CTS patients. The rate of fluid uptake subsides after 4 hours. Control patients exhibited less of an increase in fluid uptake ranging between 0.003 to 0.007 over the first three hours. These differences in fluid retention of the different tissues may suggest a tendency for increased fluid pressure within the carpal canal, which may cause compression of

the neural tissues.

#### IMPACT OF SELENIUM AND VITAMIN E SUPPLEMENTS ON PROSTATE AND OTHER CANCERS IN A RURAL SOUTHEASTERN COMMUNITY

Nathaniel Brown<sup>1\*</sup>, Sarah Cooks<sup>1</sup>, Dana Lamar<sup>2</sup>, Kathryn L. Riffle<sup>2</sup>, Evelyn Smith<sup>2</sup>, and Reid Jones<sup>2</sup>, <sup>1</sup>MidDelta Family Practice Clinic, Cleveland, MS 38732 and <sup>2</sup>Delta State University, Cleveland, MS 38733

A longitudinal national study of 32,400 males attempted to assess impact of selenium and vitamin E dietary supplements on the incidence and survival rates for prostate, lung, and colon cancer. A family medical clinic selected as a research site and regional university faculty collaborated to initiate the local research effort. A power point presentation described the intent and national scope of the study. The basic rationale for possible preventive effects of these substances was discussed. The research design and subject selection process were discussed. Local data comparing rates of malignant neoplasms in the Mississippi Delta with state and national rates allowed a projection of possible positive outcomes.

#### MORPHOLOGICAL EVALUATION OF HUMAN MALIGNANT LARYNX CARCINOMA CELLS EXPOSED TO VARIOUS CORTISOL CONCENTRATIONS

Melissa Daniel\*, Hamed Benghuzzi, and Michelle Tucci, University of Mississippi Medical Center, Jackson, MS 39216

Previous reports from our laboratory have established that exposure of cortisol to human malignant larynx carcinoma cells (Hep-2 cell line) resulted in a remarkable functional disturbances. In such pathologic condition it is desirable to confirm the biochemical alterations by evaluating the possible structural changes. The *in vitro* isolation of this cell line was performed in several separate mixtures of bovine amniotic fluid, embryo extracts, human and horse sera, and balanced salt solution. The focus of this investigation was to study the effect of glucocorticoids on the morphological behavior of Hep-2 cells. Cortisol, the active form of hydrocortisone, was selected for this study. In this study, Hep-2 cells were treated with various doses of cortisol (0, 1, 5, 10, 20 and 50 mg/dl) for 24 (Phase 1), 48 (Phase 2), and 72 (Phase 3) hours. At the end of each phase, the cells were harvested and morphological characteristics were determined for each phase by using standard laboratory histological protocols. Morphological criteria include: nuclear to cytoplasmic ratio (N/C ratio), regularity of the nuclear membranes, nuclear vacuolization, nuclear enlargement, hyperchromasia, cytoplasmic vacuolization, cytoplasmic enlargement, overall cell shape and size, cellular hypertrophy, and cytoplasmic angulations/processes. Morphological differences existed among the cortisol treated cells compared with the cells treated with media alone and this

observation was found to be dose specific. In conclusion, the investigation confirms our preliminary studies that exposure of cortisol to human larynx carcinoma cells could lead to extensive structural changes and this observation could be utilized as an ideal prognostic tool for such complication. \*Graduate Student

#### MORPHOMETRIC ANALYSIS OF HARD TISSUE UPON THE EXPOSURE TO SUSTAINED DELIVERY OF ANABOLIC PROMOTING AGENTS USING ADULT MALE RATS AS A MODEL

James Tramontana\*, Hamed Benghuzzi, Michelle Tucci, Audrey Tsao, and James Hughes, University of Mississippi Medical Center, Jackson, MS 39216

Several investigations have documented that the use of anabolic agents could promote osteogenesis and enhance bone ingrowth in traumatized bone. Previously, anabolic steroids have been shown to increase the mineralization of bone. However, their clinical use has been limited because of the unwanted virilizing activity. The previous studies used systemic administration of anabolic steroids, which subjects other tissues within the body to high concentrations of hormones. In addition, different anabolic/androgenic steroids have varying affinities to different cell types within tissues. The specific objectives of this study were (i) to histopathologically evaluate the structural changes associated with sustained delivery of testosterone (T), dihydrotestosterone (DHT), and androstendione (AED) using adult male rats as a model, and (ii) to morphometrically evaluate the cortical areas and length upon the exposure of the aforementioned hormones for 90 days. A total of 23 adult rats were randomly divided into five groups (group I = control, group II = sham, group III = AED, Group IV = T and group V = DHT treated). At the end of the treatments the animals were euthanized and the X-rays, blood, and bones were analyzed using standard laboratory protocols. Data obtained from this investigation revealed the following: (A) all treated femurs appeared healthy with no traumatic responses observed in comparison to control animals, (B) measurements of the inner perimeter of the bone on the endosteal side showed significant reduction in the androgen treated animals. This suggesting that the androgens caused increases in the cortical bone. The differences seen in the amount of reduction was in the following ease: T>DHT>AED. (C) quantitative measurements of the cortical length showed slight increases in the cortical lengths in the androgen treated rats in comparison to the control. \* Second Year Medical Student

#### PREVENTION OF OSTEOPOROTIC PROGRESSION BY MEANS OF TCPL DELIVERY SYSTEM LOADED WITH STEROID HORMONES

Aaron Scott\*, Michelle Tucci, Hamed Benghuzzi, Audrey Tsao, Aaron Puckett, Zelma Cason, and James Hughes, University of Mississippi Medical Center, Jackson, MS 39216

Several studies have suggested that there is a link between bone formation and sex steroid hormones such as estrogen (E) and androgens. This investigation was designed to study the effects of sustained delivery of E as well as adrenal hormones on the bone loss formation upon the withdrawal of endogenous reproductive hormones. Female Sprague Dawley rats were divided randomly into six groups containing four rats/group. Rats in group I served as control. Animals in group 2-6 were ovariectomized (OVX) and implanted immediately with TCPL capsules containing SHAM, Diosgenin (DG), dehydroepiandrosterone (DHEA), or estrogen, respectively. At the end of 49 days postimplantation, the vital organs, reproductive organs and femurs were collected and analyzed. Bone histomorphometric analyses, as well as, mechanical strength were compared. Seven weeks after OVX, there were increases in the periosteal perimeter, cortical area, and periosteal bone formation indices, indicating that ovariectomy increased modeling-dependent bone on the periosteal envelope, relative to controls. Treatment with both DHEA and E reduced the periosteal perimeter and cortical area to values similar to control. The three point bending test of the femora composed of cortical bone showed that OVX induced a slight decline in the mechanical strength, and treatment with DHEA, DG or E was not able to reverse this decrease in mechanical strength. Results of this experiment suggest that DHEA and E can reduce bone remodeling as evidenced by the reduction in the periosteal perimeter, and DHEA can possibly be used in postmenopausal patients to reduce osteoporotic progression. \*Third Year Medical Student

#### THE EFFECT OF IGF-1 ON THE CELLULAR MORPHOLOGY AND VIABILITY OF RHESUS MONKEY KIDNEY CELLS IN CULTURE FOR LONG DURATION

Annette Davis\*, Hamed Benghuzzi, Michelle Tucci, and Leon Anderson, University of Mississippi Medical Center, Jackson, MS 39216

Insulin like growth factor-1 (IGF-1) is a multi-functional growth factor produced largely in response to rising levels of growth hormone (GH) by a wide variety of tissues including liver and kidney. Recent reports have shown that it is common to transport nephrectomized kidneys in IGF-1 for tissue preservation. The objectives of this study are to (i) determine the dose dependency and time interval of IGF-1 exposure that affects kidney cells in culture, and (ii) to evaluate the biochemical and morphological effects of IGF-1 on cell viability. Rhesus monkey kidney cells were obtained from Vironmed labs, and divided in three groups of 15 tubes/group. The cells were treated with either 0, 0.28 ng/ml, 0.63 ng/ml or 1.4 ng/ml of IGF-1 for 24, 48, and 72 hours. At the end of each phase, the cells and supernatants were collected; cell viability and damage were assessed. Cell morphology was also evaluated at the end of each phase using established laboratory protocols. At the end of 24 and 48 hours, there

was a significant increase in cell number seen in all three IGF-1 treatment groups compared with the control. However, there were no statistical differences observed in levels of cell damage as indicated by similar levels of malondialdehyde (MDA). The data shows that the cells were capable of surviving with added IGF-1 for the duration of the study and the treatment did not induce any significant changes in cellular morphology or cell viability. The lack of cellular damage seen in the IGF-1 treated cells may offer protection of the kidney cells upon transport, especially in cases where transport and transplant cannot occur within a very narrow window of time (<12 hours).

\*Graduate Student

#### THE EFFECT OF CINNAMON EXTRACTS ON HUMAN BUCCAL EPITHELIAL CELLS IN CULTURE

Ayesha Alam\*, Hamed Benghuzzi, and Michelle Tucci, University of Mississippi Medical Center, Jackson, MS 39216

Numerous investigations have shown that natural products such as cinnamon can act as an oral allergen in sensitized individuals. The purposes of this investigation were: (I) to identify, isolate, purify and characterize the various fractions of cinnamon using extraction protocol in water, ethanol or dimethylsulfoxide (DMSO), and (ii) to determine which of the isolated fractions affect the viability of human buccal epithelial cells. Cinnamon was extracted in either 64% ethanol, by steam evaporation in water, or in DMSO according to laboratory procedures established previously. Buccal epithelial cells were obtained by gentle scraping of the oral cavity with a sterile tongue depressor and washed in media containing fetal bovine serum and antibiotic/antimitotics. The cells were plated in 96 well culture plates at a density of  $10^4$  cells/well. The cells were divided into vehicle controls (Control, Ethanol (EtOH), or Water extracted (PBS), or EtOH + cinnamon, DMSO + cinnamon and water extracted + cinnamon. At 24 and 48 hours the cells were digitized and morphology was evaluated. Cell count, total protein and cell damage was assessed in all experimental groups. The data obtained in this investigation demonstrated that water; DMSO and ethanol extraction of cinnamon or vehicle alone did not effect cellular protein levels. However, increases in MDA levels were seen in EtOH vehicle treated cells, and most notably the levels of MDA were significantly reduced below control non-treated cells in wells where water and ethanol cinnamon extracts were used. DMSO + cinnamon had no effect on MDA levels when compared to control non-treated cells. Morphometric analysis of the cells demonstrated that the area of the cells were significantly lower in the DMSO + cinnamon group in comparison to vehicle alone or control cells. No differences were seen with PBS and EtOH vehicle or PBS + cinnamon, or EtOH + cinnamon groups. The data obtained in this investigation indicates that cinnamon extracts (water and ethanol) are capable of acting as an antioxidant to reduce free radical related damage. \*High School Student, Base Pair Program

#### THE EFFECT OF ULTRAVIOLET RADIATION DOSES AND PRETREATMENT OF DEHYDROEPIANDROSTERONE ON RMK CELLS IN CULTURE

Cheryl Coach\*, Hamed Benghuzzi, and Michelle Tucci, University of Mississippi Medical Center, Jackson, MS 39216

The purpose of this investigation is twofold. First, to determine the duration of UV exposure that causes cellular damage and second, to determine if pretreatment of cells with DHEA can protect the cells from the UV radiation. Rhesus monkey kidney (RMK) cells were divided into five equal groups for the first specific aim. The tubes in group I were untreated, cells in groups II-V were treated with UV light at a distance of 10" or 22" for 30 or 60 minutes. At the end of each exposure, the cells were placed in an incubator for 72 hours. Cellular damage (MDA), as well as, cell counts and cell morphology were evaluated. The results for phase I revealed a marked increase in the MDA levels with a reduction in cell number after both 30 and 60 minutes of UV exposure. From this information a second experimental design was established. RMK cells were divided into eight groups of 6 tubes/group. The cells in groups 1-4 were not exposed to UV radiation and were treated with 0 ng, 2.5 ng, 25 ng, and 250 ng of DHEA, respectively. The cells in groups 5-8 were exposed to UV radiation at 22" for 30 minutes after pre-treatment with 0 ng, 2.5 ng, 25 ng, and 250 ng of DHEA, respectively. The results obtained indicate that the tubes with low and medium DHEA levels without UV exposure caused a significant decrease in MDA levels whereas after UV treatment the MDA levels increased indicating that DHEA was not efficient in protecting the cells from damage. Morphological evaluation showed an increase in degeneration of chromatin in UV treated cells.

\*Undergraduate Student in Cytotechnology

#### THE ROLE OF THYROID STIMULATING HORMONE ON THE PROLIFERATION AND VIABILITY OF HEP-2 LARYNGEAL CELLS IN CULTURE

Diane Sodachanh\*, Hamed Benghuzzi, Michelle Tucci, and Zelma Cason, University of Mississippi Medical Center, Jackson, MS 39206

Previous studies in our labs have shown that estrogen treatment has a direct effect on the proliferation and viability of Hep-2 laryngeal cell line. It is obvious that thyroid hormone is involved in the growth as well as metastasis of such cancer. This can be chained directly (by T3, or T4) or indirectly through the involvement of the anterior pituitary gland hormone: thyroid stimulating hormone (TSH). In addition, it is clearly established that TSH have an effect on several organs without the involvement of the native hormone (Thyroxin). The objective of this experiment was to study the effect of TSH on Hep-2 cells. A total of sixteen tubes ( $5 \times 10^4$  cells per tube) were divided into four equal groups (media alone (control), serum containing 0 TSH, 10.3  $\mu$ L/mL TSH, and 49  $\mu$ L/mL TSH). The supernatants and cells were collected

at 24, 48, and 72 hours after incubation. The result shows that TSH caused an increase in cell number after 24 hours in comparison to control media alone. Analysis of supernatants for cellular damage showed an increased pattern in MDA levels in serum exposed cells at 24, 48, and 72 hours. In contrast, MDA levels in TSH treated cells were similar at 24, 48, and 72 hours. The levels obtained at 48 and 72 hours were statistically ( $P < 0.05$ ) lower than those obtained for control and serum treated or 0 TSH group. This observation suggests that TSH could provide a protective measure against membrane lipid peroxidation. Morphological evaluation of the cells at 24, 48, and 72 hours, suggests that TSH exposure did not induce noticeable cellular injury and most adaptive responses observed were slight shape changes (round up), occasional detachment, and hyperchromatic nuclei (increase in cell number). \*Undergraduate Student in Cytotechnology

#### THE EFFECT OF CORTISOL ON HUMAN ORAL MUCOSA

Elizabeth Gordon\*, Michelle Tucci, Hamed Benghuzzi, and James Hughes, University of Mississippi Medical Center, Jackson, MS 39216

Cortisol also called Hydrocortisone, is an organic compound belonging to the steroid hormone family, and is a potent anti-inflammatory agent. Recently, aqueous mouthwash solutions containing hydrocortisone have been developed to offer a potential vehicle for topical steroid therapy of oral mucosal lesions. The effects of cortisol on the buccal epithelial cells have not been previously investigated. The objective of this study is to provide information on the effect of cortisol administration to human buccal epithelial cells maintained in culture. Cells for this investigation were obtained by gently scraping the buccal cavity with a sterile tongue depressor ( $n = 12$  volunteers). The cells were washed with media containing fetal bovine serum and antibiotic/antimitotics. The cells were placed into culture at a concentration of 10,000 cells/well. The cells were divided into two groups (control and cells treated with 10 mg/dL cortisol). The cells were analyzed for morphological changes following standard laboratory procedures after 24 and 48 hours of incubation. After 48 hours, the cells and supernatants were harvested, and cellular protein levels, cell numbers and cell damage were measured. The results showed that cortisol treatment did not affect the cell numbers or the amount of cellular protein. There was a slight reduction in MDA levels in the cortisol treated cells after 48 hours of incubation. Morphologically the cells treated with cortisol appeared in cluster groups, and the nuclei of the treated cells were more condensed than the control non-treated cells. Overall, treatment with cortisol did not induce significant damage to the buccal epithelial cells for the entire duration of the experiment, and hydrocortisone supplementation in mouthwash appears to be a convenient means of overcoming the difficulties in applying topical steroids in to the oral mucosa. \*Undergraduate Student

#### THE EFFECT OF THYROID STIMULATING HORMONE AND ESTROGEN ON THE STRUCTURAL AND FUNCTIONAL ACTIVITY OF HUMAN BUCCAL EPITHELIUM

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

Recent findings have shown that estrogen receptors were localized in stromal cells in the oral cavity. The role of physiological doses of growth promoting hormones such as thyroid stimulating hormone (TSH) and estrogen have not exclusively studied. This investigation identifies the cytology and biochemical response of buccal epithelial in the presence of estrogen and TSH at 24, 48, and 72 hr of incubation. The cells were obtained from pre, postmenopausal women and men. The cells were seeded at a density of 10,000 cells per well and aseptic techniques, morphological evaluation, biochemical analysis (MDA), and data analysis were performed following standard lab protocols. Results of this investigation revealed that: (i) there was an initial increase in total protein observed in cells treated with TSH in comparison to the control and estrogen treated cells. This trend continued for 48 hours, and no statistical differences were observed at the 72 hour phase, (ii) there was an initial decrease in MDA levels in cells treated with TSH, however, cellular damage was evident at 48 and 72 hours phases in comparison to estrogen and control groups, (iii) morphological evaluation demonstrated that there were structural changes associated with TSH treatment. These include aggregates, nuclear shriveling and lack of cellular boundaries. Estrogen treatment showed no structural alteration throughout the experiment. \*Undergraduate Student in Cytotechnology

#### THE EFFECTS OF SUSTAINED DELIVERY OF GROWTH PROMOTING HORMONES ON THE PROLIFERATION OF MG63 CELLS IN CULTURE

Javad Tavassoli\*, Hamed Benghuzzi, and Michelle Tucci, University of Mississippi Medical Center, Jackson, MS 39206

Bone matrix proteins are being identified in mineralized foci in several different pathological states. Irrespective of how these proteins become localized it is of great interest to further define what endocrine factors are necessary for triggering the release of bone matrix proteins. MG63 cells were seeded at a density of  $10^5$  cells/ml onto two 24 well tissue culture plates. The wells were divided into 8 groups of 6 wells/group. Cells in group I were served as a control. Cells in group II, IV, and VI were supplemented with Insulin Like Growth factor-1 (IGF-1), Testosterone (T), or Growth Hormone (GH), respectively. Cells in groups III, V, and VII were supplemented with TCPL capsules containing IGF-1, Test, or GH, respectively. Cells in group VIII were incubated with sham TCPL and served as vehicle control. Cells were incubated in the presence or absence of hormones for 24, 48, and 72 hours. At the end of each phase, cell damage, cell morphology,

cell number and cellular protein concentrations were determined. The results showed a significant increase in MDA initially in all groups, followed by a drop in MDA levels by the 48-hour phase, and thereafter remaining lower than the control. Results also demonstrated a decrease in total cellular protein following administration of hormones by conventional means. Cell count data showed an initial decrease in all groups reaching control levels at the 72 hour period. Morphological evaluation revealed major structural changes associated with sustained delivery as compared to conventional delivery of hormones. \*Second Year Medical Student

#### THE EFFECT OF OPSONIZATION ON THE PROLIFERATION OF RAW 264.7 CELLS EXPOSED TO BIOCERAMICS DEVICES

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

Ceramic materials were introduced as implantable materials in the early 1960's. Currently, there are numerous types of ceramic materials under evaluation as ideal implant devices. The inflammatory responses generated by various calcium phosphate-based ceramics implants have not been clearly evaluated. The current investigation evaluates the response of RAW 264.7 macrophage cells to large particle size (> 38 mm) of hydroxyapatite (HA), tricalcium phosphate (TCP), and aluminum calcium phosphate (ALCAP). RAW 264.7 cells were cultured in a 24 well plate at a density of  $1.5 \times 10^5$  cells per well. The plates were divided into seven equal groups (n = 6) (control, HA, TCP, ALCAP, ops HA, ops TCP, ops ALCAP). The total protein, malondialdehyde (MDA), nitric oxide, and cell counts were measured using established lab protocols at 24, 48, and 72 hours of incubation. Cells grown on coverslips were used to evaluate morphological features. The data obtained from this investigation suggested that the nonopsonized particles of ALCAP and TCP materials exhibited an increase in cell number at both the 48 and 72 hour phases. However, a decrease was seen in cell number in all three opsonized groups at 48 and 72 hour phases when compared to the control. As for MDA level in the opsonized group, all treatments showed an initial increase. Nitric oxide production increased in TCP and ALCAP at the 48-hour phase. Morphological evaluation revealed that upon the exposure of the three different type of ceramic, the cells appeared to be biocompatible. \*Undergraduate Student in Cytotechnology

#### THE EFFECT OF DIFFERENT DOSAGES OF CORTISOL ON THE SECRETION OF MUCINS FROM AIRWAY EPITHELIUM (A549)

Robert Triplett\*, Elizabeth Hall, Hamed Benghuzzi, Michelle Tucci, and Leon Anderson, University of Mississippi Medical Center, Jackson, MS 39216

Epithelial cells, which line the airways, are

protected from microorganisms, toxins, and abrasive particles by secretions of mucus. Mucus can be hypersecreted in response to inflammatory conditions and can eventually obstruct the airway. Because mucin glycoproteins are the major component of mucus, it is likely that substances such as cortisol may increase the biosynthesis of mucins that accompany hypersecretion. Cell lines such as A549, which were derived from carcinoma of the airway epithelium, provides a model system for studying the relationship between different dosages of the stress hormone cortisol, and the secretion of mucins from airway epithelium. A549 cells were divided into four groups containing 6 tubes/group (n = 3x). Cells in group 1 were maintained in media alone, while cells in group 2-4 were treated with 20  $\mu$ L of serum containing media, 1, and 10  $\mu$ g/dL cortisol. At the end of 24, 48, and 72 hours of incubation the cells were collected and analyzed for cell number, cellular protein content and cellular damage (MDA). H&E and Alcian Blue staining methods determined cellular morphology and mucin production. Data shows that at the end of 24 hours high cortisol concentrations caused a marked increase in cellular number. After 48 and 72 hours, there were no differences detected in cellular number, protein or cellular damage when compared to control cells. Morphologically, the cells appeared healthy and no structural damage can be observed. As far as the mucin production, the results demonstrated that there was a dose dependent increase in Alcian Blue stained cells. \*High School Student

#### MORPHOMETRIC ANALYSIS OF THE ADRENAL COMPARTMENTS EXPOSED TO SUSTAINED DELIVERY OF ANDROGENS

Joseph A. Pope\*, Hamed Benghuzzi, and Zelma Cason, University of Mississippi Medical Center, Jackson, MS 39216

The objective of this investigation was to morphometrically evaluate the effect of testosterone (T), dihydrotestosterone (DHT), and androstenedione (AED) given in a sustained manner, by tricalcium phosphate lysine (TCPL) ceramic capsules, on the adrenals of adult male rats. Sixteen adult male rats were randomly divided into four equal groups. Groups I, II, and III were implanted with TCPL capsules loaded with AED, T, and DHT, respectively. Group IV animals were not implanted, and thus served as the control group. At the end of ninety days post-implantation, the animals were euthanized using standard aseptic surgical techniques. The adrenal glands were harvested and stored in 10% formalin. Data collected were analyzed by means of ANOVA ( $p < 0.05$ ). Results of this study revealed (1) there were an increase in the total areas of T treated animals in comparison to the control and other experimental groups, (2) the total lengths of each hormonally treated tissue showed an increase in size of DHT treated tissue verses control, but differences of T and AED compared with control remained insignificant, (3) upon analysis of the zona glomerulosa (Z1) and zona

fasciculata (Z2) the data demonstrated that there were significant increase in animals treated with DHT and AED in comparison to control and T treated animals, (4) finally, statistical analysis performed on measurements of the zona reticularis (Z3) indicated notable increases only in the AED exposed animals. The changes in size of the various tissues may be warranted due to reactions of the steroid hormones with different surface receptors in different layers. \*Undergraduate Student in Cytotechnology

#### THE USE OF SUSTAINED DELIVERY SYSTEM OF DG, DHEA AND E TO TREAT OSTEOPOROTIC BONE IN ADULT OVARIETOMIZED RAT MODEL

Kent Higdon\*, Michelle Tucci, Hamed Benghuzzi, Audrey Tsao, Aaron Puckett, Zelma Cason, and James Hughes, University of Mississippi Medical Center, Jackson, MS 39216

It is well established that the pattern of bone loss from the cortex in osteoporotic bone begins from the cortical-endosteal surface, where there is enlargement of the medullary canal at the expense of the inner cortex. Bone loss does not occur at the periosteal surface. The objective of the following study was to induce osteoporosis in female rats by ovariectomy, followed by treatment with sustained delivery of Diosgenin (DG), dehydroepiandrosterone (DHEA), or estrogen (E) after clinical signs of osteoporosis. Female Sprague Dawley rats were divided randomly into six groups containing four rats/group. Rats in group I were left intact and served as control. Animals in group 2–6 were ovariectomized (OVX) and after 14 days they were implanted with TCPL capsules containing SHAM, DG, DHEA, or E, respectively. The experiment was stopped after 33 days and the vital and reproductive organs were collected, weighed and analyzed histomorphometrically for differences. In addition, bone was X-rayed, collected, the left femur was processed for histology and the right femur was used for three point bending analysis. The results show that the increase in body weight associated with OVX is not reduced to control levels after replacement therapy was started. OVX resulted in atrophy which was somewhat reversed with E treatment. Results of the bending stress and modulus in OVX and treated animals were not statistically different from the control intact animals. This suggests that the material properties of the bone were unaltered. However, histomorphometric analysis revealed treatment with both DHEA and E reduced the periosteal perimeter and cortical area to values similar to control, whereas DG treatment was unable to reduce the periosteal perimeter. The data suggest that changes of bone loss after OVX can be moderately reduced by supplementation with sustained levels of DHEA as well as E. \*Third Year Medical Student

### HISTORY AND PHILOSOPHY OF SCIENCE

Chair: Robert Waltzer, Belhaven College  
Vicechair: Paula Smithka, University of Southern Mississippi

### THURSDAY MORNING

Imperial Room

#### 8:30 THE RE-EMERGENCE OF “THE OLD PROBLEM OF UNIVERSALS” WITHIN THE PHILOSOPHY OF SCIENCE

Michael J. Fitzgerald, University of Southern Mississippi, Hattiesburg, MS 39406

The paper will be in two parts. In Part I, the Traditional Problem of Universals will be briefly revisited and its major alternatives examined. In Part II I will develop a discussion of how the Traditional Problem and its major alternatives has re-emerged and generated some theoretic difficulties within certain scientific disciplines, such as Philosophy of Mathematics, Theoretical Physics, and Philosophy of Biology.

#### 9:00 CONFLATING ONTOLOGY AND EPISTEMOLOGY: A COMMON PROBLEM FOR UNDERSTANDING SPECIES

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

Keeping ontological issues distinct from epistemological issues throughout the history of philosophy has been a common challenge for philosophers. The consequences for not keeping these issues distinct has been the source of much confusion and misrepresentation of important concepts. We argue that this same problem, the confusion of ontological and epistemological issues, has plagued scientific discourse and caused fundamental difficulties concerning our understanding of species. The nature of the ontological status of a species is a fundamentally different kind of question than asking how humans know anything about species. Here, we sort out some fundamental confusions regarding the ontological and epistemological concerns regarding species and ultimately argue that whatever the ontological status of a species, the real concern for biologists and philosophers of biology has to do with epistemological issues.

#### 9:30 SPECIES AND PHYLOGENETIC REPRESENTATION THROUGH HIERARCHIES AND CLASSIFICATION

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

We consider here the epistemological aspects of

species and phylogenetic representation, rather than ontological aspects. Hierarchies are organizational models constructed by humans. They are not natural objects. The merits of the traditional Linnaean hierarchy are contrasted with recent proposals embodied in phylogenetic taxonomy. Phylogenetic taxonomy is a recently evolved branch of cladistics focusing on classification and nomenclature. Proponents of phylogenetic taxonomy have criticized the Linnaean hierarchical representation of phylogeny and its associated nomenclatorial devices principally because of incongruency between formal Linnaean categories and apparent phylogenetic realities. Under the tenets of phylogenetic taxonomy they would recognize and refine hierarchical categories that are increasingly isomorphic with specific lineages. However, traditional suffixes designating particular ranks as specified by nomenclatorial codes would have no meaning and without mandatory ranks the concept of genus, although still useful, would not be necessary. Traditional binomial names, if used, would no longer reflect a genus and specific epithet and could be replaced with uninomials. These new ideas are considered here in the context of hierarchical representations of phylogeny. A cladogram is a hierarchy focusing on genealogical continuity (i.e., lineages). The Linnaean hierarchy combines genealogical continuity with phylogenetic discontinuity (i.e., speciation events). Both of these hierarchical models are flawed, but close examination of them gives us insight to create improved models and improved conceptualization of species and phylogeny.

10:00 Divisional Business Meeting

10:10 Symposium: ASSUMPTIONS UNDERLYING SCIENCE

Robert P. Waltzer, Belhaven College, Jackson, MS 39202

10:10 SOME OBSERVATIONS ON THE PROCESS OF SCIENCE IN UNDERSTANDING BIOLOGICAL EVOLUTION

Kenneth J. Curry, University of Southern Mississippi, Hattiesburg, MS 39406

Science is a way distinct from theology and philosophy of understanding the world. The process of scientific understanding generally involves observation of a phenomenon for which a tentative explanation is offered, a hypothesis. Hypotheses then serve as premises from which predictions can be made. In some cases experiments to test predictions can be designed and executed; in other cases predictions must be tested by additional observations. Predictions that are not met force a reconsideration of their hypotheses, experimental designs, or the interpretation of observations. Hypotheses with high predictive value tend to become "scientific truth." Groups of related hypotheses associated with a broadly conceived phenomena are theories. Theories with high predictive value tend to become the scientific truth of the day. Theories may become outmoded in the light of new information and new

interpretations. New theories with improved predictive value replace old theories as part of the dynamic, self-correcting nature of the process of science. The historical development of the theory of biological evolution and its principal current hypotheses will be used as an example of the process of science in biology.

10:30 ON ASSUMPTIONS UNDERLYING THE APPLICATION OF SCIENCE & MATH

S. Kant Vajpayee, University of Southern Mississippi, Hattiesburg, MS 39406-5137

In today's world, we usually treat any science/math as "second-class citizens" if it has no application in materially enhancing our mundane day-to-day living. Engineers and technologists are the application experts. These experts, however, do not have the luxury of infinite time and money. With these two real-world constraints, they therefore seek a heuristic rather than the optimum solution. We hero-worship these experts for developing a product even when they are guilty of rough-cutting science and math by making crude assumptions. For example, the incandescent light bulb is not really a light bulb. It is in fact a heat bulb since 95% of the energy is radiated as heat, only 5% as light. But since the market for artificial light was ripe for dispelling darkness, we have credited the inventor all these years, excusing him for the wrong terminology! Some typical assumptions we make on the physical world are: (a) linearity over non-linearity, (b) homogeneity over non-homogeneity, (c) finiteness over infiniteness, (d) randomness over exactness. We make these assumptions to cover our intellectual deficiencies. Through them we attempt to compensate for the spiritual void we are fast becoming as exploiters of science?

10:50 LIMITS OF SCIENCE

David H. Magers, Mississippi College, Clinton, MS 39058

Earlier this century with the early successes of the space program and the advent of antibiotics and other great strides in medicine and technology, natural science commanded near universal respect from the general public. However, in recent years natural science has lost some of that respect. From one side have come attacks from religious fundamentalists against evolution and from another side postmodern theorists have attacked the very notion of objective truth. In light of these attacks and in light of the work of Thomas Kuhn in the 1960's, current views of science and its limits, strengths, and presuppositions are discussed.

11:10 Discussion

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## THURSDAY AFTERNOON

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Imperial Room

1:30 FOCUSING IN: AN ARGUMENT FOR

### FUNCTIONALISM

Linda M. Englade, University of Southern Mississippi, Hattiesburg, MS 39406

This paper will explore the debate between the physicalists who claim that our minds are only a series (however complex) of chemical reactions, and the non-materialists who claim that for the mind, the whole is greater than the sum of its parts. After rejecting the "common sense" though problematic non-materialist hypothesis, I focus on the four major materialist positions. Finally, I advance a view in favor of the Functionalist theory of mind based on the pragmatism of its reductionist capabilities.

### 2:00 THE OLFATORY SYSTEM: A MODEL FOR INTELLIGENT DESIGN

Robert Waltzer, Belhaven College, Jackson, MS 39202

Intelligent design is a program which seeks to demonstrate that information and specified complex patterns of structure and function arise from an agent possessing intelligence (See Dembski, 1999 Touchstone 12:4 p. 76) and not from necessity or chance. Recent findings on the olfactory system, reviewed in *Sci.* 286:711, shed light on its mechanisms for the processing of sensory information. Sets of structures, connected in series, transmit impulses with great precision. These include 1000 protein receptors, 2,000,000 sensory neurons, 2000 glomeruli, and 40,000 mitral cells which in turn connect with the olfactory cortex. These are highly organized in their placement and in the arrangement of circuits to detect, code, transmit, and decode electrical signals representing a possible 10,000 odors. This system contains specified complex patterns of structure and function and it processes information. For example, the information within the pathways possesses meaning and some claim to be able to directly interpret it (*Nature* 384:162). Chance does not generate meaning. To say that it does represents an unjustified, undefended use of teleological concepts. Mainstream science attributes properties of design to this and other systems when it attributes specific roles for each component in the system. Such roles provide a framework for scientific study and employ language loaded with teleological concepts considered metaphorical. However, design-related thinking is important for scientific progress and intelligent design deserves status as a valid explanation of origins.

### 2:30 JEAN-BAPTISTE DENIS: CONTRIBUTIONS TO TRANSFUSION MEDICINE

Carolyn E. Beck, University of Southern Mississippi, Hattiesburg, MS 39406

The fascination of man with blood dates to the earliest periods of history. Realistic accounts of transfusion did not appear until after 1628 when William Harvey discovered the circulatory system. One of the pioneers in transfusion medicine was Joan-Baptiste Denis (Denys), who described himself as a professor of philosophy and

mathematics. Denis was also the court physician to King Louis XIV of France. In 1667 Denis performed one of the first transfusions to a human when he transfused a young man with about 9 ounces of blood from a sheep. The patient, a victim of mental illness, had been repeatedly bled to cure his affliction and Denis surmised that perhaps the loss of blood contributed to his poor condition. The transfusion was a success and Denis described the procedure and patient reactions in considerable detail. Denis was successful in treating two other patients, but caused the death of his fourth patient. As part of this event, Denis supplied the first detailed description of a hemolytic transfusion reaction, saying that the urine of the patient turned so dark it was black. Unfortunately, Denis was also the first transfusionist charged with malpractice and subsequently was tried for murder. Due to the death of Denis's patient, the French and later the English passed laws forbidding human transfusion and the practice did not resume for some 150 years.

### MARINE AND ATMOSPHERIC SCIENCES

Chair: Jeffrey Lotz, University of Southern Mississippi

Vicechair: Alan M. Schiller, University of Southern Mississippi

### THURSDAY AFTERNOON

#### Executive Room

### 1:00 LESIONS ASSOCIATED WITH THE MONOGENEAN *ERPOCOTYLE TIBURONIS* ON GILLS OF WILD AND CAPTIVE BONNET-HEAD SHARKS (*SPHYRNA TIBURO*)

Stephen A. Bullard<sup>1\*</sup>, Salvatore Frasca, Jr.<sup>2</sup>, and George W. Benz<sup>3</sup>, <sup>1</sup>Gulf Coast Research Laboratory, Ocean Springs, MS 39564; <sup>2</sup>University of Connecticut, Storrs, CT 06269; and <sup>3</sup>Southeast Aquatic Research Institute, Chattanooga, TN 37401

Gill lesions associated with infection by *Erpocotyle tiburonis* (Monogenea: Hexabothriidae) on wild and aquarium-held bonnethead sharks (*Sphyrna tiburo* [Carcharhiniformes: Sphyrinidae]) were compared using light and scanning electron microscopy. Four wild sharks each had 3–11 widely-dispersed adult specimens of *E. tiburonis*, and 1 of the sharks hosted a juvenile specimen. Lamellae near adult specimens of *E. tiburonis* were pushed aside or bent, but otherwise similar to those of normal filaments. Two aquarium-held sharks each had hundreds of juvenile and adult specimens of *E. tiburonis*. In these cases, lamellae were in disarray but otherwise normal near juveniles, while a thick layer of hyperplastic epithelium



both filled spaces between lamellae and partially or completely covered lamellae near adults. The intense captive infections of *E. tiburonis* caused severe hyperplastic lesions that probably caused the death of the sharks by reducing or blocking respiratory water flow over lamellae and by reducing both gaseous and ionic exchanges across the lamellar epithelium. However, the wild sharks had relatively minor lesions, suggesting a benign wild parasite-host relationship. Support from Mississippi Alabama Sea Grant Consortium (MASGC) and NOAA/NMFS No. NA86FL0476.

1:15 RELATIVE SUSCEPTIBILITY OF *LITOPENAEUS VANNAMEI* (KONA STOCK) TO WHITE SPOT SYNDROME VIRUS AND TAURA SYNDROME VIRUS

M. Andres Soto\*, Virginia Shervette, and Jeffrey M. Lotz, University of Southern Mississippi, Institute of Marine Sciences, Ocean Springs, MS 39566

We used an experimental procedure that is based on a mathematical epidemiology model to study the survival rate of *Litopenaeus vannamei* from exposures to white spot syndrome virus (WSSV) and Taura syndrome virus (TSV). The experimental procedure involves exposing 12 susceptible shrimp to a single infected shrimp cadaver for a specified period of time, and then isolating the exposed shrimp individually to determine the number of infections and deaths. In this study, susceptible shrimp are exposed to the infected cadaver for 14 h and isolated for five days. The *L. vannamei* used in the experiments are from the original unselected population of shrimp (Kona stock) that have been maintained by the United States Marine Shrimp Farming Program. In experiment one, the mean survival rate from a WSSV exposure was 0.55, and from a TSV exposure was 0.52. In experiment two, the mean survival rate from a WSSV exposure was 0.60, and from a TSV exposure was 0.62. A statistical difference was not detected in final mean survival rates between the WSSV and TSV exposed groups from either experiment (chi-square test). In both experiments, for the WSSV exposed shrimp, most animals died between 24 and 48 h post-exposure, and for the TSV exposed shrimp, most animals died between 48 and 96 h post-exposure. Our results suggest the original unselected population of *L. vannamei* are as susceptible to TSV as to WSSV.

1:30 EXPERIMENTAL INFECTION OF THE BLUE CRAB (*CALLINECTES SAPIDUS*) WITH WHITE SPOT SYNDROME VIRUS: EVALUATION OF WATERBOURNE TRANSMISSION

Charles H. Flowers, Jr.\*, Jeffrey M. Lotz, and Verlee Breland, University of Southern Mississippi, Institute of Marine Sciences, Ocean Springs, MS 39566

White Spot Syndrome Virus (WSSV) has been devastating to shrimp aquaculture in Asia well as North and South America. Because WSSV is quite virulent in

penaeid shrimp and has a wide host range, we undertook to evaluate the susceptibility of wild caught blue crabs (*Callinectes sapidus*) to infection with WSSV. Blue crabs were collected in bayous near Ocean Springs, MS. This experiment examined three variables: infectivity and mortality differences between sexes, and water-borne transmission. Crabs were retained individually in baskets with plexiglass lids and fine meshed nylon sacks on the exterior of the baskets. These sacks were introduced to inhibit particulate matter from traveling from basket to basket. Six baskets were placed in each of four 1900-L tanks. Into the baskets of each tank were placed three males and three females (one crab per basket) of comparable size (120–150mm carapace width). Two males and two females in each tank were fed one moribund *Litopenaeus vannamei* each, once a day for five days. The feeding ratio for this trial was approximately 5% M:M. The remaining male and female in each tank were fed specific-pathogen free (SPF) *L. vannamei* with their cephalothoraces separated from their abdomen to allow for ease of predation. The feeding ratio for clean shrimp to crabs was equivalent to the per os viral treatment. Confirmation of WSSV infection was accomplished through the use of polymerase chain reaction (PCR), histology, and bioassay. This research was funded in part by the United States Department of Agriculture/CSREES grant #98-38808-6019.

1:45 THE EFFECTS OF SALINITY STRESS ON SURVIVAL OF NAIVE AND CHRONIC, TAURA SYNDROME VIRUS INFECTED SHRIMP (*LITOPENAEUS VANNAMEI*)

Lesber F. Salazar\*, M. Andres Soto, and Jeffrey M. Lotz, University of Southern Mississippi, Institute of Marine Sciences, Ocean Springs, MS 39566

Taura syndrome virus (TSV) is one of the most important shrimp viruses affecting farmed shrimp in the Western Hemisphere. Infected shrimp go through an acute phase in which most mortality is observed. In the ensuing chronic phase shrimp remain infected but otherwise appear normal. If chronically infected shrimp resume normal functions they should be as likely to survive a stress test as naive shrimp. Therefore we undertook this study to determine if chronically infected shrimp can withstand salinity shock as well as naive shrimp. All shrimp were obtained from the SPF program of the United States Marine Shrimp Farming Program. Chronically infected shrimp were shrimp that had survived a previous TSV laboratory per os challenge. Two experiments were conducted that compared survival of chronically infected and naive *L. vannamei* subjected to different salinity shocks. In the first experiment, shrimp were transferred from tanks containing 24 ppt seawater individually into jars containing either 6, 12, 18, or 24 ppt seawater. The second experiment consisted of transferring chronically infected and naive shrimp from 24 ppt into seawater of 0, 3, 6, 12, and 24 ppt. In both experiments there was a statistically significant difference in survival between chronically infected and

naive shrimp at the salinity shock of 6 ppt. (Pearson Chi-square test,  $\alpha = 0.05$ ). These results suggest that chronically infected shrimp are not as likely to resist stress as naive shrimp.

2:00 RESPONSE OF MARSH PLANTS TO CD-SPIKED SEDIMENTS: EFFECTS ON SITE PARTITIONING EFFECTS OF METALS AND BIOAVAILABILITY

Thomas F. Lytle<sup>1\*</sup>, Krystal Gage<sup>2</sup>, Nicole Housley<sup>3</sup>, and Julia S. Lytle<sup>1</sup>, <sup>1</sup>Gulf Coast Research Laboratory, Ocean Springs, MS 39566; <sup>2</sup>Mississippi State University, Mississippi State, MS 39762; and <sup>3</sup>University of Mississippi, Oxford, MS 38677

A study was initiated to determine how the dominant saltmarsh macrophytes, *Juncus roemerianus* and *Spartina alterniflora* respond to coastal sediments that have been contaminated with Cd. Cd contamination at one site for each plant was effected by addition of Cd to surface sediments. Leaves and sediments were collected after two months (winter) and seven months (summer) and analyzed for Cd with sediments analyzed to determine how much Cd was distributed in sediment fractions, each possessing varying degrees of bioavailability. During winter, Cd in sediments under *Spartina* and *Juncus* locates primarily in Fe oxide fraction (reducible) in contrast to primary location in Mn oxide fraction (easily reducible) of controls, but during ensuing active growth months much of the Cd migrates to Mn oxide fraction. Compared to large amplification of Cd in all fractions of sediments for *Juncus* and *Spartina* occurring seven months after Cd enrichment, very little difference is seen in amount of Cd uptaken in leaves of either plant species. Significant amounts of Cd are relocated to organic fraction of sediments underlying *Spartina* after seven months (not observed with *Juncus*). It appears that these marsh plants do play a major role in establishing the distribution of Cd and consequently the bioavailability in sediments and in a way unique to each species.

2:15 Break

2:30 POTENTIAL FOR USE OF *JUNCUS ROEMERIANUS* FOR PHYTOREMEDIATION OF COASTAL SEDIMENTS CONTAMINATED WITH PETROLEUM HYDROCARBONS

Hernando C. Payne II<sup>1\*</sup>, Larry Stewart<sup>2</sup>, Thomas F. Lytle<sup>3</sup>, and Julia S. Lytle<sup>3</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217; <sup>2</sup>California Institute of Technology, Pasadena, CA; and <sup>3</sup>Gulf Coast Research Laboratory, Ocean Springs, MS 39566

Polynuclear aromatic hydrocarbons (PAH) are one of the most common sources of coastal contamination resulting from petroleum products and combustion byproducts. To remedy this problem in an economically efficient manner, environmental agencies need to know if marine plants can assist in the clean-up of these

contaminants in marine sediments and water by the process called phytoremediation. A field study was designed to determine uptake ability of PAHs by the dominant Gulf estuarine plants *Juncus roemerianus* and *Spartina alterniflora*. Four sites were selected that represented various levels and histories of PAH contamination: a Department of Defense site in Biloxi, a harbor site with long history of various types of contamination, a site spiked with used motor oil to represent a very recent episode of PAH contamination, and a site which served as a control. Leaves, roots, and underlying sediments were analyzed for aliphatic and aromatic hydrocarbons. Though there was evidence of uptake into leaf tissues of hydrocarbons by both plants, *J. roemerianus* was quite remarkable in having hydrocarbons in leaves with both the distribution and even higher levels of the entire suite of aliphatic hydrocarbons than that found in the sediments. There is good evidence that this marsh plant holds great promise as a candidate for phytoremediating petroleum contaminated sites.

2:45 GEOGRAPHIC VARIATION IN EGG DIAMETER AND FECUNDITY OF BLUE CRAB *CALLINECTES SAPIDUS*

Lori C. Hill\*, Kristin N. Ealy, and Patricia M. Biesiot, University of Southern Mississippi, Hattiesburg, MS 39406-5018

Previous work in our lab has shown seasonal variation in egg diameter of blue crabs from Mississippi. The present study was conducted to determine if egg diameter and fecundity varied within this species over its range in U.S. waters. Ovigerous crabs were obtained during summer 2000 from coastal sites in Louisiana, Mississippi, Florida, South Carolina, North Carolina, Maryland, and Delaware. Crabs were similar in size as determined by carapace width. Egg diameters were measured using video microscopy, and fecundity was estimated using a direct count/dry weight method. The diameter of blue crab eggs ranged from 243 to 309  $\mu\text{m}$ , with an overall mean of  $268 \pm 21 \mu\text{m}$ . Although mean egg diameter was greatest for crabs from the west coast of Florida ( $282 \pm 22 \mu\text{m}$ ) and least for crabs from Mississippi (258  $\mu\text{m}$ ), these were not statistically significant differences. There was no apparent relationship between egg diameter and fecundity. Fecundity ranged from  $1,557 \times 10^3$  to  $6,168 \times 10^3$  eggs per crab with a mean of  $2,871 \times 10^3$ ; larger females exhibited greater fecundity. Mean fecundity was greatest for South Carolina crabs ( $4,319 \times 10^3$ ) followed by Mississippi ( $3,885 \times 10^3$ ) and Louisiana ( $3,014 \times 10^3$ ). Although variations in egg diameter and fecundity occur among blue crabs from different states, the variations are not predictable and likely do not indicate geographic influence.

3:00 BEHAVIORAL EFFECTS OF INDUCED SPAWNING IN TILAPIA, *OREOCHROMIS NILOTICUS*

Shawanda R. Wilson\* and Michael D. Porter, Mississippi Valley State University, Indianola, MS 38741

Experiments were performed to determine if visual cues, olfactory stimulation, or a combination of both is involved in inducing spawning of Tilapia. Two possible hypotheses for the outcome of these experiments are 1) olfactory stimulation will cause the females to ovulate, or 2) both visual cues and olfactory stimulation will cause the females to ovulate. Three tanks were set up side-by-side with dividers placed between them. A filter is set up to allow water to circulate between tanks two and three as to permit water containing pheromones secreted from a male to enter the female's tank. The divider is removed from between tanks one and two to allow visualization of a male during an experimental trial. The fish are then arranged so that the female is always in the middle tank (tank 2) and the males, one of which produces milt and one that does not, are in the other two (tanks 1 and 3) being alternated every two to three trials. HCG is pipetted onto the gills of the females and the male that is producing milt. MS-222 is used as an anesthesia to calm the fish when the hormone is given. The male that is not producing milt is isolated in a dark room after every trial to suppress milt production. Females are exchanged after every trial with at least a month break between trials.

### 3:15 THE EFFECT OF DIFFERENT HARVEST VOLUMES ON CALANOID COPEPOD CULTURES

Jason T. Lemus\*, John T. Ogle, and Jeffrey M. Lotz, University of Southern Mississippi, Institute of Marine Sciences, Ocean Springs, MS 39566

Calanoid copepods from the Mississippi Sound waters have been cultured using the brown water technique in which half the water volume of a zooplankton culture tank is removed and replaced every other day while harvesting copepods. It was assumed that the proportion of harvested copepods was equal to the proportion of water volume removed. Four harvest levels (0%, 25%, 50%, and 75%) were used to determine the effects of harvesting on copepod populations and harvest yields over a 16-day period. Harvested copepods in the range of 23  $\mu\text{m}$  to 125  $\mu\text{m}$  were preserved and counted, while the remaining copepods were returned to the tanks. Each day, 4 g of rice bran was added to all the tanks. The copepod population of each treatment was estimated. The mean copepod yield for each treatment on each harvest day was calculated. Naupliar density and adult density were significantly greater in the 0% treatment than the 50% and 75% treatments. Adult density was significantly greater in the 25% treatment than the 50% and 75% treatments and 50% was significantly greater than the 75% treatment. There were significantly more copepods harvested in the 50% and 75% regimes than the 25%. The 50% and 75% regimes did not differ significantly from each other. Naupliar and adult density decreased with increasing exploitation levels, whereas copepod yield increased with increasing harvest rate. A 75% harvest of one tank would produce the most copepod nauplii; however, harvesting 25% of 2.24 tanks to

every one tank harvested at 75% would be more cost effective.

3:30 Divisional Business Meeting

3:45 Divisional Poster Session

### A TECHNIQUE FOR PROCESSING UNDISTURBED MARINE SAND SEDIMENTS

Maritza Abril<sup>1\*</sup>, Jana B. Avant<sup>1</sup>, Kenneth J. Curry<sup>1</sup>, Richard H. Bennett<sup>2</sup>, and Matthew H. Hulbert<sup>3</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406; <sup>2</sup>SeaProbe, Inc. Picayune, MS 39466; and <sup>3</sup>Research Dynamic Co., West Chester, PA 19380

A study of sediment pore fluid pathways and porometry require an "undisturbed" sediment sample for analysis. To preserve the interstitial organic material and the *in situ* structure, agar infiltration was employed. Cores were collected and placed in a water bath at 55°C for 45 minutes. Subcores within the main core were infiltrated with liquid agar for 1 to 2 h, followed by a cooling at room temperature. Once the agar solidified it held the sand particles together avoiding disturbances that would be created by subsequent processing. Annotations were made on the position and the physical-chemical parameters. Plugs of 1 cm were taken from the subcores for fixation and plastic embedding. These plugs were fixed in formaldehyde, dehydrated in an ethanol and propylene oxide sequence, and embedded in ERL 4206 epoxy resin (Spurr's). Sediment samples so processed were used for the study, reconstruction and quantification of the two and three dimensional microfabric.

### DIURNAL AND NOCTURNAL ACTIVITY BUDGETS OF CAPTIVE BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*)

Rachel Thames\* and Stan Kuczaj, University of Southern Mississippi, Hattiesburg, MS 39406

Behavioral observations were taken from nine captive bottlenose dolphins over an 8-week period to estimate their activity budgets over a 24-hour day. Instantaneous samples on individual dolphins were taken every minutes throughout the course of a day. Behaviors were expected to be influenced by time of day and age. Observed behaviors were placed into one of five categories: swim high, swim low, play high, play low, and rest. Preliminary data analyses suggest that dolphin behavior is influenced by these factors.

### EXAMINATION OF SURFACE GRADIENTS OF DISSOLVED OXYGEN IN AQUACULTURE PONDS

Tracy A. Thurmond\* and Michael D. Porter, Mississippi Valley State University, Itta Bena, MS 38941-1400

This project involves comparing patterns in nighttime dissolved oxygen levels in commercial catfish (*Ictalurus punctatus*) ponds. The study examines the role of wind in relation to the orientation of the ponds to see if

there are any effect on oxygen distribution. It examines eight ponds during the months of August and September. Oxygen levels were checked on opposite ends of each pond at 2 hour intervals over a 12 hour period. Geographic Information System (GIS) will be used to analyze the data. The interaction of wind with pond dissolved oxygen will be analyzed.

#### THE EFFECTS OF SUBSTRATE STRUCTURAL COMPLEXITY ON TWO POPULATIONS OF STONE CRABS (*MENIPPE ADINA*) FROM OYSTER REEFS IN THE MISSISSIPPI SOUND

Daniel Bass\* and Harriet M. Perry, Cooperative Intern Program, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553 and Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39564

The stone crab, *Menippe adina*, is commonly found in northern Gulf waters and is associated with rock jetties and oyster reefs. Structural complexity and niche availability have been found to affect size frequency of stone crab populations. Stone crab populations from two reefs with different relief were examined to determine abundance and size class differences. The two reefs were located in Mississippi Sound approximately 25 miles apart and differ in age and structural complexity. Stone crab populations were sampled using artificial habitats. Habitat samplers were filled with oyster shell, placed on the reefs, and allowed to soak for three months. Samplers were retrieved, returned to the laboratory and stone crabs removed and frozen. Sex, carapace width ( $\pm 0.02$  mm), and weight ( $\pm 0.001$  g) were determined. The abundance and size frequencies of the crabs were compared between the two reefs (Student's t-test,  $\alpha = 0.05$ ) to examine the effects of structural complexity on the composition of the stone crab populations.

#### USE OF ESTUARINE VEGETATION FOR PHYTO-REMEDIAING CD-CONTAMINATED WATERS

Thomas F. Lytle<sup>1\*</sup>, Nicole Housley<sup>2</sup>, Krystal Gage<sup>3</sup>, and Julia S. Lytle<sup>1</sup>, <sup>1</sup>Gulf Coast Research Laboratory, Ocean Springs, MS 39566; <sup>2</sup>University of Mississippi, Oxford, MS 38677; and <sup>3</sup>Mississippi State University, Mississippi State, MS 39762

Of available methods to remediate metal contaminated soil, phytoremediation offers significant advantages. Use of plants to remove/immobilize metals in soils is effective in many applications and non-destructive to natural environmental systems. We have examined ability of coastal marsh plants to remove metals from contaminated sediments and the mechanisms of removal and storage in the plants. To determine whether freshwater and brackish plants will translocate metals into their tissues and produce these sequestering compounds, we tested *Najas guadalupensis*, a submerged non-rooted and *Bacopa monnieri*, a rooted plant by placing them into plastic containers and exposing them to Cd levels of 0, 0.1 and 1.0

ppm. During 12 intervals covering five days including a 1 day depuration period, plants were removed and examined for Cd levels. *Najas guadalupensis* removed significantly more Cd in less time than did the *B. monnieri*, though the latter retained the Cd in tissues much longer than did the *N. guadalupensis* particularly at the 1 ppm exposure level. Results suggest that examination of very hardy submerged and rooted plants that be readily cultured and resist toxic effects of Cd may be of value in considerations of plant candidates for cleaning up coastal ponds or other enclosed waters with Cd contamination.

#### UPTAKE OF CADMIUM AND CHROMIUM BY *JUNCUS ROEMERIANUS*

Julia S. Lytle<sup>1\*</sup>, Roshunda Sample<sup>2</sup>, and Thomas F. Lytle<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Institute of Marine Sciences, Ocean Springs, MS 39564 and <sup>2</sup>Jackson State University, Jackson, MS 39217

Gulf coastal sediments, particularly estuarine sediments, contain elevated levels of heavy metals, some of which are toxic. Studies have shown that some agricultural plants take up and accumulate heavy metals, but it is not known whether coastal marsh plants can accumulate metals in their tissue. Phytoremediation, a natural process by which plants remove contaminants from sediments and waters, may be an alternative process for removing metals from coastal waters and sediments. A laboratory study designed to assess uptake of cadmium and chromium by *Juncus roemerianus*, Mississippi's most dominant tidal marsh plant, indicated that this species bioaccumulated twice the concentration exposure levels of chromium and five times the concentration levels of cadmium in seven days. Total glutathione and peroxidase activity were measured to evaluate the plants' response to oxidative stress. Glutathione levels increased in a dose response manner when exposed to chromium but decreased when exposed to cadmium. Results of this experiment can be used to help determine if *J. roemerianus* can be used in cleaning up metal contamination in coastal sediments.

#### UPTAKE OF HEAVY METALS BY *SPARTINA ALTERNIFLORA*

Julia S. Lytle<sup>1\*</sup>, Valencia A. Payne<sup>2</sup>, and Thomas F. Lytle<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Institute of Marine Sciences, Ocean Springs, MS 39564 and <sup>2</sup>Jackson State University, Jackson, MS 39217

Phytoremediation is a process using plants to remove contaminants from sediment, air or water. Though it is well known that many agricultural plants take up contaminants from soils, little is known regarding the uptake capability of coastal plants. A laboratory study was designed to assess the ability of *Spartina alterniflora* to take up Cd, Pb, Ag, Cr, and Cu from water. Peroxidase activity (POD) was measured on days two and eight to assess the ability of *S. alterniflora* to handle oxidative stress. Four replicate microcosms, each containing 12 plants, were prepared for each of the five metals tested and

four replicates were prepared as test controls. Test solutions were prepared in Hoagland's solution to contain 1 ppm metal concentrations. On days two and eight, half of the plants in each microcosm were collected and analyzed for heavy metals and POD. Heavy metal analysis was made using atomic absorption spectrophotometry and POD analysis was measured using UV/Visible spectrophotometry. One replicate microcosm from each treatment was evaluated for biomass. Biomass decreased in all metal treatments except chromium, and chromium biomass increased. Plants in the silver treatment lost significantly more biomass than those of the other metal treatments. Uptake of cadmium was small on day two but increased significantly from day two to day eight when it accumulated 16 times the exposure concentration. Chromium elicited both the strongest POD and glutathione response. *Spartina alterniflora* took up 16 times the exposure concentration of both cadmium and copper in eight days and may be a possible candidate for phytoremediation of heavy metals.

#### HABITAT RECORDS OF SOME FISH SPECIES IN THE VICINITY OF MISSISSIPPI SOUND

Sonya D. Barner\*, Sara E. LeCroy, and Chet F. Rakocinski, University of Southern Mississippi, Gulf Coast Research Laboratory Campus, Ocean Springs, MS 39566-7000

To generate museum records and document biodiversity in Mississippi coastal waters, fishes were collected from various habitats in Mississippi Sound and nearby Gulf of Mexico waters, ranging from Fort Bayou inshore waters to open waters near Horn and Chandeleur Islands. Samples were collected with seines and an otter trawl. Fishes were sorted, identified, catalogued and deposited in the fish museum at Gulf Coast Research Laboratory (GCRL). The GCRL Museum database was searched to provide additional information on the five most abundant species from each habitat in order to compare fish habitat preferences for the most common species collected. Forty species of fish were identified. The following families had the highest number of species: Carangidae (5), Fundulidae (5), Sciaenidae (5), Engraulidae (3) and Sparidae (3), followed by the Clupeidae (2), Gobiidae (2), Mugilidae (2), Synodontidae (2) and Syngnathidae (2). Of the seven species collected at the Fort Bayou station, *Menidia beryllina*, *Anchoa mitchilli*, and *Lucania parva* were the most abundant accounting for about 76% of the total catch. In the offshore areas of Barrier islands, eleven species were collected with *Anchoa hepsetus*, *A. mitchilli*, and *Saurida brasiliensis* being the most abundant. Two different distribution patterns were evident based on our collections. Pelagic forage species such as *Anchoa mitchilli* and *Menidia beryllina* were widespread, showed no apparent habitat association and were euryhaline, occurring widely throughout the area. The second pattern was shown by species that were associated with one or two habitat types. These included *Sauridia brasiliensis*, *Eutremus*

*teres*, and *Stenotomus caprinus*, which were collected only at the open water stations, *Gobiosoma bosc*, from low salinity mud bottoms, *Trachinotus carolinus* and *Menticirrhus americanus* from nearshore sand bottoms, and all three species of *Fundulus*, *Oligoplites saurus*, and *Eucinostomus argenteus* from high salinity grassbeds.

#### RELATIONSHIP BETWEEN THE FLUORESCENCE LIFETIME OF CHLOROPHYLL A AND PRIMARY PRODUCTIVITY WITHIN THE MISSISSIPPI PLUME AND ADJACENT SHELF REGION DURING HIGH-FLOW AND LOW-FLOW CONDITIONS

Callie M. Hall\*<sup>1</sup>, R.L. Miller<sup>1</sup>, S.M. Fernandez<sup>2</sup>, and B.A. McKee<sup>3</sup>, <sup>1</sup>NASA, Geospace Applications and Development Directorate, Stennis Space Center, MS 39522; <sup>2</sup>Ciencia, Inc.; and <sup>3</sup>Tulane University, New Orleans, LA 70118

In situ measurements of chlorophyll fluorescence intensity have been widely used to estimate phytoplankton biomass but provide little information on the physiological state of the phytoplankton under study. Lifetime-based measurements of chlorophyll fluorescence, however, provide a framework in which photosynthetic rates of phytoplankton can be analyzed according to phytoplankton physiology. Within photosynthetic organisms, high chlorophyll a lifetimes correspond to low photochemical efficiency and low chlorophyll a lifetimes correspond to high photochemical efficiency. Along with the measurement of primary production and ambient nutrient concentrations within the Mississippi River plume in the northern Gulf of Mexico, phytoplankton fluorescence lifetimes were measured using a Fluorescence Lifetime Phytoplankton Analyzer (developed under a NASA Small Business Innovative Research contract to Ciencia, Inc.). The extent to which nutrient and effluent loading within this dynamic coastal region affect the photosynthetic performance of phytoplankton, especially during low-flow and high-flow conditions of the Mississippi River, will be presented as a function of phytoplankton fluorescence lifetimes. Comparisons will be made between the relationship of phytoplankton primary productivity and chlorophyll a fluorescence lifetime during high and low discharge of the Mississippi River to the plume environment. Differences between chlorophyll a fluorescence lifetime and between primary productivity measured during the two flow regimes will be discussed also.

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#### FRIDAY MORNING

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##### Executive Room

9:00 SIMPLE SYRINGE FILTRATION METHODS FOR FIELD FILTRATION OF DISSOLVED TRACE ELEMENT SAMPLES

Alan M. Shiller, University of Southern Mississippi, Stennis Space Center, MS 39522

Adequate sample filtration is an important aspect of sample processing for dissolved trace element analysis. Inadequate filtration can be responsible for improperly high results. There have been debates in the literature about filtration protocols as well as defining the dissolved phase. Here I examine the use of both 0.45  $\mu\text{m}$  polyethylene and 0.02  $\mu\text{m}$  alumina syringe filters. Even for river water it appears that these filters can be properly cleaned for dissolved trace element sample processing. The use of all-poly syringes is also required. While only small (~10–15 mL) samples are obtained by this method, the use of highly sensitive analytical techniques such as high resolution ICP-MS allows quantification of many dissolved trace elements even at the low ppt level.

9:15 THE NORTHERN GULF OF MEXICO LITTORAL INITIATIVE (NGLI): A COLLABORATIVE MODELING, MONITORING, AND RESEARCH EFFORT

Vernon Asper<sup>1\*</sup>, John Blaha<sup>2</sup>, Carl Szczechowski<sup>2</sup>, Craig Cumbee<sup>2</sup>, Bob Willems<sup>1</sup>, Steven E. Lohrenz<sup>1</sup>, Donald Redalje<sup>1</sup>, and Arne-R. Diercks<sup>3</sup>, <sup>1</sup>University of Southern Mississippi, Stennis Space Center, MS 39529; <sup>2</sup>U.S. Naval Oceanographic Office, Stennis Space Center, MS 39529; and <sup>3</sup>Ocean Technologies, L.L.C., Pass Christian, MS 39571

The objective of the NGLI project is the implementation and testing of a circulation, sediment, and wave modeling system for the Mississippi Sound and adjoining rivers, bays, and shelf waters. The final product will be a system which can be utilized by local, state, and federal agencies for a variety of purposes that deal with military training, research into littoral processes, resource management planning, maximum nutrient loads, and the possible contamination of coastal waters, rivers, and beaches. In order to develop and refine this modeling system, a suite of in situ data is required, including the circulation, optical quality and physical characteristics of the water along with important atmospheric parameters such as wind speed and direction, rainfall, humidity, and barometric pressure. These parameters are being measured by an expanding suite of sensor systems, some of which relay their observations in real time to a data collection system at NAVO. The installation and maintenance of these sensors represents a substantial investment of both funds and effort, and will be discussed along with a presentation of the first data sets to be produced.

9:30 VALIDATION OF MODAS-NRLPOM FORECASTING SYSTEM

Germana Peggion\* and Daniel N. Fox, University of Southern Mississippi, Stennis Space Center, MS 39522

A scalable, rapidly relocatable version of the Princeton Ocean Model has been implemented to provide short term (2 day) forecast applications in support of real-time naval operations. The simulations are initialized with temperature and salinity fields generated by the

Modular Ocean Data Assimilation System (MODAS) which uses optimal interpolation to assimilate scattered profiles into a first guess field using remote sensed data. MODAS has proven to be a valuable tool in deep and open areas where a high correlation exists between surface and subsurface flow. In coastal areas the correlation is weak and MODAS nowcast may lack accuracy. We will present the results of 3 real-time exercises in 3 different coastal domains. 1) off the NJ coast in support of the LEO-15 program (where a large amount of in situ were available); 2) the Northeastern Gulf in support of the FBE-H naval exercise off Panama City, Fla. (where few data were collected), and 3) the Monterrey Bay, Ca in support of the Bioluminescence field program (no in situ data). All the cases have been configured with some nesting/coupling procedures between: 1) existing real-time large-scale models (such as POM in North Pacific and NCOM-global) and 2) 1-way nesting between domains of different resolutions. The coupling/nesting procedure will also be presented and discussed.

9:45 COMPARISON OF MOS FORECASTS AGAINST HIGH-RESOLUTION FORECASTS

Darryl Nash\*, Laurita Brown, Frederick Howard, and Pat Fitzpatrick, Jackson State University, Jackson, MS 39217

The Northern Gulf of Mexico Littoral initiative (NGLI) is an initiative sponsored by the U. S. Navy with participation from several companies and universities including Jackson State University. The purpose of this initiative is to implement, verify, and test a circulation-sediment-wave modeling system for the Mississippi sound, bays, and shelf waters. The goal of (NGLI) is to develop an improved, high-resolution forecast suite in support of troop developments in coastal (littoral) regions. The tools currently being used to assist in these predictions are Nested Grid Model (NGM) coupled with Model Output Statistics (MOS), which are considered to be the benchmark standards. The Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS) is a high-resolution forecasting tool developed by the Navy. COAMPS was designed to run at a higher resolution than MOS and is thought to provide more accurate forecasts than its predecessor. The purpose of our experiment is to examine whether COAMPS is the more accurate of the two forecasting systems. We plan to accomplish this by deploying a COAMPS model at predetermined sites along the Northern Gulf of Mexico Littoral Region. The data from our COAMPS model will be plotted against data generated from MOS models. Both models will then be compared against observed conditions to determine accuracy. It is our hypothesis that COAMPS will prevail as the more accurate of the two weather forecasting systems.

10:00 Break

10:15 EXAMINATION OF INHERENT OPTICAL PROPERTIES, BIOGEOCHEMICAL

### CONSTITUENTS AND PHYSICAL PROPERTIES IN SOUTHEASTERN LAKE MICHIGAN DURING STRATIFIED CONDITIONS

Amy G. Brown<sup>1\*</sup>, Steven E. Lohrenz<sup>1</sup>, and Gary L. Fahnenstiel<sup>2</sup>, <sup>1</sup>University of Southern Mississippi, Stennis Space Center, MS 39529 and <sup>2</sup>Great Lakes Environmental Research Laboratory, Muskegon, MI 49440

Evaluation of remote sensing algorithms in coastal and lake waters is limited by a paucity of in situ optical and biogeochemical data. This study is the first to examine the relationship between physical properties, inherent optical properties (spectral absorption and scattering), and dissolved and particulate constituents (e.g. SPM, Chl *a*, and CDOM) in southeastern Lake Michigan. Our study was conducted in the outflow region of the St. Joseph River during the stratified period in June, 1999. Our results demonstrated that the river is a potential source of horizontal gradients between nearshore and offshore stations, and contributed to a localized area of distinct bio-optical properties. The results of this study will be used to refine estimates of subsurface irradiance for modeling primary production and will contribute to a database for validation of ocean color algorithms for estimation of algal biomass and other constituents in this lake ecosystem.

### 10:30 A STUDY OF THE RELATIONSHIP BETWEEN LONGSHORE/OFFSHORE BAR DEPTH AND DISTANCE FROM THE SHORE

Cynthia M. Fiallos\* and Peter Fleischer, Naval Oceanographic Office, Stennis Space Center, MS 39522

Although the dynamics and morphology of offshore/longshore bars have been studied extensively, bar depth as function of distance from the shore is generally ignored. Knowing bar depth with respect to distance from shore, as well as the seasonal and tidal variables affecting bars, is advantageous when navigating vessels to the beach, and for conducting amphibious operations. We have compiled and analyzed data from the literature in order to determine what relationship exists between the depth of longshore/offshore bars and distance from the shore in various environments and seasons. Regression equations were calculated for data subsets as well as for combined data from various environments and seasons. The combined, full data set has a linear regression of  $y = 0.66 + 0.0071x$  ( $R^2 = 0.62$ ), which best describes the relationship between bar depth and distance from the shore. From limited data, it appears that bar depth and distance from shore diminish during spring. The effect of tidal range upon bar depth, the magnitude of seasonal variation, and type of coast require additional data to establish confidence in any relationships.

### 10:45 HIGH FREQUENCY COASTAL RADAR (CODAR) SURFACE CURRENT MEASUREMENTS IN THE MISSISSIPPI SOUND

Arne-R. Diercks<sup>1\*</sup>, Charles Riley<sup>1</sup>, Kim Pettway<sup>1</sup>, and Don Barrick<sup>2</sup>, <sup>1</sup>Ocean Technologies, L.L.C., Pass Christian, MS 39571 and <sup>2</sup>CODAR Ocean Sensors, Ltd., Los Altos, CA 94024

Two 25 MHz CODAR high frequency (HF) radar systems have been installed along the coast of the Mississippi Sound to acquire synoptic real time surface currents in coastal waters at a spatial resolution of one square kilometer. At over 500 grid points, current vectors are derived hourly in real time to produce surface current maps. Installation, operation and maintenance of these HF radar systems represents a substantial investment of both funds and effort. Concepts, operation and first results of these two shore-based CODAR systems will be presented. Objectives of the HF radar operations include the contribution of boundary data to the Northern Gulf of Mexico Littoral Initiative (NGLI) modeling system in the Mississippi Sound, and establishment of a database of high resolution surface currents. Long term surface current data can aid in tracking contaminants, trace their origin, and help in other environmental and research related objectives.

### 11:00 HIGH-RESOLUTION RECORD OF LATEST QUATERNARY PALEOCEANOGRAPHY IN THE GREAT AUSTRALIAN BIGHT

Charlotte A. Brunner\* and Miriam S. Andres, University of Southern Mississippi, Stennis Space Center, MS 39529 and Geological Institute, ETH-Zentrum, Sonneggstr. 5, CH-8092, Zurich, Switzerland

An enormous temperate-water, carbonate reef has dominated the structure of the continental margin of the Great Australian Bight (GAB) since the late Eocene. The bryozoan reef growth flourished in particular during the large fluctuations in Quaternary sea level, which sculpted redeposited reef carbonate into thick seismic sequences within the outer reef and adjacent reef and continental slope. Sediment accumulated at a stunning rate near 1 m/k.y. on the shelf edge and upper slope, where Quaternary-age sequences exceed 500 m in thickness. Despite the evident volumetric importance of temperate reef systems, such as the GAB, to burial of carbon, the nature and growth of temperate-water bryozoan reefs and reef slopes remain poorly known. In this study, the latest Quaternary sections of two ODP holes from the shelf edge (200 m water depth) and slope (700 m water depth) were examined in detail to determine the paleoceanographic conditions that modulate carbonate production in the GAB bryozoan reef. Assemblages of planktonic foraminifers, stable carbon and oxygen isotope anomalies, sedimentation rates, and other proxies of seawater properties were evaluated to determine the conditions that spurred periods of fastest carbonate production. Preliminary results suggest that strong, episodic upwelling stimulated production at the shelf edge during marine oxygen isotope stage 3.

11:15 CORAL REEF ECOSYSTEMS OF BELIZE  
Christopher Simmons\* and Gary Gaston, University of

Mississippi, University, MS 38677

Coral reef ecosystem off the coast of Belize, located around South Water Caye, is studied in terms of and pertaining to coral reef ecology. Reef ecosystem surrounding South Water Caye is studied and surveyed using a patch reef acquisition method. Aspects of physiology, morphology/behavior, and sex change/mating systems are studied and described using the tropical marine fish of the coral reef ecosystem.

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## FRIDAY AFTERNOON

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Executive Room

1:00     **FEEDING HABITS OF JUVENILE POMPANO (*TRACHINOTUS CAROLINUS*) COLLECTED FROM THE EASTERN GULF OF MEXICO**

Kersten N. Wheeler\*, Richard W. Heard, and Chet F. Rakocinski, University of Southern Mississippi, Gulf Coast Research Laboratory Campus, Ocean Springs, MS 39566-7000

Relatively little information is available on the feeding habits of the Florida pompano (*Trachinotus carolinus*) from the eastern Gulf of Mexico. From June to October 2000, juvenile pompano were collected from coastal habitats in Mississippi, Alabama, and Florida. These shallow water habitats offer a diverse array of potential prey items for this commercially important fish. We compared feeding habits of Florida pompano based on their size and collection site. The digestive tracts of the pompano were examined, and were found to contain at least 45 different prey taxa. Crustaceans, primarily juvenile mole crabs (*Emerita* sp.), were the dominant food item of the juvenile pompano from all of the collection sites. Our data indicates that during the summer/fall months, juvenile pompano are opportunistic feeders utilizing the most readily available food resources of the habitats in which they forage. In addition, we found that the diversity of the pompano diet decreases as the fish grows.

1:15     **EFFECT OF SALINITY ON FOOD CONSUMPTION BY THE MYSIDS, *AMERICAMYSIS BAHIA* AND *BOWMANIELLA FLORIDANA***

Natasha R. Magee\*, Eric J. Fisher, and Paulinus Chigbu, Jackson State University, Jackson, MS 39217

Mysids serve important trophic role in aquatic ecosystems where they occur. They are omnivorous, feeding on detritus and plankton, and serve as prey for many economically important fish species. In the nearshore areas of the Mississippi Sound, at least, three species have been reported including *Bowmaniella floridana*, *Americamysis bahia*, and *A. almyra*. These species are euryhaline, hence are capable of tolerating considerable variations in salinity that often occur in the nearshore areas of the Sound. The objective of our study was to determine if salinity has any

influence on food consumption by *B. floridana* and *A. bahia*. Mysids were acclimated in the laboratory to various salinity levels: 5, 15, and 35 ppt over a period of one week. During this period, they were fed *Artemia* nauplii daily. Thereafter, the mysids were transferred into 3 L plastic containers each containing a mysid. There were five replicates of each salinity treatment for a total of fifteen containers for each experiment. Mysids were then starved for 24 hours after which they were fed sixty (60) *Artemia* nauplii. After six (6) hours, the nauplii remaining in each container was counted. The mysids were subsequently killed, measured and identified. Food consumption by *B. floridana* was highest at 5 ppt and least at 35 ppt ( $P = 0.0001$ ). No significant differences were observed among salinity treatments in the number of nauplii ingested by *A. bahia* ( $P = 0.096$ ). It seems, therefore, that salinity is an important factor influencing growth and life history of *B. floridana*.

1:30     **MULTIPLE PATERNITY IN THE GRASS SHRIMP *PALAEEMONETES PUGIO***

Michelle A. Baragona\*, Lisa A. Haig-Ladewig, and Shiao Y. Wang, University of Southern Mississippi, Hattiesburg, MS 39406

Microsatellite markers were used to study the mating system of *Palaemonetes pugio*. Grass shrimp genomic libraries were screened for clones containing more than five tandem trinucleotide repeats or more than seven tandem dinucleotide repeats. Among the 11 microsatellite loci characterized, two were selected on the basis of polymorphism and ease of amplification to genotype 30 embryos from each of 10 brooding females collected from an estuary in the northern Gulf of Mexico. Results indicate that 8 of the 10 females were brooding embryos sired by more than one male.

1:45     **COASTAL WETLANDS "BROWN-OUTS": ARE THEY OCCURRING IN MISSISSIPPI MARSHES?**

Kristal E. Cromer\*, Matthew L. Treadway, Cynthia A. Moncreiff, John D. Caldwell, Brett R. Blackburn, and Nicole M. Opel, Cooperative Intern Program, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553 and Gulf Coast Research Laboratory, Sciences, University of Southern Mississippi, Ocean Springs, MS 39566-7000

Unexpected large areas of dead and dying *Spartina alterniflora* Loisel. were observed in Louisiana saltwater marshes during the summer of 2000. To date no causes for these "brown-outs" have been identified, although it is suspected that lack of rainfall is the reason why the plants are dying. Mississippi has experienced the same drought conditions, so there was interest in determining if this phenomenon was occurring in Mississippi's saltwater marshes. Overflights of the marshes in coastal Mississippi were conducted to look for dead and dying *Spartina alterniflora*. Local marshes were visited where observations on



the condition of saltwater marsh vegetation were made along with measurements of surface-water and soil-water salinity. Preliminary investigations suggest this phenomenon is not occurring in coastal Mississippi.

2:00 Break

2:15 FISHERY IMPLICATIONS OF *PHYLLORHIZA PUNCTATA* BLOOMS IN MISSISSIPPI COASTAL WATERS

Kirsten M. Larsen\*, Harriet M. Perry, Christine Trigg, and Tom VanDevender, Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39564

*Phyllorhiza punctata* von Lendenfeld 1884, a scyphomedusa native to the Indo-Pacific, and introduced to the tropical Atlantic and Caribbean in the 1960s, was initially sighted in Mississippi coastal waters in mid-June, 2000. Heaviest concentrations were noted offshore and in the vicinity of barrier island passes. By mid-August, massive numbers (~2 per m<sup>2</sup>) were present in western Mississippi Sound. The scyphomedusae are thought to have been transported from the Caribbean into the Gulf of Mexico via the Loop Current. Satellite altimetry assimilated into a numerical model from May 2000 indicates that a large eddy detached from the Loop current and moved onto the shelf in the northern Gulf. Current effects on area fisheries include clogging of shrimp nets with resultant gear damage and a decrease in trawling effort in areas where jellyfish are most numerous. Since *P. punctata* is a voracious filter feeder, potential impacts include a decrease in zooplankton biomass as a result of their high and constant filtering capacity. Many of Mississippi's fishery resources have planktonic larvae and there is concern that larval numbers may be reduced and overall abundance of these species affected. Peak abundance of meroplankton was coincident with bloom conditions of *P. punctata*. Long-term ecological effects of this non-indigenous species are unknown.

2:30 MISSISSIPPI SOUND'S PHYTOPLANKTON POPULATIONS: WERE THEY AFFECTED BY THE APPEARANCE OF *PHYLLORHIZA PUNCTATA*?

Matthew L. Treadway\*, Kristal E. Cromer, Cynthia A. Moncreiff, John D. Caldwell, Brett R. Blackburn, and Nicole M. Opel, Cooperative Intern Program, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553 and Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs MS 39566-7000

*Phyllorhiza punctata* were discovered in the Mississippi Sound in May of 2000 by researchers at the Dauphin Island Sea Lab and the USM Institute of Marine Sciences. This exotic jellyfish feeds by filtering large volumes of water, stripping it of phytoplankton, zooplankton, and small fish and crustaceans. Because of

this it competed with native fauna and may have altered the structure of food webs in Mississippi Sound. To examine the possible effects of *Phyllorhiza punctata* on phytoplankton, which form the base of the food web, we looked at chlorophyll a, total suspended solids, and phytoplankton community structure. These variables should allow any major impacts from jellyfish invasion to be detected. Since *Phyllorhiza punctata* has changed into a different life cycle stage, we may not know the full potential of their effects until they reappear in the spring time.

**MATHEMATICS, COMPUTER SCIENCE  
AND STATISTICS**

Chair: Dale Bowman, University of Mississippi  
Vicechair: Joseph Kolibal, University of Southern  
Mississippi

**FRIDAY MORNING**

Room 2

9:00 MISSISSIPPI CENTER FOR SUPER-COMPUTING 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 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. IHL Faculty and graduate students with an interest in high performance computing are also invited to attend.

**FRIDAY AFTERNOON**

Room 2

12:40 BOOTSTRAP ESTIMATES OF HOME RANGE SIZE USING MINIMUM CONVEX POLYGONS

Jake H. Olivier\* and Dale Bowman, University of Mississippi, University, MS 38677

One of the most widely used methods for computing home range size employs minimum convex polygons. This procedure is simple and quick to implement but is not probabilistic. A bootstrap procedure is proposed which retains the desirable properties of the minimum convex polygon while providing confidence intervals for the home range size. In addition the bootstrap procedure may be adjusted so that the estimated home range size is not dependent on the number of sampled points, as the minimum convex polygon generally is.

1:00 THE POWER OF AUTOTASKING

Germana Peggion\*, Alan Wallcraft, and Ray Sheppard Logicon, University of Southern Mississippi, Stennis Space Center, MS 39522

Ocean models are memory intensive with a relatively small ratio between computations per communications. Thus domain decompositions approach may not be efficient for simulations over small domains but for long time iterations. Under those conditions it would be still possible to achieve a good level of performance via auto tasking. The importance of such an approach is illustrated with the Princeton Ocean Model (POM). POM is a Fortran code written in the early 80s. Since then, new versions have been targeted to improve the physical formulation rather than the numerical efficiency Numerical simulations, conducted on two moderately parallel platforms: 1) Sgi-Origin 2000 and 2) Sun-Enterprise 10000 illustrate how model performances can be improved by taking advantage of the f77/f90 loop parallelization. The results indicate that it is possible to migrate old vector programs to the parallel environment without writing one parallelization statement in the original code.

1:20 USING AUGMENTED SERIATION TO STUDY THE SCHOOL DATA OF THE UNITED STATES: A GEOGRAPHIC DATA ANALYSIS TOOL

Lixin Yu\*, Myke Gluck, and Abhijit Parchure, Alcorn State University, Alcorn State, MS 39096 and Florida State University, Tallahassee, FL 32306

Focusing on the tool rather than the data, this presentation demonstrates a new data analysis software which integrates map viewers and a *seriation* matrix. Seriation, also known as reorderable or permuted matrix, is the process of looking for univariate sequences in data. It may be used as a tool for discovering patterns in numerical data. Seriation matrix cells contain icons proportional in size to data values rather than actual data values. This feature allows users to observe and compare fields with different data ranges. For example, it is hard to compare age and salary directly since age rarely has three digits but salary has five or more. However, they become

comparable after they are transformed into icons representing their relative ranks among records in each field. An icon for age 60 can be big and an icon for salary of 20,000 can be small. With this software, users can move rows and columns to visually discover graphical patterns of the data with meaningful interpretations, or use a built-in function to do the seriation. It is *augmented* because it has other multimedia features such as map viewer and sound. The system permits simultaneous display of maps and matrices and graphically links them. These augmented features expand the use of seriation and permit users to perform a visual analysis of numerical and spatial data concurrently. State data from Common Core of Data (CCD) published by the US Department of Education are used to demonstrate the data analysis process with this system.

1:40 TESTS FOR LOCATION WITH K SAMPLES UNDER THE KOZIOL-GREEN MODEL OF RANDOM CENSORSHIP

Ke Wu, University of Mississippi, University, MS 38677

In survival analysis, one is often interested in comparing several groups (or treatments) in terms of their means, medians, or distributions when data are possibly censored. This paper considers tests for location with k samples and randomly right-censored data. Under the Koziol-Green model of random censorship in which the survival distribution of the censoring times is some power of the survival distribution of the lifetimes, one class of k-sample location tests similar to those discussed by James (1987), which allows shapes do differ in the k populations, are developed. The tests are based on general estimating functions and do not require full parametric assumptions for large samples. The asymptotic distribution of the test scores is derived under the null hypothesis.

2:00 ROBUST CHARACTER OF THE RELIABILITY CHARACTERISTICS OF SOME STATIC SYSTEM MODELS WHEN THE PARAMETERS IN A LIFE TIME DISTRIBUTION ARE CONSIDERED AS RANDOM VARIABLES

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

Assuming random variations in the parameters of the life time distribution, static system models are analyzed in the Bayesian's framework. The random variations in parameters represented by prior distributions are updated by experimental data and are represented by posterior distributions in the Bayesian's framework. The present study, however, deals with robust character of the reliability characteristics of some static system models when parameters of life time distributions are assumed to be random variables.

2:20 Break

2:30 MATHEMATICAL EXPECTATION USED IN DETERMINING AN EQUITABLE OR FAIR GAME

Garfield Burke, Jr., Mississippi Valley State University, Itta Bena, MS 38941-1400

Casinos and state-run lotteries have become big business. For example, in Mississippi, following legislation in 1990, casinos have become a major addition to the state's tourism industry. There are also over 200 different lotteries games run by over 35 different states and at least 6 interstate games. Some states run only one game each, while some run over 10 different games. Often, gamblers are motivated by the value of a successful outcome rather than the probability of success. The games they play seem to be fair because all the game participants appear to have an equal chance to win the same prize. The study of probability has become increasingly popular because it has a wide range of practical applications. Many practical applications of probability used by actuaries, insurance companies, casino gambling, etc. are embedded in the phenomena of fair games and mathematical expectation. The concept of mathematical expectation, some times called expected value, originally arose in connection with games of chance and is used to formally define a fair game. One of the reasons gambling is exciting is that winnings on a single play or even a few plays are uncertain. However, in the long run, as the number of plays increases and increases, the relative frequencies of outcomes get closer and closer to a theoretical (or actual) probability value. This paper will explore not only some concepts used in describing probability, but also some different kinds of probability situations using mathematical expectation concepts.

2:50 PRACTICAL APPROACHES TO ESTIMATING VARIATION FOR SAMPLE SIZE CALCULATIONS

Carolyn R. Boyle, Mississippi State University, Mississippi State, MS 39762

The most crucial component in a sample size calculation is the estimate of effect size, which relates the expected treatment differences to the expected variation in response. The exact relationship depends on the experimental design and the method of analysis; however, if the effect size is small, then the required sample size will be large. To estimate the effect size, the experimenter must decide how big a treatment difference is of practical importance and estimate how much variation in the response will be observed in the completed experiment. It is obviously difficult to predict the variation in response prior to performing the experiment. On the other hand, an estimate could be based on a pilot study, on published studies using similar protocols, on the inherent variation observed in untreated experimental units, or even on the experimenter's expert judgement. It is important to obtain a realistic estimate of the variation because it greatly influences the sample size. For example, when comparing

two means using the two-sample t-test, the sample size required to detect a given treatment difference with a given power and confidence level is proportional to the square of the common standard deviation. If the common standard deviation is doubled, then the sample size quadruples and the total number of experimental units needed increases by a factor of eight (because there are two groups). This presentation will give a number of practical suggestions for obtaining a reasonable estimate of variation for use in sample size calculations.

3:10 HOW MANY EAVESDROPPERS GUARANTEE INTERCEPTION?

Jeffrey L. Stuart, University of Southern Mississippi, Hattiesburg, MS 39406

Consider a finite, loop-free undirected graph, which can be viewed as a bi-directional communications network. If one wishes to wisely deploy a team of eavesdroppers to intercept all communications between two nodes in the network, how large must that team be? This is closely related to the well-studied problem of the edge connectivity of a graph. However, in the eavesdropping scenario, one seeks the maximum over the sizes of all of the minimal cutsets of the graph rather than the minimum over the sizes. We will discuss how results on edge connectivity and on maximal clique structure can be used to produce bounds on the interception number. We will also discuss why computation of the interception number is algorithmically harder than computation of the edge connectivity.

3:30 Divisional Business Meeting

3:45 Meeting of the Mississippi Chapter of the American Statistical Association

**PHYSICS AND ENGINEERING**

Chair: S. Kant Vajpayee, University of Southern Mississippi

**THURSDAY MORNING**

Mississippi Room

9:00 DESIGN OF SEDIMENT TRAPS FOR REDUCING SILTATION IN HARBORS

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

Majority of harbors in the world are man-made and they are located on rivers, lakes, estuaries and ocean shorelines. Natural water depths at these locations is often inadequate for accommodating vessels with large draft. Depending upon the type of vessel, the requirement of

water depth could be as high as 18 to 20 meters. Navigation channels and harbor areas need to be dredged to this depth to permit passage of vessels to the berthing and anchoring locations. Sediment from the surrounding shallow areas enters the deep channel under tidal currents, waves and wind, which causes reduction in navigable depth. Periodic removal of this sediment is expensive and the operation may hinder navigation. Providing a sediment trap outside the navigation channel or harbor area is sometimes feasible under certain specific natural conditions. Such a trap collects sediment before it enters the areas of interest and thus keeps them operational. Sand traps do not catch all the sediment moving in the area. Hence dredging of the main areas cannot be completely avoided but the frequency and quantity of dredging in those areas can be significantly reduced. This increases the efficiency of their use and results in cost savings on maintenance dredging. The sediment trap itself must be emptied periodically to keep it functional. This operation can be easily performed independently at convenience without adversely affecting or hindering the navigation in the area. Sediment traps are very uncommon because they can be effective only at highly selective locations and cannot be provided as a general solution to channel sedimentation problem. Physical or numerical model studies are very useful in designing sediment trap. One such trap was designed for the Visakhapatnam Outer Harbor in India in the late 60's. The trap was constructed and has been found to be quite effective. Another trap has been designed at the Rollover Pass, Texas for trapping sediment before it enters the Gulf Intracoastal Water Way (GIWW). The effectiveness of this trap will be known only after it is constructed and starts functioning. Details of design of both the traps will be offered during presentation.

#### 9:20 CRYOGENICS IN MANUFACTURING

S. Kant Vajpayee, University of Southern Mississippi, Hattiesburg, MS 39406-5137

Manufacturing like all other fields of engineering continues to be on the lookout for physical phenomena that can be applied beneficially. Cryogenics is a recent example. Cryogenics-based technologies are making inroads in manufacturing, albeit slowly. Approximately 150 cryogenic processing companies, most of them mom-and-pop operations, exist worldwide. Cryogenic processing is claimed to improve wear resistance of tools and dies. With the resulting longer tool/die life, and reduced machine downtime and maintenance, it lowers operating costs. Simply chilling metals to sub-zero temperatures for stress relief and stabilization has long been practiced by Swiss watchmakers. In recent advances, extreme temperatures and computer-based controls are being used. In one treatment, under deep, dry, controlled systems, processing takes place at around  $-320^{\circ}\text{F}$ , near the temperature of liquid nitrogen. In the shallow-type, the temperature is around  $-120^{\circ}\text{F}$ . The temperature is slowly lowered by a microprocessor-based controller. Items to be treated remain

at that temperature for 20 to 60 hours. Such processes are finding applications in manufacturing associated with aerospace, firearms, sports, music, and tooling.

#### 9:40 FINITE ELEMENT ANALYSIS OF THE PRESSURE BEHAVIOR DURING THE PULTRUSION OF COMPOSITES

Tabious Hayes\* and Tyrus McCarty, University of Mississippi, University, MS 38677

A common problem associated with the manufacture of composites is the formation of voids in the final product. The voids in the composite adversely affect the strength of the final product. A high pressure rise in the die inlet region can eliminate the voids. The elimination of voids can lead to a better quality final product. The purpose of this research is to determine the effect that various process control parameters have on the pressure rise during the pultrusion process. A numerical approach referred to as the finite element method is employed in this study. Finite element analysis is used to investigate the effect of the process control parameters of pull speed, fiber diameter, and fiber volume fraction on the pressure rise in the pultrusion die region.

10:00 Break

#### 10:20 THE EFFECTS OF MICRO-ADAPTIVE FLOW CONTROL OVER ROTOR BLADES

Tamara Crawford\* and Sumon K. Sinha, University of Mississippi, University, MS 38677

Flow separation control is an integral part of controlling the boundary layer of numerous aerodynamic devices. Presently there are devices known as transducers, which are available to aid in flow separation control. The transducer employs thin conductive strips of the same height to transmit vibrations over Mylar film. This is done in an effort to alter the boundary layer. Although some results have been achieved in the modification of a steady boundary layer flow, the obstacle of yielding repeatable results on pitching airfoils is still prevalent. After further analyses of the device, the transducer was redesigned. The modified transducer now has a fixed number of high and low strips which alternate throughout the array. Additionally, the Mylar membrane is pre-tensioned to prevent wrinkles on the outer surface, which if left done could lead to inconsistent and undesired effects. These changes produce better control of membrane vibration. Tests conducted via wind tunnels using the modified transducer produced repeatable and improved results for flow separation control on a NACA-0012 airfoil. Once further research has been conducted, the modified transducer could propel aerodynamic studies to the next level.

#### 10:40 EFFECT OF HEAVY SUBSTITUTION IN THE BENZENE RING ON THE RING-MODES OF BENZENE II. PHENYLTHALLIUM DICHLO-

## RIDE

Chandra M. Pathak\* and B.P. Asthana, Alcorn State University, Alcorn State, MS 39096 and Banaras Hindu University, Varanasi, 221005 (INDIA)

The vibrational frequencies related to the ring modes in benzene remain fairly constant when one of the hydrogen atoms in the benzene ring is substituted with a single lighter atom or a lighter group of atoms. The present work describes the effect of replacing a single hydrogen atom in the benzene ring with a relatively heavier group : TICl<sub>2</sub>. The studies included the investigation of the infrared spectra of Phenylthallium Dichloride in solid phase covering the spectral region 4000–20 cm<sup>-1</sup> and the normal coordinate analysis. The far-infrared spectra in the region 500–20 cm<sup>-1</sup> were recorded and investigated for the first time. The normal coordinate analysis was carried out using the ‘least square iterative technique’ assuming a geometrical model with a C<sub>2v</sub> symmetry for the molecule and has supported the frequency assignment quite well. Twenty-eight symmetrized principal force constants and seven interaction force constants have been found to reproduce the observed frequencies. The average percentage error between the calculated and observed frequencies has been found to be 2.20% with the standard deviation not exceeding 6.74 cm<sup>-1</sup>. The standard deviation in the force constants was found to lie in the range 0.002–0.235 mdyne/A.

## 11:00 VISUAL ANALYSIS OF ELECTROPHORETIC DEPOSITION OF CHAIN MACROMOLECULES WITH A COMPUTER SIMULATION

Vasudevan Rainamijam\* and R.B. Pandey, University of Southern Mississippi, Hattiesburg, MS 39406

A computer simulation model is used to study the growth of polymer density and conformation of polymer chains in an electrophoretic deposition process. We consider a discrete lattice of size  $L_x * L * L$  with a large aspect ratio  $L_x/L$ . A chain macromolecule of length  $L$ , is modeled by  $(L_c + 1)$ -nodes connected by bonds on a trail of random walk with a self-avoiding-walk constraint. Chains are released from one end ( $x = 0$ ) of the sample and are driven toward an impenetrable substrate/wall at the opposite end ( $x = L_x$ ). In addition to excluded volume, we consider a polymer-polymer repulsive and polymer-wall attractive interaction. A Metropolis Monte Carlo method is used to trace chain nodes with dynamics such as kink-jump and crank-shaft. As the chains move and deposit on the substrate, polymer density grows and their conformation evolves via relaxation depending on the driving field, temperature, and molecular weight. Attempts are made to visualize this process and analyze the effects of these parameters.

## 11:20 MODELING OF HUMAN LEG FOR SYSTEM STABILITY ANALYSIS

Ching-Sia Lim\* and J.P. Sharma, University of

Mississippi, University, MS 38677

Muscular and skeleton systems are the key elements for strength, support and locomotion to the human system. The shank, a part of the human leg system supports body weight for walking and running. This may be considered as an assembly of mechanical springs, mass and damping elements. Its mode of vibration and stability depends upon stiffness, damping coefficient and their arrangements in the muscular and skeletal system. The modeling and analysis of this system has shown that the rate of change of stiffness and damping takes place in several stages. In this paper four stages have been considered for these changes: stage 1 (child with age up to 3 years); stage 2 (adolescence with age ranging between 3+ years to 20 years); stage 3 (adults in the age group from 20+ years to 65 years) and stage 4 (old age considered beyond 65+ years). Results show that the rate of change in both the stiffness and the damping in the stage 3 are negligible. This also means optimum stability is achieved by the human locomotion system between the ages 20 to 60 years. However, towards the end of this stage, the changing rate of the damping elements decreases but not the stiffness. In stage 4, these changes lead to brittleness of the system. The brittleness occurs when the bone loses its pores and permeability and fluids dries out in the muscles fibers. A linear model is used to simplify the analysis of this system. Different cases for each stage are discussed from results computed using the circuit simulation software SPICE as a virtual analog computer.

## 11:40 ONE-HUNDRED-AND-ONE WAYS TO DEFINE QUALITY

S. Kant Vajpayee, University of Southern Mississippi, Hattiesburg, MS 39406-5137

In this age of quality, the most fundamental question still remains: What is quality? As an abstract term, quality is difficult to define and associate with an acceptable meaning. A large number of professionals whose job is to produce high quality products and services have recently been asked to define quality. More than eighty of them responded with definitions from the sublime to the ridiculous. It is well nigh impossible to have one definition of quality that will satisfy everyone. Quality means different things to different people in different industries in different jobs. Some interesting definitions are: “Quality is when the customer returns and the product doesn’t,” by Jim Taglieber; “Quality is never having to say you’re sorry,” by David Laschinger; “Quality is peace of mind,” by Mihail Liviu Iliescu; “Quality is working without hassles,” by Satish Pendharkar. For mathematically-oriented people, Dave Wiemer offers: “Quality = Maximization of perceived value = Fulfillment of tangible and intangible expectations = (Good product or service performance + customer service) Attributes/Cost.” A comprehensive meaning of quality, based on these responses and their analysis, will be provided in the presentation.

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**THURSDAY AFTERNOON**

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## Mississippi Room

**1:30 EFFECTS OF THE ELEMENT CONCENTRATION ON THE LIBS SPECTRAL INTENSITY**

Sean Lestrade\*, Chun Fu Su, Fang-Yu Yueh, and Jagdish P. Singh, Mississippi State University, Mississippi State, MS 39762

In recent years, laser-induced breakdown spectrometry (LIBS) has been used to identify the elements and evaluate their concentrations present in solid, liquid, and gas samples. The effect of the sample temperature on the spectral intensities obtained by the LIBS technique is one aspect of these studies. The results have been presented at past MAS annual meetings. This current study focuses on the effects of the elemental concentrations on the LIBS spectral intensities. Two categories of samples are investigated; commercial aluminum alloy samples and vitrified glass samples produced by a transportable vitrification system (TVS). Eight samples of the former and five of the latter were used in this study. Each sample contains more than ten elements. The concentrations of some elements of each sample were analyzed by the atomic absorption technique performed at Mississippi State University. The analyzed results were used as references for the project. The element concentrations differ between samples. The results of the LIBS technique show that the observed spectral intensities for each element have a linear relationship with the sample concentration. These results were consistent with what was expected. The experimental procedures and more detailed results will be presented.

**1:50 AN EFFICIENT MODELING OF WAVEGUIDE-BASED PATCH AND SLOT ANTENNAS FOR SPATIAL POWER COMBINING APPLICATIONS**

Milan Lukic\* and Alexander B. Yakovlev, University of Mississippi, University, MS 38677-1848

In this paper, a full-wave analysis of waveguide-based patch and slot antennas is proposed for the modeling of spatial power combining amplifier arrays. The analysis is based on the integral equation formulation discretized via the method of moments for the electric and magnetic current density. This results in the Generalized Scattering Matrix for all propagating and evanescent TE and TM modes of a waveguide transition containing interactive patch and slot antennas. In this formulation, the electric dyadic Green's functions are obtained in the form of a double series expansion as the solution of Sturm-Liouville boundary-value problems for layered waveguides. Numerical results are obtained and compared with other numerical methods for the scattering parameters of single patch and slot antennas and aperture-coupled patch arrays operating at X-band. Multimoding and surface-wave

coupling effects are studied leading to a better understanding of power combining mechanisms in spatially distributed structures. The proposed numerical-analytical approach can be effectively used in modeling large antenna arrays as encountered with spatial power combiners.

**2:10 X-BAND P-I-N DIODE MODULATOR**

Tracy L. Jeffries, University of Mississippi, University, MS 38677

The purpose of this project is to test the feasibility of the design of a shunt switch for radio frequency (RF) waveguides or transmission lines that will be the basis of the design for an X-Band P-I-N diode modulator. The designed circuit consists of an electronic timer, transistor driver, switching diodes, and waveguide. The last phase of this project requires the layout of the driver circuit and fabrication of a printed-circuit (PC) board for the diode driver. This procedure is performed using a numerically controlled milling machine that removes the copper cladding during the engraving process for the circuit. The design of this circuit is examined using three different techniques: an analytical approach, a circuit simulation using the software program PSPICE, and experimental test and verification of the circuit performance. All three methods yielded the same basic results that verified the design of an X-band modulator. This switch is used to square wave modulate a 50 milliwatt flange mount, Gunn diode source in X-band at 1 kilohertz for microwave measurement applications.

**2:30 FULLY AUTOMATED BOUNDARY ISOLATION IN HIGH-RESOLUTION SATELLITE IMAGES**

Harold A. Dunsford\* and John Patrick Lestrade, Mississippi State University, Mississippi State, MS 39762

The advent of 1-meter resolution panchromatic data and 4-meter resolution multispectral data from the IKONOS satellite provide the remote sensing community with new opportunities to study smaller areas, such as roads and urban structures. Our research focuses on the application of grouping algorithms and wavelet analyses to perform image segmentation and classification. Using edge detection algorithms in conjunction with ancillary and contextual information, this classification supplies the necessary constraints for successful fully-automated boundary isolation.

**2:50 Break****3:10 ANNULAR DIELECTRIC RESONATOR LOADING A MONOPOLE ANTENNA**

Swee H. Ong\* and Ahmed A. Kishk, University of Mississippi, University, MS 38677

One widely used antenna is the monopole antenna, which is a wire antenna placed normal to a ground plane. This antenna is normally of a quarter wavelength. It is a narrowband antenna and requires a matching circuit most

of the time to achieve a certain bandwidth. Instead of using a matching circuit that increases the antenna losses, we loaded the monopole antenna by an annular dielectric resonator. When the monopole is loaded with the annular dielectric resonator in a symmetric form, the radiation pattern remains the same as that of the unloaded monopole antenna and its matching bandwidth increased. The bandwidth increase is due to the excitation of the zero order mode of the dielectric resonator. Numerical results will be presented to show the effect of the dielectric loading on the antenna characteristics. When the dielectric loading becomes asymmetric, the radiation pattern's shape changes from the monopole type to the broadside type, with the radiation pattern peak points in the direction of the monopole. This is because the monopole in this case excites the non-zero order mode of the dielectric resonator and the radiation pattern is affected by the dielectric resonator mode more than the monopole antenna mode. Within the bandwidth, the radiation pattern is disturbed a little due to the mixing of the monopole mode and the dielectric resonator mode.

### 3:30 GAMMA-RAY BURST TIME PROFILES: ARE THE INTENSITY PEAKS RANDOMLY DISTRIBUTED IN TIME?

Sarah B. Nage\* and John Patrick Lestrade, Mississippi State University, Mississippi State, MS 39762

Gamma-ray bursts (grb) are cosmic explosions that are more powerful than anything since the Big Bang. Their sources are cosmological, i.e., they are located outside our galaxy. Of the thousands of grb detected, we have been able to measure the redshifts of only 18 ranging from  $z = 0.4$  to  $z \sim 5$ . Their causes remain unknown. As a starting point in our research, we are looking for patterns in the grb intensity time profiles. The statistic that we use is the Gini-Simpson Index, a measure of dispersion based on the Poisson distribution. We use this index to determine if evidence of patterns in the distribution of inter-peak times is statistically significant. The arrival times of the intensity peaks in 100 gamma-ray burst time profiles have been measured and the results of the statistical test will be presented.

### 3:50 Divisional Poster Session

#### NUMERICAL ANALYSIS OF GROUNDED COPLANAR WAVEGUIDES

Xuexun Hu\*, Atef Z. Elsherbeni, and Charles E. Smith, University of Mississippi, University, MS 38677-1848

This research is a study of the transmission characteristics of grounded coplanar waveguides (GCPW) with the objective to improve transmission at an operating frequency of 10 GHz. Three types of GCPW configurations are investigated in this study: the ordinary GCPW (geometry A), a GCPW with large air cavity under the center line feed (geometry B), and a GCPW with two small air cavities under the gaps between the feed line and the

side grounds (geometry C). The finite difference time domain (FDTD) technique for a meshed computational space with inhomogeneous lossy dielectrics is used to calculate the distribution of electromagnetic fields in these three configurations of GCPW. The computation of transmission parameters, including the attenuation and scattering parameters as a function of frequency are calculated for these examples over a desired frequency range. Two types of boundaries, perfectly electric conductor (PEC) and an absorbing boundary condition (ABC), are applied in this study. Comparison of numerical results reveal that the geometry B yields the lowest return loss and the lowest attenuation as compared to the other two designs.

#### ACCURATE CHARACTERIZATION FOR THE DIELECTRIC PROPERTIES OF BIOLOGICAL TISSUES BASED ON MULTI-TERM DEBYE DISPERSIVE RELATION

Atef Z. Elsherbeni\* and Mohamed A. Eleiwa, University of Mississippi, University, MS 38677-1848

Debye modeling for the dielectric properties of dispersive materials facilitates its incorporation into the Finite-Difference Time-Domain (FDTD) formulation. This paper generates a comprehensive list of multi-term Debye coefficients for 16 biological tissues. A numerical technique is developed to accurately fit one, two, and three-term Debye equations with the published experimental data of biological tissues. The proposed numerical technique is a two-step procedure. First, Matlab "invfreqs" is used to find the numerator and denominator real coefficients of the polynomial representing the measured dielectric constant  $\tilde{\epsilon}^*(\omega)$ . Then Matlab "residue" is used to convert the obtained quotient of the polynomial form of  $\tilde{\epsilon}^*(\omega)$  to the partial function expansion from which the corresponding Debye coefficients are calculated. Tables of Debye coefficients (two and three terms) for a wideband of frequency are presented. For verification purposes, the obtained coefficients are substituted back into Debye equation to reconstruct the complex dielectric constant  $\tilde{\epsilon}^*(\omega)$ . The reconstructed  $\tilde{\epsilon}^*(\omega)$  is shown to be in excellent agreement with the measured data over the frequency range 1 Hz to 20 GHz.

#### ON THE USE OF A GENETIC ALGORITHM FOR PATTERN CORRECTION OF A LINEAR ARRAY

Lee A. Harrison, Raytheon, Inc., Brandon, MS 39042

In recent years, the Genetic Algorithm (GA) has received much attention in areas of electromagnetic optimization problems. Some examples include the design of layered material for broadband microwave absorber, antenna array pattern shaping, minimization of side lobes by array thinning and the design of microwave filters. When one or more elements in an antenna array are damaged, this can lead to pattern deformation, such as a major increase in side lobe level, which may prove to be detrimental to antenna operation. A method for adjusting

the functioning elements to compensate for the failing elements would prove valuable in circumstances where replacing the damaged elements is impractical, such as in the battlefield or in satellite communications. In this paper, the GA is studied as a method to correct for element failures in a linear array. This method is based on a steady state genetic algorithm that employs binary coding of the amplitude and phase coefficients of the array elements. Comparisons are made between the original and corrected patterns for single and double element failures.

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## FRIDAY MORNING

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### Mississippi Room

9:00 A STATISTICAL STUDY OF BACKGROUND NOISE IN GAMMA-RAY BURST TIME PROFILES

Christopher G. Kelly\* and John Patrick Lestrade, Mississippi State University, Mississippi State, MS 39762

When the detectors of an experiment in earth orbit record a burst of high-energy gamma radiation, the burst signal is mixed with background radiation. The cause of the burst might be the collision of two neutron stars or a large mass falling into a black hole. The background "noise" is in the form of high-energy photons that emanate from both known sources such as black holes and X-ray binaries and countless unknown sources in the universe. In this project we study the statistical properties of this background radiation. In addition to learning more about the sources of the noise, we hope that this research will lead to a clearer identification of the start and end points of the burst itself.

9:20 ANALYSIS OF CONICAL SHAPED DIELECTRIC RESONATOR ANTENNAS

Yan Yin\*, Ahmed A. Kishk, and A.W. Glisson, University of Mississippi, University, MS 38677

Last year we had presented a parametric study of dielectric resonator antennas with conical shapes. The antenna was excited by a coaxial probe. This excitation method requires machining of the dielectric resonator to host the coaxial probe inside the dielectric resonator. It also excites several modes that may disturb the radiation pattern symmetry. To isolate the excitation mechanism from the radiation domain, another excitation is considered. The excitation is a narrow slot on a ground plane, where the dielectric resonator resides on the slot. From the other side of the ground plane a microstrip transmission line is coupled to the slot. To achieve this coupling the transmission line is placed normal to the slot. The microstrip line is designed to have a characteristic impedance of  $50 \Omega$ . Thus, it is required to match the antenna input impedance to the transmission line. This is achieved by the proper design for the slot length and width, and also by adding a matching stub to the microstrip transmission line. Through an optimization of these

parameters we have achieved a wide frequency matching for the antenna that is more than 50%. This type of excitation is selected also to achieve a wide radiation bandwidth. Samples of these results will be presented with a comparison between the slot excitation and the coaxial probe excitation.

9:40 COMPARATIVE ANALYSIS BETWEEN CONICAL AND GAUSSIAN HORN

Ahmed A. Kishk, University of Mississippi, University, MS 38677

Conical horn antennas are normally excited by circular waveguides. In this case, cylindrical waves with planar phase front propagate inside the waveguide and are transformed to spherical waves in the conical horn with a spherical cap aperture. When the horn apex angle increases the aperture phase error increases causing a reduction in the horn directivity and an increase in the side lobe level. A Gaussian horn introduces a smooth transition between the circular waveguide aperture and the horn aperture in the sense that the cylindrical waves in the waveguide transform to nearly spherical waves inside the horn and then back to cylindrical waves at the horn aperture. The cylindrical wave on the Gaussian horn aperture has smaller phase error. Here, a comparison between the performance of the conical horn and the Gaussian horn will be presented. While it is recommended that the Gaussian horn should be long with small radii ratio between the waveguide radius and the horn aperture, we have analyzed horns with large radii ratio to shorten the horn length and reduce the phase center variation within the frequency band. Reducing the horn length reduces its weight and make it more attractive for space antenna applications. To improve the radiation characteristics of the horn, a corrugated Gaussian horn is studied. This horn is a promising candidate as a feed for parabolic reflectors. Therefore, the horn is analyzed as a feed for the parabolic reflector. The reflector efficiencies such as phase efficiency, spillover efficiency, and total reflector efficiency are computed. The reflector efficiency is improved to about 80%.

10:00 Break

10:20 CHARACTERISTICS OF CIRCULAR DIELECTRIC ROD LOADED WITH CONDUCTING STRIPS USING THE ASYMPTOTIC STRIP BOUNDARY CONDITIONS

Andrew E. Simon\* and Ahmed A. Kishk, University of Mississippi, University, MS 38677

Circular dielectric guides are used as fiber optics cables. Also, dielectric rods are used as antennas. The dielectric rod can be excited by a circular waveguide. The radiation characteristics of such a dielectric rod antenna can be controlled by the rod length and shaping its end. Here, we load the rod with conducting strips. The



characteristics of the rod as a guiding structure is investigated and the supported modes are analyzed. The strips form a helix around the rod with very large number of turns ( $N$ ) per wavelength. The number of turns is taken to be large in order to apply the approximate asymptotic strip boundary conditions (ASBC) to simplify the analysis. The ASBC is used when the spacing between the helix turns,  $S$ , approaches zero. The solutions using this assumption were found to be valid for practical cases when the period  $S \ll \lambda/10$  ( $\lambda$  is the wavelength) and when the pitch angle is 0 degree (circumferential strips) and 90 degrees (longitudinal strips). With this assumption, the tangential fields along the strips are zero electric field and continuous magnetic field, and the tangential electric field in the transverse direction to the strips is continuous. The dielectric rod with such surfaces supports the conducting waveguide modes and the dielectric rod mode. The propagation constant and cutoff frequencies are computed and compared with those of the dielectric rod and the circular waveguide. A mode chart and field distribution for different modes will be presented.

10:40 USE OF THE SYMBOLIC SOFTWARE IN THE DERIVATION OF THE GREEN'S FUNCTION DUE TO A SOURCE IN A GROUNDED DIELECTRIC SUBSTRATE

Jin Yu\* and Ahmed A. Kishk, University of Mississippi, University, MS 38677

Analytical solutions of complicated mathematical problems sometimes require high level skilled researchers to perform a lengthy derivation of mathematical expressions. Performing that with a pencil and a sheet of paper sometimes is carried out through several trials of repeating the derivation to assure that the final expressions are correct. Most of the time, one may find that in the middle of the derivation something was written in error from one step to the next, and the error is carried over to the following steps leading to incorrect expressions. For a non-experienced person this may lead to frustration. With the available symbolic software such as Maple, one can derive very complicated expressions and reach simple form of the expressions, as much as possible. These types of symbolic software can be used for many purposes. However, we are presenting a simple example of their possible use. Here, we used Maple to derive the Green's function expressions for a grounded dielectric substrate excited by an electric or magnetic current source. The procedure used in the derivation of Green's functions will be presented. Another advantage of using this symbolic software is that these expressions can be programed in FORTRAN or C by the software, which you can use. A live presentation will be carried out to show the simplicity of the procedure.

11:00 HIGHER ORDER WAVELET-LIKE BASIS FUNCTIONS IN A FINITE ELEMENT ALGORITHM

Elliott Hutchcraft\* and Richard K. Gordon, University of

Mississippi, University, MS 38677

The objective of this research is to investigate the use of higher order wavelet-like basis functions in the finite element solution of partial differential equations. These wavelet-like basis functions are obtained from the traditional higher order finite element basis functions using an algorithm developed by Stephane Jaffard. In this talk, the generation of the wavelet-like basis functions will be discussed, and numerical results obtained using these basis functions will be presented. Comparisons with results obtained using the traditional higher order finite element basis functions will be considered in order to highlight the advantages and disadvantages of this technique.

11:20 Divisional Business Meeting

**PSYCHOLOGY AND  
BEHAVIORAL NEUROSCIENCE**

Chair: Pamela Banks, University of Mississippi  
Medical Center

Vicechair: Billy Barrios, University of Mississippi

**THURSDAY MORNING**

Room 604

8:20 RACE, RECEPTIVITY, AND COMPROMISE  
Jerome Burt\* and Billy A. Barrios\*, University of Mississippi, University, MS 38677

The present study examined the modern face of racism as manifested through differences in receptivity, i.e., the display of openness and interest in others. Forty white male undergraduates were placed in a waiting-room situation with either a white male confederate posing as a fellow subject or a black male confederate posing as a fellow subject. The four-minute waiting period was monitored continuously via a hidden video camera and subsequently rated for the following response elements of the receptivity construct: interpersonal distance, openness of body posture, directed gaze, positive affect, and verbal engagement. High estimates of interrater reliability and moderate estimates of interrelationships among the response measures were obtained. As expected, the white male participants were more receptive to the presence of the white male confederate than they were to the presence of the black male confederate (i.e., more eye contact, more positive affect, greater openness of body posture, and greater levels of conversation to the white confederate than to the black confederate). Following the waiting room situation, a conflict situation was created in which the subject and confederate attempted to resolve. Their negotiations were monitored via a hidden video camera and

later rated for the following response elements of the compromise construct: cooperation, appropriate assertiveness, active listening, and brainstorming. Small to moderate correlations were obtained between the receptivity measures and the compromise measures of the white subjects in the black confederate condition, suggesting the modern face of racism may find expression through both of these fundamental forms of social interaction.

8:40 AFRICAN-AMERICAN STUDENTS ATTENDING A PREDOMINANTLY WHITE INSTITUTION: A STUDY OF RACIAL IDENTITY AND ATTRITION

Bertha Langin-Ealey\* and Billy A. Barrios \*, University of Mississippi, University, MS 38677

In recent years, predominantly white universities have been very successful in recruiting greater and greater numbers of African American students. They have not been so successful in graduating African-American students at rates equal to that of their white students. What is more, these institutions have directed far more attention to the matter of white student attrition than they have to the matter of black student attrition. The widely-researched and widely-accepted Tinto model of student persistence/attrition has been the focus of much of the former. In Tinto's model, dropping out of college before attaining a degree is seen as a function of three sets of variables: individual student characteristics, goals and commitments, and institution's academic and social systems. The present study tested the validity of the Tinto model in predicting attrition/persistence among African-American students attending The University of Mississippi. Seven core propositions of the model were tested on a sample of over one hundred incoming African-American students: (1) the student entry characteristic of racial identity would be associated with commitment to graduation, (2) academic integration would be associated with commitment to graduation, (3) social integration would be associated with commitment to the institution, (4) commitment to graduation would be associated with persistence in college, (5) commitment to the institution would be associated with persistence in college, (6) pre-entry commitment to graduation would be associated with in-school commitment to graduation, and (7) pre-entry commitment to the institution would be associated with in-school commitment to the institution. Mixed support for the model was obtained, suggesting the need for refinements in order to enhance the generality of the model to minority populations.

9:00 HINDLIMB COORDINATION IN INFANT RATS

Gabriel Haymon<sup>1\*</sup>, Sarah Waller<sup>1</sup>, Sheree Watson<sup>1</sup>, and Scott Robinson<sup>2</sup>, <sup>1</sup>Jackson State University, Jackson, MS 39217 and <sup>2</sup>University of Iowa, Ames, IA 52242

Fetal and neonatal mammals exhibit spontaneous movement as a normal aspect of early behavioral

development. The importance of this spontaneous activity in the development of motor coordination has not been well characterized. If spontaneous limb activity influences the patterns of later motor behavior, interventions that impose specific motor patterns should increase rates of those patterns. In the present study, the hindlimbs of newborn rats were yoked such that the limb movements were constrained to an alternated stepping pattern. The rats that underwent yoke training demonstrated higher levels of the alternating stepping pattern than unyoked controls. These results imply the existence of a functional kinesthetic sense soon after birth and indicate that motor learning may provide an important contribution to early motor development. This research was supported by NIH grants 5T34GM07672-23 awarded to Richard Sullivan and HD33862MH50701 awarded to Scott Robinson.

9:20 EFFECTS OF PARITY ON SEXUAL RECEPTIVITY IN FEMALE BUSHBABIES

Sheree Watson\*, Aarion Gray, Ronda Stavisky, Kenchetta Collins, LaTarsha Henderson, and Natalie Herndon, Jackson State University, Jackson, MS 39217

Bushbabies are prosimian primates which exhibit consistent sex ratio biases in favor of male offspring. There is a birth order effect with the sex ratio bias most pronounced for the offspring of primiparous females. Several physiological variables have been suggested as mechanisms influencing sex ratio, but the successful influence of physiological variables may depend on interaction with behavioral mediators. The present study examined sexual behavior and vaginal epithelialization in 5 nulliparous and 5 multiparous female bushbabies. The duration of vaginal epithelialization was compared for nulliparous and multiparous females for a two year period. When the reliability of the sexual cycle was established for each female, it was placed with a mate. Behavior was videotaped through courtship and first copulation. First day of copulation within the receptive period was recorded. Male bushbabies successfully mated with nulliparous females earlier in the receptive period than with multiparous females ( $p = .03$ ). Nulliparous females tended to have longer maximum periods of epithelialization than multiparous females ( $p = .1$ ). These results are consistent with the hypothesis that behavioral factors interact with physiological factors to produce sex ratio bias. The differences in timing of mating with nulliparous and multiparous females may result from prior mating experiences, changing hormone levels associated with bearing and rearing young, or a combination of experiential and physiological factors. This research was supported by NSF Grant 9874475.

9:40 Break

9:50 ALTERATIONS OF DENDRITIC LENGTH AND CONNECTIVITY IN SCHIZOPHRENIC CORTEX

Lathen Hardy<sup>1\*</sup>, Sheree Watson<sup>1</sup>, and William Greenough<sup>2</sup>,  
<sup>1</sup>Jackson State University, Jackson, MS 39217, and  
<sup>2</sup>University of Illinois at Urbana-Champaign, Champaign,  
 IL 61820

Schizophrenia is a severe chronic mental illness that affects approximately 1% of the world population. Structural anomalies have been consistently noted in the brains of schizophrenics. These anomalies include ventricular enlargement and reduced cortical thickness coupled with increased cellular density in prefrontal cortex. The present study compared Golgi stained brain tissue from schizophrenic and control cases for evidence of differential number of synapses per neuron and differential size of synaptic components in cortical Areas 10 and 17. Results indicated that neural connections are impoverished and dendritic length of neurons is reduced in the prefrontal cortex of schizophrenics compared to those of normal controls. The differences, however, were less pronounced in Area 17 than in Area 10. These results are consistent with the results of previous studies which found diminished neuronal material and impoverished neural connectivity in the schizophrenic cortex. This research was supported by NIH grant ST34GM07672-23 awarded to Richard Sullivan.

#### 10:10 MIGHT FALSE CONSENSUS EFFECTS INFLUENCE PERCEPTIONS ABOUT SOCIAL BEHAVIOR?

Pamela G. Banks\*, Sheree Watson, and Carmenita Jiles,  
 Jackson State University, Jackson, MS 39217

There has been substantial research examining gender differences in agreement with stereotypes about sexual behavior. We investigated gender differences in agreement with statements about sexual stereotypes usually attributed to women, but we applied them to males. Ninety-three male and 168 female undergraduates responded to a survey assessing attitudes about male sexual behavior. Respondents were asked to indicate on a 5-point scale the extent of agreement with statements such as "Men tend to prefer lovers who are aggressive, forceful, and dominant." Internal consistency of the survey instrument was verified by a Cronbach's alpha coefficient of 0.77. Men were more likely than women to agree with statements indicating that men are less than forthright about underlying sexual motives. Men were more likely to endorse such statements as "Most men are shy about expressing their sexual interests or desires to women" ( $p < .001$ ), "When men say no, they usually mean yes" ( $p = .04$ ), "Most men play hard to get when it comes to sex" ( $p = .004$ ), "If a man has several female friends, he is probably promiscuous" ( $p = .04$ ), and "Men are being seductive when they are polite" ( $p < .001$ ). These results are consistent with the hypothesis that male belief sex stereotypes about women result from a false consensus effect. These findings suggest that sexual harassment workshops might be more effective if they address gender differences in perception of male-female interactions.

#### 10:30 SUN PROTECTION BEHAVIORS IN BLACKS AND WHITES

Richisa Johnson\* and Kim Lochner, Harvard University,  
 Boston, MA 02115

According to the National Cancer Institute SEER Program, the skin cancer incidence rate for whites from 1988-1992 was 24.6% and 1.7% for blacks (1993). However, the mortality rate for whites with skin cancer was only 5.1% and 0.9% for blacks. The Healthy People 2000 skin cancer prevention goals are to increase the percent of people who engage in sun protection behaviors to at least 60%. The present study investigated sun protection behaviors in whites and blacks using the 1992 National Health Interview Survey (NHIS) Cancer Control Supplement (N = 9,267). The investigators also conducted a review of skin cancer awareness/prevention materials and campaigns. It was found that some variation existed among blacks and whites for sun protection behaviors. While the percentage of blacks and whites that reported being unlikely to wear protective clothing was almost equal (51% and 50% respectively), 45% of blacks and 32% of whites reported being unlikely to avoid the sun. Eighty-one percent of blacks and 45% of whites reported being unlikely to wear sun block. Of the twelve skin cancer awareness/prevention materials and campaigns, only two included a photograph or an illustration of a black person. Moreover, only three of the campaign ads made reference that people of various ethnicities are at risk for skin cancer. Given the variation in sun protection behaviors and the scarcity of blacks in campaign ads, the researchers recommend that all ads and campaigns make reference to and target people of all ethnicities. Emphasis on the seriousness of skin cancer, prevalence and mortality rates across ethnicities, and increased sun protection behaviors for all ethnic cultures should be advocated in skin cancer prevention materials.

#### 10:50 PARAMETER VARIATION OF A LONGITUDINAL STRUCTURAL MODEL OF ALCOHOL USE AND ABUSE WITH AGE

Shaila Khan, Tougaloo College, Ridgeland, MS 39157

This study investigated the effect of age on alcohol use and abuse in a longitudinal random sample, stratified by age and gender, drawn by Winnipeg Health and Drinking Survey, Canada in 1989 and 1991. The data set contains complete records of 865 cases (433 males and 432 females). Alcohol abuse was measured in three ways: alcohol use, alcohol problems and alcohol dependence. Volume of ethanol per day was derived from quantity and frequency questions asked separately about wine, beer and liquor used over the past 30 days. Two different pattern indicators of alcohol use were considered. Items measuring alcohol problems included: binge drinking, symptomatic drinking, loss of control, spouse's complains about drinking, problems at work, problems with police, health problems, and accidents. Alcohol Dependency was measured by three scales: DIS-III-R, SADD, and SMAST.

Structural Equation Modeling was used to analyze the dependence and causal structure among the observed variables. Comparisons were made by simultaneous evaluations of three models (younger, middle, and older age group) with constraints imposed on parameters for testing equality. The three groups were found to behave differently in terms of alcohol abuse. The younger age group was observed to have higher symptomatic problems, higher occurrence of problems with police and higher involvement with accidents. It was also found that the means of alcohol use, alcohol problems, and alcohol dependence for age group 1 were the highest.

11:10 Divisional Poster Session

#### SCREENING *PIPER METHYSTICUM* AND ITS COMPOUNDS FOR ANXIOLYTIC PROPERTIES

Matt W. Feltenstein<sup>1\*</sup>, H.R. Dharmaratne<sup>1,2</sup>, K.K. Smith<sup>1</sup>, S.L. Broom<sup>1</sup>, J.T. Roach<sup>1</sup>, N.P.D. Nanyakkara<sup>1</sup>, I.A. Khan<sup>1</sup>, and K.J. Sufka<sup>1</sup>, <sup>1</sup>University of Mississippi, University, MS 38677 and <sup>2</sup>Institute of Fundamental Studies, Kandy, Sri Lanka

*Piper methysticum* extract (kava kava) possesses numerous therapeutic properties, but it is unknown which of its principle constituents (kavalactones) subserve such effects. This experiment sought to characterize the putative anxiolytic properties of *Piper methysticum* extract and its six principle kavalactones in the chick social separation-stress paradigm. Eight-day-old chicks received intraperitoneal injections of either vehicle, chlordiazepoxide (5.0 mg/ml/kg), *Piper methysticum* extract (containing 30% kavalactones), kavain, dihydrokavain, methysticin, dihydromethysticin, yangonin, or desmethoxyyangonin, (30 mg/ml/kg for kava compounds) 30 minutes prior to being tested in the presence of two conspecifics or in isolation for a three minute observation period. Latency to adopt a ventral recumbent posture to index sedation, number of vocalizations to index separation distress, and a composite pain score (in response to .05 ml of 0.10% formalin injection into the plantar surface of the foot) to index stress-induced analgesia, served as dependent measures. Both chlordiazepoxide and *Piper methysticum* extract attenuated separation-induced distress vocalizations and stress-induced analgesia. Dihydrokavain attenuated separation-induced distress vocalizations. These findings suggest that the anxiolytic effects of *Piper methysticum* extract may be mediated, in part, by dihydrokavain.

#### A COMPARISON OF HELPFUL AND UNHELPFUL COMMENTS FOR BEREAVED AND NON-BEREAVED INDIVIDUALS

Richisa Johnson\* and Pamela G. Banks, Jackson State University, Jackson, MS 39217

To identify helpful and unhelpful comments and responses to bereaved persons who have lost a loved one to death, 120 college students completed a four-part

questionnaire developed by the researchers. Participants were asked to report whether or not they had experienced bereavement in the past five years, identify statements they felt would be most helpful in grief situations, describe what they would want people to say or do if they lost a loved one, and respond to items that assessed their comfort levels when speaking to bereaved individuals. It was hypothesized that differences exist between individuals who have lost a loved one to death and those who have not when identifying helpful and unhelpful comments. Seventy-eight percent of the subjects reported that they had experienced the loss of a loved one within the past five years. Comments that persuaded the person to express emotions about their loss and that reminded the person of the qualities of their loved ones were perceived as most helpful in grief situations. Conversations that allow a person to talk about their loss were also regarded as being helpful. These findings were consistent with helpful comments and responses in grief situations found in previous studies (Johnson, 1999; Range, Walston, & Pollard, 1992). In a forced-choice format regarding preference for social support versus rationalization of death, ninety-two percent of the respondents reported that they would want people to "be there when needed" if they lost a loved one to death, implying the significance of social support in grief situations. This research was supported by NIMH-COR Grant MH-16926.

#### IMAGING NORADRENERGIC AND NON-ADRENERGIC BINDING OF [3H]CLONIDINE IN BRAINS FROM PSYCHIATRICALY CHARACTERIZED HUMANS

S. Swilley\*, John E. Piletz, G. Rajkowska, He Zhu, B.J. Duncan, C.A. Stockmeier, G. Dilley, L. Konick, H.Y. Meltzer, J.C. Overholser, A. Halaris, and G.A. Ordway, University of Mississippi Medical Center, Jackson, MS 39216

Clonidine is a partial agonist at brain  $\alpha_2$ -adrenoceptors ( $\alpha_2$ AR), and also has high affinity in homogenate binding assays for non-adrenergic imidazoline-binding sites (I-sites). This study utilized receptor autoradiography to compare the density distributions of binding of [<sup>3</sup>H]clonidine to  $\alpha_2$ AR and I-sites and in sections of human brain. The  $\alpha_2$ -AR component of [<sup>3</sup>H]clonidine binding was masked with either norepinephrine ( $\alpha_2$ AR agonist) or with methoxy-idazoxan (selective  $\alpha_2$ AR antagonist) and the remaining I-sites were displaced with the imidazoline compound, cirazoline. Densities of [<sup>3</sup>H]clonidine binding to  $\alpha_2$ AR and I-sites, determined in adjacent tissue sections, were positively correlated across 27 brain regions ( $p = 0.0003$ ;  $r^2 = 0.385$ ). Despite this significant correlation, closer inspection within the hippocampus, using quantitative transepts drawn across hippocampal images, revealed  $\alpha_2$ AR enrichments in the CA-1 and inner molecular layer of the dentate gyrus, areas not enriched in I-sites. Competition curves were generated for I-sites in caudate sections using 10 ligands reported to distinguish

between I<sub>1</sub> and I<sub>2</sub> subtypes. The rank-order of affinities was cirazoline > harmaline > BDF6143 > idazoxan = tizanidine (affinities of agmatine, efaroxan, moxonidine, norepinephrine, and oxymetazoline were too low to be reliable). The low affinity of moxonidine for I-site binding was confirmed using [<sup>3</sup>H]moxonidine as the radioligand. [<sup>3</sup>H]Moxonidine selectively labeled α<sub>2</sub>-AR in the human brain. [<sup>3</sup>H]Clonidine binding to α<sub>2</sub>AR and to I-sites in 6 layers of the left, rostral orbitofrontal cortex (area 47) were measured in 11 psychiatrically normal control subjects and 11 subjects with major depression, of whom diagnoses were confirmed by retrospective psychiatric autopsy.

#### INFLUENCE OF LEAD ON NITRIC OXIDE SYNTHASE ACTIVITY IN THE DEVELOPING RAT BRAIN

R. Bell, V. Hinton\*, K. Cornelius, S. Rajanna, and B. Rajanna, Alcorn State University, Alcorn State, MS 39096

Nitric oxide synthase (NOS) is a class of enzymes that catalyze the oxidation of L-arginine to L-citrulline. Lead (Pb) affects physiological, biochemical and neurochemical junctions in the rat brain. The present study is designed to determine the effects of Pb on NOS activity in the developing rat brain. Pregnant Sprague Dawley rats in their 5<sup>th</sup> day of gestation were treated with 0.1% and 0.2% Pb Acetate through distilled, deionized drinking water only. Treatments continued during pregnancy and until 21 postnatal days (PND). The pups were sacrificed at PND 5, 10, 15, 20, 25, 30, 45, and 60. The whole brain tissues were excised and separated into four regions: the cerebellum, the frontal cortex, the hippocampus, and the brain stem. Nitric oxide synthase activity was assessed by quantifying the release of [<sup>3</sup>H]-citrulline from [<sup>3</sup>H]-arginine. The effects of Pb on the NOS activity were dose and age dependent and region specific. Pb decreased the NOS activity in the cerebellum, the frontal cortex, and the brainstem at all ages except PND 60. However, in the hippocampus, the NOS activity was decreased at all ages. These results suggest that Pb reduce NOS activity in different regions of the rat brain leading to a decreased NO production. (Supported by NIH/NIGMS/MBRS GM #55356).

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### THURSDAY AFTERNOON

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Room 604

#### 1:00 AN EXPLORATORY STUDY ON THE EFFECT OF SPIRITUALITY ON ALCOHOL ABUSE

Jennifer L. Broom\* and John C. Koepfel, University of Southern Mississippi, Hattiesburg, MS 39406

Although the scientific community recognizes spirituality as a useful factor in recovery from alcohol addiction, very little research has been specifically directed toward this relationship. Past research has indicated that a person's spiritual involvement or religious affiliation may lend protection against alcohol abuse. This research

provides data on the relationship between spirituality and alcohol use in a college student sample. A group of 167 undergraduate psychology students (121 females, 45 males) participated in the study. A questionnaire incorporating the Allport and Ross Religious Orientation Scales, Schaler's Spiritual Beliefs Scales, and an adapted form of Buelow and Koepfel's Alcohol Abuse Blackout Scales was used. Participants also responded to one question assessing a religious or non-religious perception of themselves. The overall drinking patterns of this sample represent differences between drinkers and non-drinkers when compared by gender, race, intrinsic religious orientation, and spiritual beliefs. These differences are also upheld when compared to the religious or non-religious self-perception. No significant differences were found between drinkers and non-drinkers on extrinsic religious orientation. These results suggest that cultivating spirituality as a preventive mechanism might be an additional aid in lowering the incidence of alcohol abuse. Due to the relatively small sample size, future studies are suggested using larger more diverse groups of college students.

#### 1:20 ADOLESCENT SOCIAL AVOIDANCE PERSONALITY (ASAP) CHARACTERISTICS IN UNDERGRADUATES

Paige Havens\* and Reid Jones, Delta State University, Cleveland, MS 38733

While the Freshman Year serves as a 'Rite of Passage' for many undergraduates, many others still are anxious in social situations. That anxiety often creates problems in social and/or academic activities. A questionnaire was developed in a first step for research on this issue. The survey asked the respondent to report the frequency of anxious experiences in situations encountered by most college students. Likert-type response alternatives were used, ranging from a score of 5 ("Always") down to a score of 1 ("Never"). Additionally, subjects rated themselves on nine personality and emotional variables. Results from a preliminary sample of 30 subjects showed that the ASAP survey had a very high reliability (Chronbach's alpha = .903748). Nineteen of the 20 items showed a significant item-to-total correlation (Pearson r's ranging from .37 to .84). Preliminary evidence of concurrent validity was also suggested by significant Pearson r's between the ASAP total score and the self ratings on personality and emotional variables. Persons with a high ASAP score had significantly ( $p < .05$ ) higher self ratings on "Introversion" and "Emotional Unhappiness." Subjects with high ASAP scores had significantly ( $p < .05$ ) lower self ratings on "Openness" and "Self Esteem." It was argued that the ASAP questionnaire could be useful to college counselors since the situations selected for items occurred more frequently to college students than the situations described in similar questionnaires designed for adults.

1:40 INTROVERSION-EXTRAVERSION (I-E) IN COLLEGE ATHLETES

Jason R. Keen\* and Reid Jones, Delta State University, Cleveland, MS 38733

College athletes must forego many social activities available to other college students. Long hours of practice, strength training, and curfew cut into the time available for social gatherings, dating, and spending time with friends. The present study had two goals: 1) to determine if college athletes were more or less extraverted than non-athletes; and 2) to determine if strongly extraverted athletes were more dissatisfied by the loss of social opportunities than were strongly introverted athletes. Twenty items measuring I-E were constructed and tested on a sample of 30 undergraduates. Each item described one activity that would be preferred by an introvert and similar activity that would be preferred by an extravert. Respondents had to choose which of the activities they would prefer. The total number of extraverted choices served as that respondent's I-E score. Chronbach's alpha on the first version of the I-E Survey was only moderate (.5851). Five items were removed, based on low item to total correlations, improving Chronbach's alpha to .6436. Subject self ratings on nine personality traits were used to predict I-E score in a significant regression model ( $R=.7164$ ;  $p < .05$ ). The resulting tool was administered to a sample of student athletes and non-athletes. Initial indications were that extraverted athletes were not significantly more dissatisfied with the loss of social opportunities.

2:00 Joint Divisional Business Meeting of Psychology and Behavioral Neuroscience and Social Sciences

2:30-3:10 Joint Program with Social Sciences

3:30 Invited Speaker

EFFECT OF POSTMORTEM DELAY ON IMIDAZOLINE RECEPTOR-BINDING PROTEINS (IRBP) IN THE MOUSE BRAIN

John K. Ma<sup>1\*</sup>, He Zhu<sup>2</sup>, and John E. Piletz<sup>2</sup>, <sup>1</sup>University of Mississippi, University, MS 38677 and <sup>2</sup>University of Mississippi Medical Center, Jackson, MS 39216

Depression is a dreadful illness with unknown pathogenesis. Recent studies suggest a role for imidazoline receptors in depression. Two immunoreactive IRBP bands, I<sub>2</sub> and I<sub>1</sub>, have been identified in the human cerebral cortex. In cortical membranes of depressed suicide victims, density of the more abundant 29/30-kD I<sub>2</sub> protein decreases, whereas that of 45-kD I<sub>1</sub> protein increases over controls (Garcia-Sevilla et al., 1998). We reasoned that changes of the two IRBP immunoreactive bands as observed in postmortem-delayed brain from suicide victims might be due to degradation of a larger protein. Alternatively, this might reflect a different expression pattern of IRBP in depression. In the present study, we determined the effect of postmortem delay on IRBP in the brain of C57Bl/6J

mice. Thirty mice were divided into 6 equal groups and killed by decapitation. Their remains were processed to mimic the typical way cadavers are handled after death at the coroner's office. Brains were then removed and frozen (-80°C). IRBP levels in the brains were determined by electrophoresis and western blotting. The results indicate that IRBP exists as mostly high MW (85 kD) and some lower MW bands in fresh mouse brain. The higher MW bands were significantly decreased such that after 30 hrs the pattern was comparable to human cortex after 30 hrs postmortem (i.e., bands of 70 and 85 kDa were almost completely gone whereas bands of 30 and 45 kDa became prominent.) Hence, opposing changes in IRBP bands reported earlier in studies of suicide victims compared to sudden-death controls may owe to differences in protein degradation of a precursor IRBP. (Supported by R01 MH 49248).

**SCIENCE EDUCATION**

Chair: Willie R. Heard, University of Southern Mississippi

Vicechair: Joyce M. Applegate, Pearl River Community College

**THURSDAY MORNING**

Room 606

8:30 CONSTRUCTING AN EXHIBIT TO EDUCATE CHILDREN ON METEOROLOGY, SPECIFICALLY HURRICANES AND TORNADOES

April Bryant\*, Jeannie Flint, Willie R. Heard, and Howard Walters, Cooperative Intern Program, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553 and J.L. Scott Marine Education Center and Aquarium, Institute of Marine Sciences, University of Southern Mississippi, Biloxi, MS 39530

The purpose of this project was to construct an exhibit to educate elementary school children on the formation, internal mechanisms, and coastal hazards of two of meteorology's greatest phenomena, tornadoes and hurricanes. The exhibit includes photographs, explanations, and educational facts. A glossary of meteorological terms was included to provide definitions of general terms used in meteorology. The doors to the inside, flip cards with the glossary of terms, and forecast maps of the exhibit are designed to allow the children to interact with the exhibit and make learning more fun. The exhibit will be permanently on display at the J.L. Scott Marine Education Center and Aquarium.

8:45 CREATING AN EXHIBIT OF A VOLCANO AND ITS ASSOCIATION TO PLATE TECTONICS

Jason L. Lathrop\*, Willie R. Heard, Jeannie Flint, and Howard Walters, Cooperative Intern Program, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553 and J.L. Scott Marine Education Center and Aquarium, Institute of Marine Sciences, University of Southern Mississippi, Biloxi, MS 39530

The purpose of this project was to create a display model of a working volcano, its feature, effects, and its relation to plate tectonics. Develop a plan, researching the literature, choosing permanent materials, and constructing the model were the steps involved in creating this exhibit. The exhibit will provide a visual image of a volcanic eruption and the core, mantle, and Earth's crust through the use of fiber optics and electricity. Volcanoes have much to teach us about the dynamic geology of Earth and its interior-in its past, present, and future. This model is to be displayed at the J.L. Scott Marine Education Center and Aquarium.

9:00 CURRENT TRENDS IN SCIENCE EDUCATION

Carrie Speight<sup>1</sup>\*, Edna Waller<sup>2</sup>, and Julie Wade<sup>2</sup>, <sup>1</sup>Cooperative Intern Program, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553 and <sup>2</sup>Magnolia Park Elementary School, Ocean Springs, MS 39566-7002

Too often in today's elementary classrooms limited time is devoted to science education in terms of content and hands-on activities. Teachers are having to incorporate science in innovative ways such as through the use of the "PRISM Lab" at Magnolia Park Elementary School in Ocean Springs as an example. This study will review the problems facing the teaching of science in elementary classrooms and the innovative approaches that teachers used in developing and implementing science instruction through extramural funds the teachers for their K-4<sup>th</sup> grade students. The PRISM Lab is being used as a model with the Ocean Springs District, as well as the country, as a "win-win" partnership for the funding organizations, the district, the teachers, and the students.

9:15 USE OF NEW HISTORICAL MULTIMEDIA RESOURCES IN TEACHING CHEMISTRY TO TODAY'S STUDENTS

Johnnie-Marie Whitfield, Millsaps College, Jackson, MS 39210

The American Chemical Society (ACS), the world's largest professional organization dedicated to one discipline, strongly advocates that chemical history not be neglected in a modern chemical education. ACS and the American Institute of Chemical Engineers (AIChE) together established the Chemical Heritage Foundation (CHF) in 1982. Today CHF actively seeks to advance the heritage of the chemical and molecular sciences by

operating the Othmer Library, a historical research library, as well as encouraging research and scholarship and publishing historical materials of many types. Located at 315 Chestnut Street in downtown Philadelphia in the Independence National Historical Park, CHF is housed in the newly remodeled historical building immediately next door to the Benjamin Franklin Museum and just two blocks from Independence Hall and the Liberty Bell. CHF's Educational Services currently produces a wide variety of resources to help teachers incorporate the history of the chemical sciences into their courses. In 2000, the presenter was selected as a residential Scholar in Chemical Education at CHF while on her sabbatical leave, and as a result was involved with the latest forays into developing multimedia resources for chemical educators. This presentation will include highlights of several of these innovative educational resources as well as exciting upcoming releases from CHF. These will include: Chemical Achievers, Pharmaceutical Achievers, Faces in the Molecular Sciences, Polymer Expeditions, and Chemdate.

9:30 PT3 TECHNOLOGY PREPARATION FOR EDUCATION PROFESSIONALS

Burnette W. Hamil\*, Taha Mzoughi, and Anastasia Elder, Mississippi State University, Mississippi State, MS 39762

Preparing Tomorrow's Teachers to Use Technology (PT3) is a grant program funded by the United States Department of Education. Mississippi State University, in collaboration with Jackson State University, the University of Mississippi, and the University of Southern Mississippi, received a catalyst grant to promote technology training for the benefit of Mississippi students. The major goal of the project is the infusion of different technologies in an interdisciplinary, problem-based learning environment to foster "hands on" teaching strategies. Receiving training in the program are preservice teachers, classroom teachers, community college faculty, and university faculty from Education and Arts and Sciences. Assistive technology is being provided for all participants. In accordance with the technology-rich learning environment, additional programs like Project Learning Tree and GLOBE (Global Learning and Observations to Benefit the Environment) are providing problem solving activities for future teachers.

9:45 Break

10:00 AN EXPERIMENTAL EXERCISE IN MICHAELIS-MENTEN ENZYME KINETICS

Anthony B. Dribben\* and Dock Anderson, Mississippi College, Clinton, MS 39058

The Michaelis-Menten treatment of enzyme kinetics is one of the major topics in any undergraduate biochemistry course. This paper presents an undergraduate laboratory exercise that allows for the experimental determination of the typical enzyme-kinetics parameters [the Michaelis constant (KM), the maximum rate of the

enzyme-catalyzed reaction ( $V_{max}$ ), the turnover number (kcat), and the catalytic efficiency of the enzyme system at low substrate concentrations (kcat/KM)] using a standard benchtop multi-cell UV-vis spectrophotometer. The experiment also allows for the elucidation of enzyme-inhibitor behavior using standard Lineweaver-Burke methodology, and for the determination of inhibitor dissociation constants.

10:15 THE DEVELOPMENT OF A CD-ROM TO EDUCATE MIDDLE AND HIGH SCHOOL STUDENTS ABOUT JELLYFISH

Siobahn Thompson\* and Tim Reid, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39533 and Mississippi- Alabama Sea Grant Consortium, Ocean Springs, MS 39566-7000

As more and more research on jellyfish is conducted, the link between jellyfish and the health of the waters in which they live grows stronger. However, middle and high school students in Mississippi and other coastal communities receive little education on jellyfish that live in the Gulf of Mexico and the impacts these jellyfish have on the Gulf's ecosystems. Therefore, a CD-ROM is being developed to help instructors teach their students about these animals. Information was gathered through a teacher survey, literature reviews, and researcher interviews. The CD-ROM will contain general information describing the different jellyfish found in the Gulf and around the world. Using text, photos, illustrations, animation and video, the CD-ROM will highlight the jellyfish lifecycle, facts and statistics about jellyfish, current research and a special section describing the recent invasion of the Australian Spotted jellyfish. The CD-ROM will also be developed for teachers to use in their classrooms. It will include teaching activities such as quizzes, diagram sheets, and experiments.

10:30 Divisional Business Meeting

10:45 Divisional Poster Session

STUDY OF FUEL CELLS

Tahida Pierre and Anil K. Sharma\*, Mississippi Valley State University, Itta Bena, MS 38941

A fuel cell is a device that continuously converts chemicals into direct-current electricity through electrochemical reactions. In a typical fuel cell, hydrogen gas combines with hydroxyl ions at one electrode to produce water electrons. The electrons perform electrical work by flowing through an external circuit to the other electrode, where they recombine with oxygen and water to produce hydroxyl ions. The overall reaction is hydrogen (g) + oxygen (g)  $\rightarrow$  water (l). Fuel cells can theoretically convert fuel to electricity with nearly 100% efficiency.

THE CHEMISTRY OF AIR BAGS

Deidra Dungee and Anil K. Sharma\*, Mississippi Valley State University, Itta Bena, MS 38941

Air bags in automobiles have saved the lives of many people. The idea behind air bags is simple: When a crash occurs, a plastic bag rapidly inflates with a gas, hopefully protecting the driver from hitting the steering wheel or the dashboard. The credit of developing this air bag system is given to chemists and engineers. The air bag system has many special requirements. First of all, the air bag must not inflate accidentally. The gas that inflates the air bag must be nontoxic. The gas must not be hot, so as not to produce burn injuries. The gas should be formed very rapidly. Lastly, the gas producing chemicals must be easy to handle and stable for long periods because most automobiles are kept for many years. Nitrogen is considered the best choice because it makes up 78% of air by volume. A good source of nitrogen is the decomposition of alkali metal azides, such as sodium azide. About 70 g of sodium azide produces 41 L of nitrogen within 20–60 ms.

SUPPLEMENTAL CURRICULUM DEVELOPMENT GROUP AT MISSISSIPPI GULF COAST COMMUNITY COLLEGE

Erin Hannon\*, Sommer Ward\*, Desiree Young\*, and Rex Moak, Mississippi Gulf Coast Community College-Jackson County-Campus, Gautier, MS 39553, and Mississippi Space Grant Consortium, University, MS 38677

The Supplemental Curriculum Development Group is a combined student/faculty initiative for the development of course specific supplemental material for the classroom. The focus is on development of curriculum materials that will provide additional student support for conceptual and mathematical learning within the sciences. The primary group goal is to carry out projects that will facilitate student learning within the physical and biological sciences. The current group project at the Jackson County campus is the development of a web-based general physics site. Site content will initially consist of supplementary materials relating to the acquisition and application of core concepts commonly encountered in the first semester of an introductory general physics curriculum.

DISTRIBUTION OF TEACHING AIDS ON THE DISSECTION OF THE CAT: ANATOMY AND PHYSIOLOGY I AND II NOTES AND QUIZZES

Wendy Smith\*, James Baggett, and Lena Melton, Cooperative Intern Program, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553 and Gulf Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39566-7000

Currently in most community and four-year colleges, classes are becoming more non-traditional than traditional. There are different needs and expectations that should be addressed. Therefore, this project focused on making notes, graphics, videos and practice quizzes available through the use of student computer technology. The primary focus was to create compact disks (CDs) to be made available for students to “check-out” and use in



Learning Labs and the library followed by creating access through the Internet at a later time. After selecting the desired information for each CD (six cat dissection video CDs, Anatomy and Physiology I or II notes, graphics, videos and CD study quizzes) master CDs were created (burned). Copies were then burned using the master CD; labels and case covers were designed, and the CDs were then released to the Learning Labs and to the library. The overall purpose of the creation and distribution of the CDs was to provide an additional study source for students, traditional and non-traditional, wishing to review the material, or if a class or laboratory had been missed, to acquire needed Anatomy and Physiology I and II information.

#### DOCUMENTING THE HISTORY OF SCIENTIFIC PUBLISHING AT THE GULF COAST RESEARCH LABORATORY

Amanda Brown\* and Joyce M. Shaw, Cooperative Intern Program, Mississippi Gulf Coast Community College-Jackson County Campus, Gautier, MS 39553 and Coast Research Laboratory, University of Southern Mississippi, Ocean Springs, MS 39566-7000

The Gunter Library maintains a comprehensive collection of materials published by the Gulf Coast Research Laboratory (GCRL). Two significant components of this collection are (1) Gulf and Caribbean Research (formerly titled, Gulf Research Reports) the scientific journal of GCRL and other GCRL grey literature and (2) reprints of articles generated by scientists affiliated with GCRL. These publications provide a historical look at scientific research of the northern Gulf of Mexico and the Mississippi Sound. The mission of this project was to document the history of GCRL by adding articles published in Gulf Research Reports, Gulf and Caribbean Research, and other journals to a bibliographic database maintained at the Gunter Library. Entries to the database were given abstracts and assigned keywords. The database was mounted on a searchable webpage. A poster illustrating GCRL publications was created for the 2001 Mississippi Academy of Sciences meeting.

#### IMPROVING STUDENT ACHIEVEMENT IN SCIENCE AND MATHEMATICS: USE EMERGING SPACE TECHNOLOGY

Stacy J. White, Mississippi Valley State University, Itta Bena, MS 38941-1400

The primary objectives of this project was to enhance student achievement in mathematics and science by providing training to in-service and pre-service educators in remote sensing, Global Learning and Observations to Benefit the Environment (GLOBE) and to provide curricular enhancement opportunities for pre-service and in-service teachers in mathematics and science. In-service and pre-service teachers in mathematics and science participated in a four-week summer program. In-service teachers were targeted from county school districts

located within the federal designated rural empowerment zone, and pre-service teachers majoring in mathematics education and biology education majors at the University were selected to participate in the program. The Partnership project represented collaborative efforts between Mississippi Valley State University, the National Aeronautics and Space Administration (NASA), the GLOBE Program Office, and the Center for Spatial Data Research and Applications (CSDRA) at Jackson State University to enhance student achievement in mathematics and science. As a result, participants gained knowledge in the Internet, remote sensing, Mission-to-Planet Earth and the Globe Program and incorporation of hands on, critical thinking, discovery, problem solving, and inquiry based teaching methods and different learning styles. Follow-up sessions took place following the summer program to see how each educator incorporated the NASA resource materials into their math and science classes. (The project was funded by the National Aeronautics and Space Administration through a Partnership Award grant).

#### PRODUCING CERTIFICATION SCIENCE AND MATHEMATICS TEACHERS IN RURAL AREAS

Stacy J. White\* and Tyrone Powell, Mississippi Valley State University, Itta Bena, MS 38941-1400

School Districts across the nation face shortages of teachers; the most critical areas include science and mathematics. Many districts use substitutes, teacher aides, and uncertified teachers to fill teaching positions. The Teacher Prep Program at Mississippi Valley State University represents collaborative efforts between Mississippi Valley State University and the National Aeronautics and Space Administration (NASA) to enhance pre-service and in-service teachers' performance on national tests, required for state certification. The program is focused on teachers in federally designated, rural empowerment zones. The major goal of the program includes the education of pre-service and in-service secondary teachers in knowledge and skills in mathematics and science content areas, pedagogical concepts, and the art and science of test taking. The goal will be achieved by the accomplishment of the following objectives: 1) recruit and retain in-service teachers with undergraduate degrees in biology and mathematics and pre-service teachers in biology education and mathematics education; 2) provide curricula enrichment using NASA resources for in-service teachers; 3) enhance the pre-service curricula using teaching strategies and models, such as, inquiry, problem solving, critical thinking, and cooperative learning. The program addresses the critical shortage of science and mathematics teachers in the Mississippi Delta by creating a workforce of local teaching talent, committed to remaining in the Delta area. (This project was funded by NASA through the MASTAP grant).

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THURSDAY AFTERNOON

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Room 606

1:30 TEACHING THE “TECHNO-VAMPIRES”:  
CHALLENGES IN MATCHING TECHNOLOGY  
LITERACY WITH CONTEMPORARY  
TEACHING METHODS

Rob Rockhold, University of Mississippi Medical Center,  
Jackson, MS 39216-4505

“Techno-Vampires,” the generation of secondary school and undergraduate students who have been raised on 56K and higher band-width access to multimedia and the World Wide Web, pose unique problems to teachers and institutions. Issues of teacher technology competency are fading as other problems such as privacy/free access concerns, necessities for 24/7 interfacing with learning materials and teachers, Web-based testing and security methodologies, and copyright allocation become foremost in the minds of classroom/laboratory professionals. Institutionally, maintenance and continual upgrading requirements, network security and questions related to individual purchase vs. institutional supply of computer technology become more prevalent. Informed perspectives will be presented across a spectrum of teaching levels, from the secondary school, and community-college views, to that of the four-year university and medical center outlooks. Presenters, all of whom have positions that exert direct impact on the use of cutting-edge learning technology in this state, will include: Dee Chambliss, Director of Curriculum, Jackson Public School District; Catherine P. Cotten, Ph.D., Jones County Community College; Lon Mathias, Ph.D., Polymer Science Center, University of Southern Mississippi; Rob Rockhold, Ph.D., University of Mississippi Medical Center; Johnnie-Marie Whitfield, Ph.D., Millsaps College; and Ellen Burnham, Office of Education Technology, Mississippi Department of Education (Supported by the Howard Hughes Medical Institute).

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FRIDAY MORNING

Room 606

9:00 BASE PAIR: MATH/SCIENCE EDUCATION  
REFORM THROUGH TEACHER  
PROFESSIONAL DEVELOPMENT

Rob Rockhold<sup>1\*</sup>, D. Chambliss<sup>2</sup>, N. Fahmy<sup>3</sup>, S. Neral<sup>1</sup>, and A. Srinivasan<sup>3</sup>, <sup>1</sup>University of Mississippi Medical Center, Jackson, MS 39216-4505; <sup>2</sup>Jackson Public School District, Jackson, MS; and <sup>3</sup>Tougaloo College, Tougaloo, MS 39174

Base Pair, a biomedical research mentorship between the Jackson Public School District (JPSD) and University Medical Center (UMC) that is funded by the Howard Hughes Medical Institute, has entered into a larger partnership with Tougaloo College (TC) to conduct middle and high school teacher professional development activities. Supported by a National Science Foundation

award, 21 teachers will be recruited from the JPSD “feeder patterns” (collaborative arrangements between middle schools and the eight high schools into which they feed students) and enrolled in eight daily workshops at TC in preparation for intensive activities during a four week summer program at UMC. Throughout both components, emphasis will be placed on enhancing professional skills in math and science that can be transmitted to students through novel activities, including the use of Web-based testing methods and advanced laboratory exercises in contemporary biotechnology. High school sites will be provided with access to the Mississippi Health Information Network (MisHIN), a web-based biomedical information gateway. Teachers, working in feeder groups, will be coached in preparation of grant applications for additional funding through a Mini-Grant program, and encouraged to use that training to explore external funding opportunities. The long-range objective is to create a cadre of teachers who are prepared to create, deliver and support contemporary activity-oriented learning within their schools. (Supported by the Howard Hughes Medical Institute and the National Science Foundation)

9:15 BASE PAIR: BIOMEDICAL RESEARCH  
MENTORSHIP FOR HIGH SCHOOL  
STUDENTS— A TEACHER’S PERSPECTIVE

C. Cook\* and Rob Rockhold, Murrah High School,  
Jackson, MS and University of Mississippi Medical Center,  
Jackson, MS 39216-4505

Curriculum reform is a daunting task for any teacher, especially when it comprises preparation of and support for students who participate in biomedical research internships at a university medical center. A teacher must consider not only upgrading delivery of contemporary content materials but also fundamental alterations in the manner of interaction with students. The Base Pair program trains students for partnership with research faculty at the University of Mississippi Medical Center (UMC), through a course, Introduction to Biomedical Research, approved by the Mississippi Department of Education and taught at Murrah High School. This course is inquiry-based, teaches contemporary biomedical laboratory skills, and requires extensive utilization of information technology by both students and the teacher. Focus areas other than basic biomedicine/biotechnology content include preparation of research findings using state-of-the-art graphics and computer projection programs, electronic communications, and critical analysis of the scientific literature. Performance of actual biomedical research, for example, analysis of classrooms for the presence of potential bacteriological causes for “sick building syndromes” is a critical part of the high school training curriculum. Monitoring of the conduct of students during semester-long off-site activities requires extensive communication skills with UMC faculty. The teacher outcome is positive, following National Science Teacher Reform Standards and increasing recognition within the

district. (Supported by the Howard Hughes Medical Institute)

9:30 **ACHIEVING THREE DIMENSIONAL MOLECULAR LITERACY WITH KINEMAGES**

Robert C. Bateman, Jr.\*, Debbie Booth, Rudy Sirochman, Andrea Hall, Jane Richardson, and David Richardson, University of Southern Mississippi, Hattiesburg, MS 39406

Structural concepts such as the exact arrangement of a protein in three dimensions are crucial to almost every aspect of biology and chemistry, but most of us have not been educated in three-dimensional literacy and all of us need a great deal of help in order to perceive and to communicate structural information successfully. It is in the undergraduate biology, chemistry, and especially biochemistry courses where students learn most concepts of molecular structure pertinent to living systems. Currently students have texts with attractive color illustrations as well as premade computer images on CD and web-based supplements. To be truly literate, however, one must be able to write as well as read. Our project is therefore focused on teaching students to construct their own course supplements, their own three dimensional molecular images, from the scientific literature and electronic databanks as a way to communicate important structural concepts to their teacher and their classmates. Our software tool is the kinemage ('kinetic image') and the kinemage authorship website is <http://orca.st.usm.edu/~rbateman/kinemage>.

9:45 **VISUAL TEACHING MODULES OF MITOSIS AND GENETICS**

Joan McCoy Messer\* and Wendy D. Barron, Jones Junior College, Ellisville, MS 39437

It has been repeatedly shown in the literature that learning is accelerated when students are exposed to "hands on" or visual examples. The microscopic nature of cell biochemistry makes this virtually impossible unless the teacher utilizes materials that enhance the imagination of the students. The purpose of this project is to show teachers several ways of enhancing their lectures with "hands-on" and visual examples. Mitosis and genetics lectures in secondary and college education will be targeted. Practical ways in which mitosis and genetics labs can be improved will be discussed. Students will benefit from these visual examples by comprehending cellular division, which is essential in understanding the overall pedagogy of biology.

10:00 Break

10:15 **THE USE OF BIVALVE MOLLUSK SHELLS TO TEACH SYMBIOSES AND OTHER ECOLOGICAL RELATIONSHIPS**

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

A collection of battered mollusk shells from such sites as the beaches of Ship Island provides excellent and

convenient material to introduce students to the principles of symbiosis and other ecological relationships. Such battered shells harbor the tubes of serpufid annelids and bryozoan colonies. They show the effects of boring sponges and gastropod predators. It is a simple matter to identify the cockles, Venus clams and oysters whose shells are occupied by such a diversity of guests and it is easy to make counts of the frequency of the effects of different commensals, parasites and predators. This student generated data makes an excellent starting point for discussions of the recycling of materials in an ecosystem. Collections of such shells are permanent and easily stored in small spaces. Both the bivalve shells and symbionts can be easily identified from readily available texts such as the Peterson Field Guides.

10:30 **DEVELOPMENT OF AN ANCILLARY WEB-BASED BIOLOGICAL SCIENCE SELF-STUDY PROGRAM: GENERAL BIOLOGY I**

James Clayton\*, and Sarah Tringle, Mississippi Gulf Coast Community College-Perkinston Campus, Perkinston, MS, 39573, and The Mississippi Space Grant Consortium, University, MS 38677

The success of a student in General Biology I is directly correlated to the motivation of the student and the availability of relevant course materials. Frequently, students are overwhelmed by the volume and tone of technical material presented in a first semester biology course. To alleviate the problems associated with assimilating this type of material, the development of a web-based biological science site at the Perkinston campus of Mississippi Gulf Coast Community College has been initiated. The main objective is to provide the student with a straightforward summary and analysis of the ideas developed in the classroom. To this end, a set of reader-friendly outlines that address fundamental ideas central to the understanding of core biological concepts and themes is being developed for inclusion in the site.

10:45 **AN ENHANCEMENT PROGRAM FOR MIDDLE AND HIGH SCHOOL BIOLOGY TEACHERS**

Babu P. Patlolla\* and Leroy Johnson, Alcorn State University, Alcorn State, MS 39096

A four-week (June 5-30, 2000) workshop was conducted at the Department of Biological Sciences at Alcorn State University for local middle school and high school biology teachers. Fifteen in-service teachers from the local school districts and three preservice teachers from Alcorn State University participated in this program. Activities included computer applications, hands on contemporary molecular biology techniques and incorporation of varied learning styles into teaching methods. Participants also took field trips to three research laboratories in the state and attended seminars. As a part of program evaluation pre and post surveys were conducted by an internal and external evaluator. Two follow-up sessions are planned for the 2000-2001 academic year to discuss the

implementation of the science awareness project developed during the program and incorporation of the new knowledge in their class. Participants enjoyed the field trips and were eager to share their experiences with their colleagues at their school district. Pre-service teachers had an opportunity to interact with experienced teachers, and understand the responsibilities before they actually begin managing a classroom. (This project was funded by Mississippi Institutions of Higher Learning through Title II Eisenhower Professional Development Program # 2000-56E.)

11:00 MATH ON THE GRADUATE RECORD EXAM:  
HOW TO PREPARE STUDENTS FOR THE  
COMPUTER ADAPTIVE TEST

Carolyn E. Beck\*, Deborah A. Ford, and Frederick E. Vamado, University of Southern Mississippi, Hattiesburg, MS 39406

The McNair Scholars Program at the University of Southern Mississippi developed a summer program to assist the participating scholars in their preparation for the Graduate Record Exam. The purpose of this presentation is to share with other educators some of the insights acquired while developing the study program for the quantitative section of the test. There were three key components to the program which evolved during planning and implementation. One of the key components of the program was discovering and debunking common myths about the test. Most myths reflected student misunderstandings related to the types of mathematical problems on the quantitative portion of the test. A second component of the study program was developing student familiarity with the various formats used for questions. For example, students initially found confusing a specific type of question (called quantitative comparisons). Confusion disappeared after detailed discussions regarding the evaluation system required to solve that type of question. Additionally, the students needed to understand the strategies necessary to succeed on the computer adaptive test itself. The final component was assessing the areas of weakness within the quantitative section for each student and devising practice sessions to strengthen those areas. The study program was deemed successful when students improved their performance over initial pretest scores.

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FRIDAY AFTERNOON

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Room 606

1:15 A LABORATORY TO DETERMINE THE  
OPTIMUM PH FOR AN ENZYMATIC  
REACTION USING CBL COLORIMETER AND  
MODELS

Alan Niven<sup>1\*</sup>, Kymbr Wright<sup>1\*</sup>, Terrence Wright<sup>2\*</sup>, Sherry Herron<sup>1</sup>, and Ray Scheetz<sup>1</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406 and <sup>2</sup>Jackson State

University, Jackson, MS 39217

We will demonstrate and describe the procedures and teaching techniques developed at an NSF-funded summer workshop for a general university biology laboratory to determine the optimum pH for a peroxidase and guaiacol reaction. It is often difficult for freshman students to visualize at the molecular level how the enzyme and substrate react to form a product. To facilitate this, flexible models of proteins and 3-dimensional models of substrates and enzymes were constructed using common materials. These models enable the students to manipulate protein structure and function. Spectrophotometers have traditionally been used to indicate color changes. The Calculator Based Laboratory System (CBL) with a colorimeter probe is a much easier system for students to use and, therefore, provides more accurate results. This system also allows for graphical and statistical data analyses.

1:30 USING THE BIOQUEST COMPUTER  
SIMULATION, LATEBLIGHT, IN A GENERAL  
BIOLOGY LABORATORY COURSE AND IN  
SCIENCE METHODS FOR ELEMENTARY  
TEACHERS

Aimee Lee\*, Rachel Thames\*, Tonya Lawrence\*, Sherry Herron, and Rosalina Hairston, University of Southern Mississippi, Hattiesburg, MS 39406

In the second semester general biology laboratory course at USM, a new program developed by BioQUEST was implemented in order to reinforce the processes of science. By using the LateBlight computer simulation, students can design, run, and analyze a scientific experiment. After an introduction to the program, students worked in groups of four to develop a hypothesis that would enable them to test variables related to potato farming under controlled conditions. Students worked to collect data throughout the week using computer labs located on campus. They presented their results in a poster presentation during class the following week which included a literature review of relevant background information. Students enrolled in Science Methods for Elementary Teachers learned the program as part of their science and technology unit. Exemplary student projects will be presented.

1:45 COMPARING THE COGNITIVE LEVELS OF  
THREE POPULATIONS ENROLLED IN A  
BIOLOGY COURSE

Rosalina Hairston<sup>1\*</sup>, Sherry Herron<sup>1\*</sup>, and Brenda Anderson<sup>2\*</sup>, <sup>1</sup>University of Southern Mississippi, Hattiesburg, MS 39406 and <sup>2</sup>Mississippi Gulf Coast Community College, Perkinston, MS 39573

This study compares the cognitive level of three populations of students: high school biology students, community college students enrolled in biology I, and university students enrolled in a freshman general biology course. The Group Assessment of Logical Thinking

(GALT) was administered to 55 high school, 81 community college, and 91 university students in the fall of 1999 and the spring of 2000. The GALT is a reliable and valid instrument used to measure formal reasoning ability. According to Piaget and other cognitive scientists, formal reasoning ability includes the understanding of conservation of mass, conservation of liquid, proportional reasoning, probabilistic thinking, correlational reasoning, and combinatorial logic. Significant differences exist among the three populations in the total GALT scores and in all subcategories as determined by one-way analysis of variance at the .05 level of significance. High school and community college students performed at lower cognitive levels than the university students. The results of this study will enable teachers to better understand the abilities of their students and to match instruction and materials accordingly. Teaching methods that promote critical thinking skills rather than rote memorization of isolated facts, such as problem-based investigative laboratories and field experiences, could develop students' formal reasoning ability.

2:00 USE OF POPULAR LITERATURE TO INTRODUCE TOPICS IN A MICROBIOLOGY COURSE

Mary F. Lux, University of Southern Mississippi, Hattiesburg, MS 39406

Several books were used to introduce various topics in a microbiology course taught on the Allied Health Campus of Pearl River Community College. The outside reading assignments also served to encourage students to read, to introduce students to topics from various perspectives, and to provide students an opportunity for collaboration. Books for this course included *E. coli* 0157 by Mary Heersink, *Bad Blood* by James H. Jones, *My Own Country* by Abraham Verghese, *Man and Microbes* by Arno Karlen, and *The Cobra Event* by Richard Preston. Students were assigned to groups, with an effort to mix students from the various allied health programs. Each group was assigned a book at the first class meeting. Charges to the groups were 1) to divide the book into sections, with each person responsible for a portion of the book, 2) to prepare outlines or summaries of the book for distribution to the class, and 3) to develop and participate in a 20 minute class presentation on some aspect of the book. Presentation types included summary, dramatization, role playing, time line, slide show, poster, and creative visual effects. Topics introduced by these presentations included food borne disease, sexually transmitted disease, AIDS, epidemiology, respiratory disease, and genetic engineering. Students benefitted from the introduction of the topics or concepts from diverse viewpoints as well as the opportunity to participate in a collaborative activity.

2:15 UTILIZING A TEST OF FORMAL REASONING TO IDENTIFY AND OVERCOME MISCONCEPTIONS HELD BY PRE-SERVICE

ELEMENTARY TEACHERS

Leslie L. Griffin, Delta State University, Cleveland, MS 38733

During the past two decades, a growing concern has mounted among researchers, teachers, educators, and psychologists about misconceptions held by students in science. Research has shown that these science misconceptions, especially physical science misconceptions, do not affect only children, but extend to both college students, and, of particular interest, to preservice teachers. Preservice teachers will likely become classroom teachers, perpetuating their misconceptions among their students. The purpose of this study was to determine if a test of formal reasoning could be used to identify the misconceptions of a selected group of preservice teachers. Results of the test were used to suggest teaching strategies for helping preservice teachers to not only overcome any identified misconceptions, but to aid them as well in correcting misconceptions they will encounter in their classroom teaching experiences.

2:30 THE ALLIANCE FOR GRADUATE EDUCATION IN MISSISSIPPI

Maurice R. Eftink\*<sup>1</sup>, Donald Cole<sup>1</sup>, Juancye Taylor<sup>1</sup>, Anselm Griffin<sup>2</sup>, William Person<sup>3</sup>, and Dorris Gardner<sup>4</sup>, <sup>1</sup>University of Mississippi, University, MS 38677; <sup>2</sup>University of Southern Mississippi, Hattiesburg, MS 39406; <sup>3</sup>Mississippi State University, Mississippi State, MS 39762; and <sup>4</sup>Jackson State University, Jackson, MS 39217

The Alliance for Graduate Education in Mississippi, AGEM, is a National Science Foundation funded program with the goal of enhancing the entry and successful completion of minority students in doctoral science, mathematics, and engineering fields. Additional goals of the AGEM Program are to increase the number of minority students who pursue academic careers and to bring about systemic change in attitudes and practices of faculty, administrators, and students with regard to minority pipeline issues. Components of the program include direct graduate stipends, remission of tuition, graduate bridge program, skills development seminars and a professional seminar series, mentoring programs, travel and research development funds, and annual statewide AGEM conference to promote networking. The AGEM Program is a consortium involving the University of Mississippi, Mississippi State University, Jackson State University, and the University of Southern Mississippi. A graduate student can choose from among all of the science, math, and engineering doctoral programs at any of the state's four comprehensive institutions. For more information, visit web site at [www.olemiss.edu/agem/](http://www.olemiss.edu/agem/), send e-mail to [agem@olemiss.edu](mailto:agem@olemiss.edu), write to AGEM Program, Graduate School, University of Mississippi, University, MS 38677, or contact the graduate dean's office at any of the listed universities.



**SOCIAL SCIENCES**

Chair: Ann Marie Kinnell, University of Southern Mississippi  
 Vicechair: Emmanuel C. Nwagboso, Jackson State University

**THURSDAY AFTERNOON**

Room 604

2:00 Joint Divisional Business Meeting of Psychology and Behavioral Neuroscience and Social Sciences

2:30 DETERMINING SUBSISTENCE STRATEGIES THROUGH ANALYSIS OF DENTAL WEAR AND CARIES

Jennifer L. Hotzman, University of Southern Mississippi, Hattiesburg, MS 39406

Dentition can provide valuable information into the subsistence strategies of prehistoric groups by evaluating caries and tooth wear. The pattern of tooth wear and the number of caries will help to determine whether the group of people were hunter and gatherers or whether they practiced agriculture. Thirty-nine burials were analyzed from Williams Landing Site(1JA306) located on the west bank of the Guntersville Reservoir, Jackson County, Alabama. Dental caries were scored based on the size and location of the caries. Dental wear was scored using two different systems. Molars were scored using the system developed by Scott, whereas the other classifications of teeth were scored based on a modified version of the Murphy system. There is currently a dispute over the time period of this site. The analyses conducted should help to determine more accurately the time period. Preliminary analyses show that this population could be a Woodland Site, although further investigations could show that it is Mississippian.

2:50 BRING IT ALL BACK HOME: LOCATING THE PLACE IN IRISH TRADITIONAL MUSIC

Valerie A. Plested, University of Southern Mississippi, Hattiesburg, MS 39406

Emmanuel Wallerstein (1992) states that people in the midst of creating a national identity erect a set of symbols and ideas that lend authority to the identity they create. The concept of a cultural "place" figures prominently in the maintenance of ethnic identity. Irish traditional music, indigenous to rural villages and townships, mirrors aspects of folk life and archives folk memory. Originally a local phenomenon, traditional dance music has strong ties to its particular locale: tune titles often cite a town or geographic feature, certain regions favor particular tune type, etc. Recently, it has enjoyed

resurgence in popularity both within Ireland and worldwide. This paper examines prominent Irish musicians' interpretations of the primacy and authority of place in Irish traditional music and the effects the globalization of Irish music has on it.

3:10 DOCUMENTING AMATEUR EXCAVATION OF A MOCK FORENSIC CASE

Kristi E. Turner, University of Southern Mississippi Hattiesburg, MS 39406

This paper examines the patterns of excavation scars left on bone by student workers in a mock forensic setting. Such patterns are of importance since they can be potentially misidentified as trauma or pathology. All postmortem trauma indicated by the bones of two adult cows and a fetal calf was documented prior to student excavation. The bones were then incorporated into a burial setting. Suggestive of homicide, a fetal calf was incorporated into the grave of one adult female cow actually known to have died during childbirth. After classroom instruction of techniques the students excavated the graves in two distinct fashions- The first is known as pedestaling, in which a trench is dug next to the grave and the bones can be dug around. The second method of excavation was carried out by digging directly down on top of the grave. Upon observation of the excavated bones, a large number of trowel scratches were seen especially on projecting ends and areas first encountered stratigraphically. We conclude that experience in excavation is of vital importance in teaching correct methods of forensic excavation.

**ZOOLOGY AND ENTOMOLOGY**

Chair: Timothy C. Lockley, USDA APHIS PPQ IFA  
 Vicechair: Alex D.W. Acholonu, Alcorn State University

**FRIDAY MORNING**

Room 604

9:00 PHYLOGENY OF THE NORTH AMERICAN WOLF SPIDERS IN THE GENUS *SCHIZOCOSA*: A MORPHOLOGICAL STUDY

Gail E. Stratton, University of Mississippi, University, MS 38677

Although several of the genera in the North American Lycosinae (Family Lycosidae) have been revised, there has yet to be a phylogenetic study of the subfamily. One step in clarifying relationships in the Lycosinae is this phylogenetic study of the North American genus *Schizocosa* Chamberlin using a morphological data matrix. Thirty taxa are included in this analysis, including two

outgroups (*Gladicosa pulchra* and *Hogna georgicola*), one undescribed species, three geographically distinct populations of *S. ocreata* and two distinct populations of *S. crassipes*. Fifty characters were found to be informative and include 20 somatic characters, 13 male palpal characters, 11 female epiginal characters and 6 male secondary sexual characters. The genus is of interest because there are several species that display prominent secondary sexual characteristics; several species have been used as models for sexual selection, fluctuating asymmetry and speciation. Heuristic searches were performed using Paup (Ver. 4.0b4a), using the Stepwise-addition option & 1000 reps of random addition sequences. All characters were unordered. The following data sets were run: (1) all characters included, equal weight; (2) palp and epiginal characters weighted as "2"; somatic and secondary sexual characters weighted as "1"; (3) characters reweighted by the CI (consistency index), RC (rescaled consistency index) and RI (retention index). There was support for three clades on the preferred trees: [*aulonia*, *cespitum*, *salsa*, *mimula*, and *chiricahua*], [*avida*, *communis*, *retrorsa*, *mccooki*, *maxima*, and *minnesotensis*] and [*humilis*, *bilineata*, *crassipalpata*, *saltatrix*, *duplex*, *crassipes*, *ocreata*, *rovneri*, *stridulans*, *uetzi*, and *floridana*]. This phylogeny provides insights into the evolution of behavior in this genus and in the evolution of secondary sexual characteristics.

#### 9:20 AQUATIC HEMIPTERA AND COLEOPTERA OF OLD WOMAN CREEK ESTUARY

Marty L. Harvill\* and Robert M. Kobza, Mississippi University for Women Columbus, MS 39701 and Florida International University, Miami, FL 33199

The primary purpose of this study was to survey the aquatic insects of the Old Woman Creek (OWC) estuary and identify them to their lowest taxonomic level. Ten sampling locations were established throughout OWC estuary. Qualitative samples were collected once in May, twice in June, twice in July, twice in August, and once in September. Three sampling methods were used for each location during each sampling period, which included Ekman dredges, dip netting, and black-light trapping. Due to the presence of bald eagle chicks at collection stations 4,5,7, 8, and 9, Federal Laws prohibited collecting in these locations during May and June. Three samples were collected from each station for a total of 195 samples yielding a total of 3710 organisms constituting 120 taxa. So far two groups of aquatic insects (Hemiptera and Coleoptera) have been completely documented for OWC area. Several other groups are partially completed with either their larvae or adults done. The study has added a several new taxa to the OWC estuary species list.

#### 9:40 MOLECULAR METHOD TO DISTINGUISH LARVAL *CALLINECTES SAPIDUS* AND *C. SIMILIS* FROM NON-INDIGENOUS *C. BOCO-URTI* (CRUSTACEA:DECAPODA: PORTUNIDAE)

Richard L. Darden\*, Kenneth C. Stuck, Walter M. Grater, Patricia M. Biesiot, and Brian R. Kreiser, University of Southern Mississippi, Hattiesburg, MS 39406

Ship ballast water is a major source of introductions of coastal marine species, particularly of holoplankton and meroplankton with relatively long-lived planktonic larvae. Morphological similarity during early life history stages of *Callinectes* spp. makes larval identification difficult. However, nucleotide sequences within the mitochondrial DNA of these species vary sufficiently to serve as reliable species identity markers. A portion of the 16S rRNA gene was amplified via the polymerase chain reaction (PCR) and sequenced to determine unique restriction enzyme cleavage sites to produce species-specific DNA restriction fragment length polymorphisms (RFLPs). Following testing of this technique using known species mixtures and sample concentrations, we will test the method using field collected plankton samples. For example, adults of the invasive *Callinectes bocourti* collected in the Back Bay of Biloxi and Mississippi Sound have presumably been transported as larvae via ship ballast water. The species identification technique described here may prove useful in studying the introduction and spread of non-indigenous species via ballast water.

10:00 Break

10:20 Divisional Poster Session

#### AGONISTIC BEHAVIOR OF THE MEDITERRANEAN GECKO (*HEMIDACTYLUS TURCICUS*)

Venetia S. Briggs, University of Southern Mississippi, Hattiesburg, MS 39406

Aggression, as a form of competition, may influence dispersal of species and the spatial distribution of individuals within a population. I observed agonistic behavior in the Mediterranean gecko (*Hemidactylus turcicus*) to test two hypotheses: 1) adult behaviors differ in response to variation in types of conspecifics and to levels of limited resources; 2) juvenile behavior is affected by different adult cues. In the first experiment, I examined aggression among males in response to different levels of food quality, availability of retreat sites, and different types of residents. In the second experiment, I observed juvenile responses to adult cues such as tactile, visual, chemical or in combinations. Preliminary results suggest that aggression is more prevalent in the presence of a conspecific male and that different levels of limited resources did not alter agonistic behavior during male/male interactions. Preliminary results also indicate that adult cues are factors that determine a juvenile's response to an



adult male during encounters. This study holds promise of providing insight into the factors that influence the social structure of an introduced species.

**THE EFFECTS OF TIME OF DAY ON MOTHER-INFANT ASSOCIATION PATTERNS OF BOTTLENOSE DOLPHINS (*TURSIOPS TRUNCATUS*) IN CAPTIVITY**  
 Kymbr Wright\* and Stan Kuczaj, University of Southern Mississippi, Hattiesburg, MS 39406

Behavioral data on association patterns between mothers and their infants are sparse. This study compares the association patterns of four mother-infant pairs over a two-month period. The data was collected using instantaneous sampling over a 24-hour period at Marine Life Oceanarium. The preliminary analysis of these data indicate a significant difference (Chi Squared  $p < 0.05$ ) between nocturnal and diurnal association patterns. This difference is based on the fact that infants spend more time with their mothers at night than during the day.

**EFFECTS OF SELECTED TIMBER MANAGEMENT PRACTICES ON FOREST BIRDS IN MISSOURI OZARKS**

Cheryl M. Welch, Mississippi University for Women, Columbus, MS 39701

I compared the effects of uneven-aged and even-aged management treatments on songbird demographics within a 127 ha forested plot under long-term study since 1990. Field methods included spot mapping, nest monitoring, mist-netting and banding. Reproductive success was analyzed using the Mayfield Method. Densities of three species, Hooded Warbler (*Wilsonia citrina*), Yellow-Breasted Chat (*Icteria virens*) and White-Eyed Vireo (*Vireo griseus*) were compared using mist net data from the two treatment areas. Reproductive success and species densities will be presented. Such short-term responses may help determine which management treatment is best for maintenance of certain avian populations.

**SPECIAL PRESENTATIONS**

**THURSDAY MORNING**

Room 706

8:30 Geology and Geography Symposium: **ACTIVE TECTONICS IN NORTHERN MISSISSIPPI**  
 Terry Panhorst, Organizer; Stephen Obermeier, Keynote Speaker

**THURSDAY MORNING**

Executive Room

9:00 **SIGMA XI SYMPOSIUM: ISSUES OF ETHICS IN THE PRACTICE OF SCIENCE AND IN SCIENTIFIC RESEARCH**  
 Charles T. Swann, Organizer

Ethics play an important part in science from the research labs to codes of professional practice. This symposium is designed to explore how ethics issues may influence your work, your classroom, and how you do business. Everyone is welcome to attend and participate.

**THURSDAY MORNING**

Imperial Room

10:10 History and Philosophy of Science Symposium: **ASSUMPTIONS UNDERLYING SCIENCE**  
 Robert P. Waltzer, Belhaven College, Jackson, MS 39202

This series of talks addresses the nature of science: what it is and how it is done. Ken Curry, a biologist, will look at the generation of theories, using evolution as an example. Kant Vajpayee, an engineer, will consider our assumptions about the physical world, our descriptions of it, and how our descriptions match it. David Magers, a physical chemist, will examine how science fits into the modern context of society and the presuppositions by which societies do science. A question and answer period for all the speakers will follow.






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**THURSDAY AFTERNOON**


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Room 2

**5:00 Dodgen Lecture: TICKS AND TICK  
ECOLOGY IN MISSISSIPPI:  
IMPLICATIONS FOR HUMAN DISEASE  
TRANSMISSION**
**Jerome Goddard, Medical Entomologist, Mississippi  
Department of Health**


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**FRIDAY MORNING**


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Room 2

**9:00 MISSISSIPPI CENTER FOR SUPERCOMPUT-  
ING 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 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. IHL Faculty and graduate students with an interest in high performance computing are also invited to attend.

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